



2013 MICHIGAN DOT

INNOVATIONS REPORT

SEPTEMBER 2013



Compiled by Research Administration

michigan.gov/mdotresearch

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Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ABC	accelerated bridge construction
AFAD	automated flagger assistance device
AMG	automated machine guidance
ARA	Applied Research Associates
ATM	active traffic management
ATIS	Advanced Traveler Information System
AVL	automatic vehicle location
BIRM	Bridge Inspector's Reference Manual
BRT	Bus Rapid Transit
CAD	computer-aided design
CCA	crushed concrete aggregate
CFRP	carbon fiber reinforced polymer
CFS	Construction Field Services
CMC	cementitious material content
CMF	crash modification factor
CMGC	construction manager/general contractor
CMU	Central Michigan University
CPM	Capital Preventive Maintenance
DB	design-build
DBB	design-bid-build
DBE	Disadvantaged Business Enterprise
DIBC	Detroit International Bridge Company
DOT	department of transportation
DSRC	dedicated short-range communication
DTM	digital terrain model
DUAP	Data Use Analysis and Processing
ECR	epoxy-coated rebar
EMS	emergency medical services
EOC	Engineering Operations Committee

FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FPVS	fixed price variable scope
FRP	fiber-reinforced polymer
FY	fiscal year
GPS	global positioning system
GRS-IBS	Geosynthetic Reinforced Soil Integrated Bridge System
HMA	hot-mix asphalt
HMAOC	Hot-Mix Asphalt Operations Committee
HPS	high-pressure sodium
HSIP	Highway Safety Improvement Program
ITE	Institute of Transportation Engineers
ITS	intelligent transportation systems
JPCP	jointed plain concrete pavement
LCCA	life-cycle cost analysis
LED	light-emitting diode
LiDAR	light detection and ranging
LOS	level of service
LTAP	Local Technical Assistance Program
LTBP	Long-Term Bridge Performance
LTU	Lawrence Technological University
MAP-21	Moving Ahead for Progress in the 21st Century
MBUF	mileage-based user fees
MDOT	Michigan Department of Transportation
MDSS	Maintenance Decision Support System
ME	mechanistic-empirical
MEPDG	Mechanistic-Empirical Pavement Design Guide
MiTEC	Michigan Transportation Engineering Conference
MPINS	MAP Project Information System
MPO	metropolitan planning organization
MSU	Michigan State University
MTU	Michigan Technological University
N/A	not available; not applicable

NBI	National Bridge Inventory
NCHRP	National Cooperative Highway Research Program
NHI	National Highway Institute
NHS	National Highway System
NREL	National Renewable Energy Laboratory
PI	principal investigator. The lead researcher of a project.
PM	project manager
QBS	quality-based selection
RA	Research Administration
RAC	Research Advisory Committee
RAP	Research Advisory Panel
REC	Research Executive Committee
RFP	Request for Proposals
RID	Reference Information Document
RSE	roadside equipment
RWIS	road weather information system
SCM	supplementary cementitious materials
SEP-14	Special Experimental Project No. 14
SHRP 2	Strategic Highway Research Program 2
SOP	Standard Operating Procedures
SPR	State Planning and Research Program
SPR, Part II	The second part of the State Planning and Research Program that concerns research rather than planning. It is also known as SPR II.
STOC	Statewide Transportation Operations Center
3-D	three-dimensional
TIGER	Transportation Investment Generating Economic Recovery
TOC	Transportation Operations Center
TPF	Transportation Pooled Fund
TRB	Transportation Research Board
TSC	Transportation Service Center
TSDC	Transportation Secure Data Center
TZD	Toward Zero Deaths
U of M	University of Michigan

UMTRI	University of Michigan Transportation Research Institute
U.S. DOT	United States Department of Transportation
usRAP	United States Roadway Assessment Program
VII	Vehicle-Infrastructure Integration
WMA	warm-mix asphalt
WMU	Western Michigan University
WSU	Wayne State University
XRF	X-ray fluorescence

Executive Summary

Introduction

Michigan state government, and the Michigan Department of Transportation (MDOT) specifically, have made improving customer service a primary focus. This means looking for better, faster, cheaper, safer and smarter ways to improve the development, delivery and operation of MDOT's products and services. Embracing innovation is critical to this improvement process. This report presents project details and implementation status updates for many of MDOT's innovation activities in four key areas: MDOT research program results; national and international research results; best practices identified from state, national or international sources; and MDOT pavement demonstration projects.

MDOT Research Project Results

MDOT's research program focuses primarily on applied transportation research—research that addresses current challenges and produces results that are ready for use by the department. Integral to the success of a state transportation research program is the timely implementation of research results. This report provides the implementation status for all research projects with final report issuance between October 1, 2009 and August 31, 2013. As noted in the table on pages 7 to 14, MDOT has successfully implemented the results of 24 of these projects and has initiated implementation efforts for another 20. Seven projects await implementation initiation. Only three projects yielded informative findings, yet were not ready for implementation at this time.

National and International Research (TRB Takeaways)

MDOT staff use many approaches to identify national and international research results that could be useful to the department. They conduct literature reviews, serve on national transportation research panels and committees, and regularly attend national meetings and conferences related to transportation. The Transportation Research Board (TRB) annual meeting, held every January, is the largest international gathering of transportation professionals. MDOT routinely sends between 15 and 30 staff to the conference in search of innovative ideas that could help the department improve its practices.

The table on pages 18 to 29 lists the key action items identified by staff that attended the 2012 and 2013 TRB Annual Meetings, along with the implementation status of each of these takeaways. Of the 58 action items reported to Research Administration, 15 have concluded and 43 are in progress.

Innovation Initiatives and Best Practices

Best practices are those initiatives that have a proven track record of increasing efficiency or effectiveness at the state or national levels. To identify effective practices not already in use within MDOT, staff review state and national research results, information from the transportation industry's contractors and contractor associations, and initiatives shared by peers at regional and national meetings. In addition, the Federal Highway Administration (FHWA) encourages the dissemination of best practices information through various programs, such as Every Day Counts and Highways for Life.

This report captures the steps that MDOT has taken to implement 16 best practices initiatives within the department. See Chapter 3 for details.

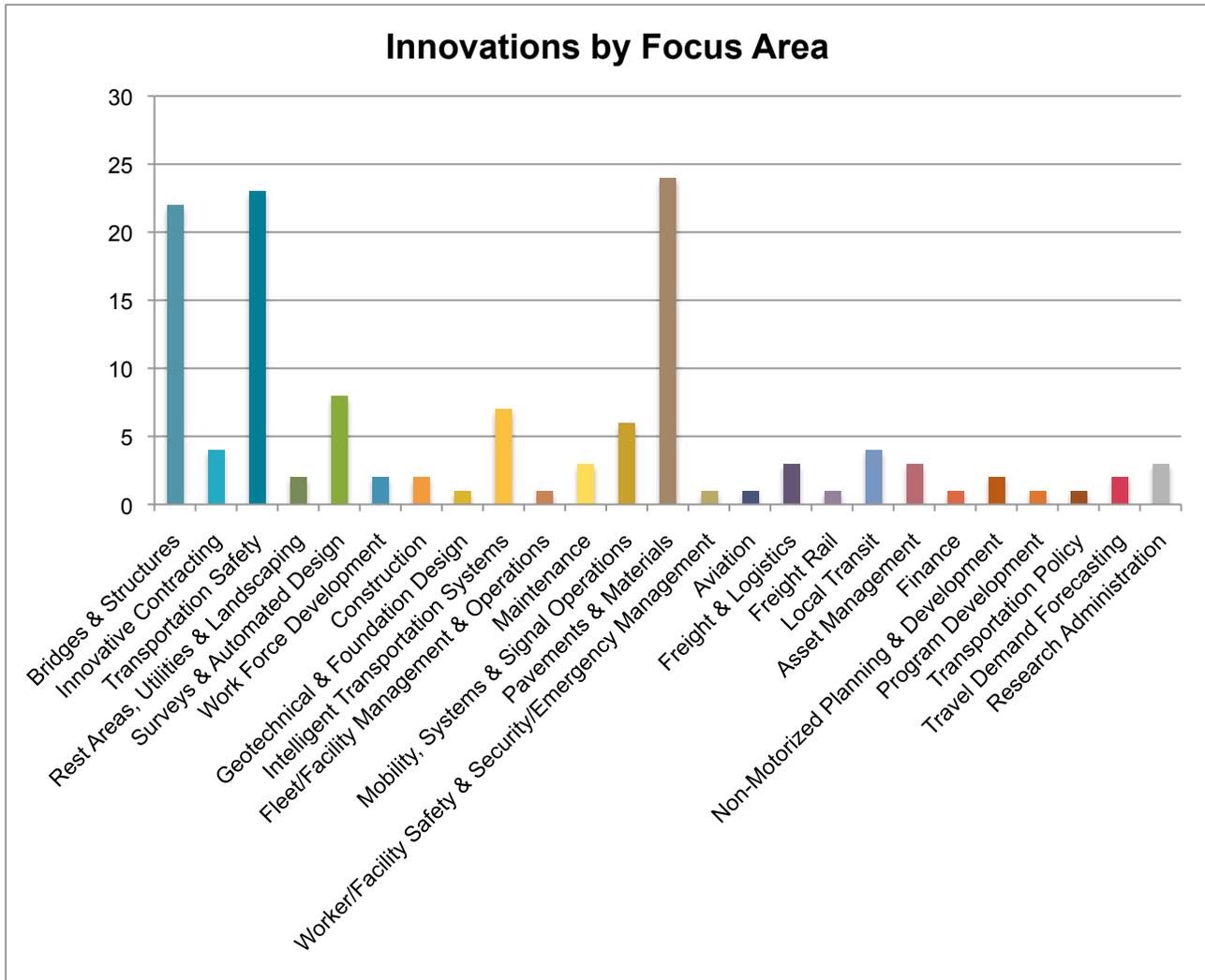
Pavement Demonstration Program

The MDOT Pavement Demonstration Program spurs innovation within the department by encouraging the use of new paving designs, materials and construction techniques. Up to four new pavement designs and technologies are applied in the field each year without being subject to the state's low-cost requirements. The program provides an opportunity to explore innovative practices that may initially cost more but could lead to significant savings or efficiencies on future projects. This report provides an overview of the Pavement Demonstration Program and a status update on the demonstration projects implemented between 2003 and 2009. See Chapter 4 for details.

Report Organization and Highlights

The new initiatives and research results presented in Chapters 1, 2 and 3 are organized by the transportation focus areas outlined in [MDOT's Research Program Committee Structure](#). Research Administration (RA) relies on the active participation of staff and executives throughout the department to identify research needs, manage research projects and implement research results. Four Research Advisory Committees (RACs), consisting of seven to eight transportation focus areas each, help guide MDOT research projects, identify promising innovative practices nationally, and lead implementation efforts within the department. By grouping the projects in this report by RAC and focus area, RA hopes to facilitate efficient review of innovations in the topic areas of greatest interest to stakeholders.

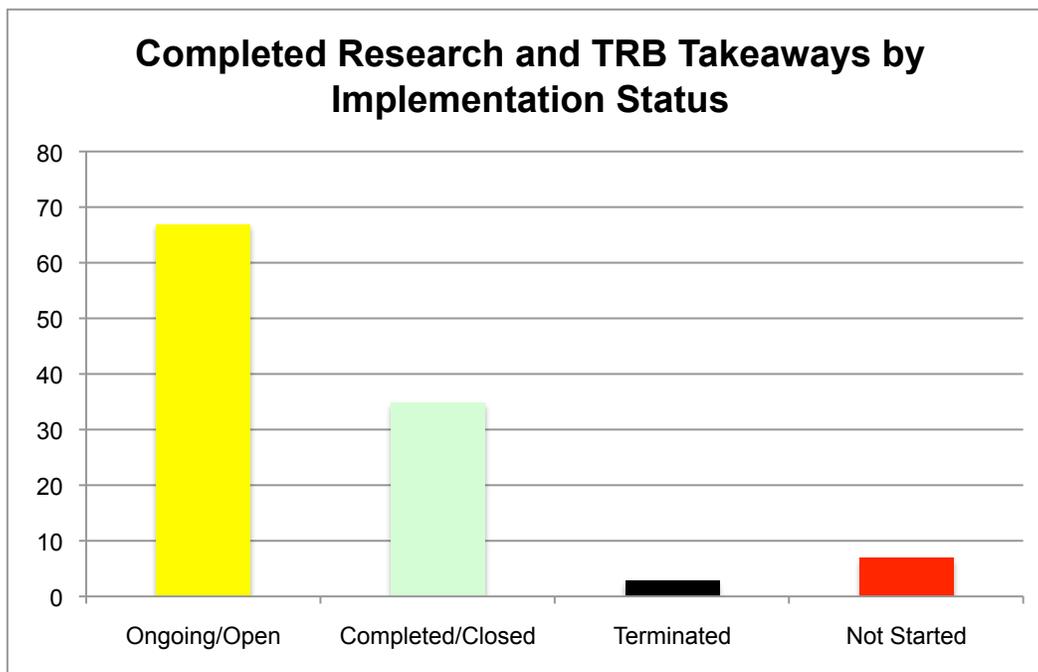
RA is pleased to report that implementation is being considered or is under way for innovations in 25 of MDOT's 31 focus areas. The diversity of transportation topics represented in this report is a testament to the entire department's commitment to efficiency, innovation and improved customer service. Three focus areas, however, stand out for the number of innovations initiated: Bridges & Structures, Transportation Safety, and Pavements & Materials. See the chart on the next page for the number of innovations reported for each focus area.



This report also provides implementation status codes for each of the MDOT research project results (Chapter 1) and TRB Annual Meeting takeaways (Chapter 2), as described below.

- Ongoing or Open (Yellow): Implementation and information sharing activities are under way.
- Completed or Closed (Green): Implementation activities and information sharing have been completed.
- Terminated (Black): The new information did not result in implementation within MDOT.
- Not Started (Red): Implementation efforts are not yet under way.

See the chart on the next page for a snapshot of these projects by implementation status.



Executives will be able to refer to the content of this report when making policy decisions or talking with legislators about successes and opportunities within the department. Managers can use the report to perform a quick assessment of where implementation stands for each completed project and which implementation activities need additional attention or resources to be successful.

Chapter 1

MDOT Research Project Results

Introduction

The Michigan Department of Transportation (MDOT) State Planning and Research, Part Two (SPR II) Program annually funds research projects that address real-world challenges identified by the state's transportation professionals. Aimed at producing implementable results, these projects can and do lead to improvements in efficiency and effectiveness throughout the department. To ensure that new innovations are successfully deployed within the agency, Research Administration (RA) works with staff throughout the department to track progress toward implementing results and identify any challenges encountered.

This chapter provides the implementation status for all research projects with final report issuance between October 1, 2009 and August 31, 2013. The summary table on pages 7 to 14 lists each project's title, final report publication year, MDOT project champion and principal investigator. The table also includes the latest available update on the status of implementation efforts made on each project. To facilitate a high-level review of implementation progress, the following four colored status codes are used:

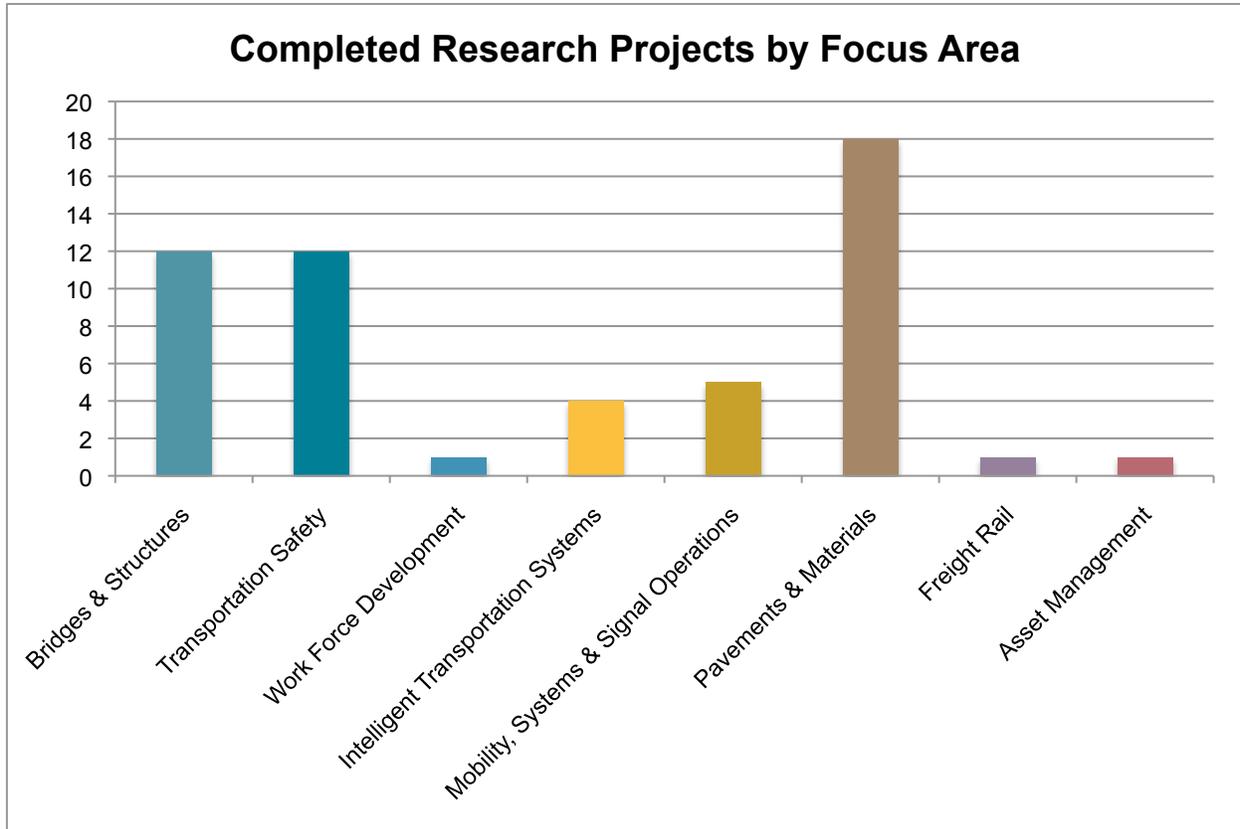
- Not Started (Red): Implementation efforts are not yet under way.
- Ongoing (Yellow): Implementation activities are under way.
- Completed (Green): The results of the research have been implemented.
- Terminated (Black): Implementation was either not recommended or was halted once it began.

The projects are organized by the four Research Advisory Committees (RACs) that make up the research program committee structure: Highways Program & Project Development, Highways Delivery & Operations, Multi-Modal Transportation, and Planning and Finance. Within each RAC, there are seven to eight focus areas that are used to further group the projects by topic.

For each of the projects summarized in the table on page 7, there is a corresponding detailed project summary in Appendix A. Refer to these detailed tables to review the goals and results of each project and any implementation activities prior to 2013. Final reports and additional project summaries are available on the MDOT Research Administration Web site at www.michigan.gov/mdotresearch.

Of the 54 completed projects presented in this report, MDOT has successfully implemented the results of 24 and has initiated implementation efforts for another 20. Seven projects await implementation initiation, and only three projects did not yield implementable results. The

projects address a range of transportation topics and needs within the department, as illustrated in the chart below.



MDOT executives can use the information in this chapter to highlight research results that are improving the agency's products and services. In addition, MDOT managers can use this chapter to review implementation progress in their areas of expertise and to identify those projects that may need additional assistance or resources.

Research Projects Summary by Focus Area

For details on each of the projects listed in the table below, refer to Appendix A. Refer to the Abbreviations and Acronyms list for the full names of each abbreviated vendor organization.

Final Report Title	Publication Year (Fiscal Year)	MDOT Project Manager	Principal Investigator & Vendor	2013 Implementation Status	Status Code
Research Advisory Committee: Highways Program & Project Development					
Bridges & Structures					
Review and Revision of Overload Permit Classification	2013	B. Wagner	M. Baker, Michael Baker, Jr., Inc.	Implementation status pending.	Not Started
Stainless and Stainless-Clad Reinforcement for Highway Bridge Use	2012	S. Kahl	S. Kahl, MDOT	Implementation under consideration.	Not Started
Implementation of Sustainable and Green Design and Construction Practices for Bridges	2013	C. Larkins	K. Korkmaz, MSU	Various MDOT supervisors were contacted throughout the design, construction and maintenance divisions and it was decided that the findings of this research will not be implemented at this time but will be kept for possible future bridge applications.	Ongoing
Skewed Highway Bridges	2013	P. Jansson	G. Fu, WSU	The project manager expects to approve the final report in Fiscal Year 2013. MDOT plans to use the researcher's modeling recommendation, including design modification factors, for project development.	Ongoing
Identification of Causes and Solution Strategies for Deck Cracking in Jointless Bridges	2012	E. Burns	R. Burgueño, MSU	The MDOT Materials Section is piloting new concrete mixtures optimized for low shrinkage, along with design characteristics, for possible future bridge deck application.	Ongoing
Investigating Causes and Determining Repair Needs to Mitigate Falling Deck Concrete Hazards	2012	S. Kahl	N. Grace, LTU	The Bridge Committee met in March 2013 to decide on next steps: further research, a pilot demonstration project, and/or statewide implementation of research results.	Ongoing

Final Report Title	Publication Year (Fiscal Year)	MDOT Project Manager	Principal Investigator & Vendor	2013 Implementation Status	Status Code
Development and Validation of a Sensor-Based Health Monitoring Model for Parkview Bridge Deck	2012	S. Kahl	O. Abudayyeh, WMU	Implementation is ongoing.	Ongoing
High Skew Link Slab Bridge System with Deck Sliding over Backwall or Backwall Sliding over Abutment	2011	S. Kahl	H. Aktan, WMU	The Bridge Committee will meet in Fiscal Year 2013 to decide on the research recommendations.	Ongoing
Effects of Debonded Strands on the Production and Performance of Prestressed Concrete Beams	2011	S. Kahl	R. Burgueño, MSU	Ongoing site evaluations and assessments are planned for the 2013 construction season. The MDOT Bridge Committee will assess if more evaluation on future pilot projects is warranted or whether MDOT is ready to implement a new standard specification in 2014.	Ongoing
A Sensor Network System for the Health Monitoring of the Parkview Bridge Deck	2010	S. Kahl	O. Abudayyeh, WMU	The deterioration prediction model developed for the precast deck system has been disseminated to bridge scoping and inspection engineers for their use.	Ongoing
ECR Bridge Decks: Damage Detection and Assessment of Remaining Service Life for Various Overlay Repair Options (Part I & II)	2011	S. Kahl	R. Harichandran, MSU	The automated acoustic tapping technology requires further development before practical application in the field. Implementation terminated.	Terminated
A Critical Evaluation of Bridge Scour for Michigan-Specific Conditions	2011	D. Juntunen	D. Carpenter, LTU	Implementation terminated in 2012.	Terminated
Transportation Safety					
Evaluating the Appropriate Level of Service for Michigan Rest Areas and Welcome Centers Considering Safety and Economic Factors	2012	L. Lynwood	T. Gates, WSU	The research data and analysis will be used to align the next long-range rest area plan with Michigan Transportation Plan goals and strategies. MDOT also will start implementing the research recommendations, including conducting a system-level analysis and developing a rest area performance management process.	Ongoing

Final Report Title	Publication Year (Fiscal Year)	MDOT Project Manager	Principal Investigator & Vendor	2013 Implementation Status	Status Code
Evaluating the Performance and Effectiveness of Roundabouts	2012	D. Kanitz	J. Bagdade, OPUS, Inc.	The results were disseminated and are available on the MDOT Web site. MDOT is currently implementing the results into the Michigan roundabout design guide.	Ongoing
Recommendations for Meeting the Transportation Needs of Michigan's Aging Population	2011	K. Lariviere	D. Eby, U of M	In 2013, the project team and PM will make a presentation at the annual Aging in America Conference. In addition, a new research project will get under way in 2013 to focus on older driver education and development of a safe mobility planning strategy (including planning for driving retirement).	Ongoing
Educating the Public to Negotiate Roundabouts	2011	K. Lariviere	P. Savolainen, WSU	MDOT will continue to disseminate information from the study to field staff. In 2013 the central traffic operations office will follow up with regions to determine how they are using the information and whether it is helpful.	Ongoing
Recommendations for Meeting the Mobility Needs of Older Adults in Rural Michigan	2013	K. Lariviere	D. Eby, UMTRI	The project final deliverables were submitted to MDOT. Implementation is complete.	Completed
Evaluating Pedestrian Safety Improvements	2013	D. Thompson	R. VanHouten, WMU	Implementation is complete.	Completed
Impact of Non-Freeway Rumble Strips – Phase I	2012	J. Morena	T. Datta, T. Gates and P. Savolainen, WSU	Implementation completed in 2012.	Completed
Sharing the Road: Optimizing Pedestrian and Bicycle Safety and Vehicle Mobility	2012	D. Thompson	J. LaPlante, TY Lin, Inc.	Implementation completed in 2012.	Completed
Evaluating the Performance and Making Best Use of Passing Relief Lanes	2012	D. Kanitz	J. Bagdade, OPUS, Inc.	The results were implemented.	Completed

Final Report Title	Publication Year (Fiscal Year)	MDOT Project Manager	Principal Investigator & Vendor	2013 Implementation Status	Status Code
Safety Analysis of 4-Lane to 3-Lane Conversions (Road Diets) in Michigan	2012	J. Gutting	R. Lyles, MSU	Implementation completed in 2012.	Completed
Improving Driver Safety with Behavioral Countermeasures	2011	K. Lariviere	R. Backs, CMU	Implementation completed in 2012.	Completed
Evaluation of Steady-Burn Warning Lights on Channelizing Drums in Work Zones	2011	B. Zimmerman	T. Datta, WSU	Implementation completed in 2012.	Completed
Work Force Development					
Examining the Disadvantaged Business Enterprise (DBE) Program	2013	P. Collins	T. Davis, U of M	Implementation is ongoing.	Ongoing
Research Advisory Committee: Highways Delivery & Operations					
Intelligent Transportation Systems					
Slippery Road Detection and Evaluation	2012	S. Cook	R. Roberson, U of M-UMTRI	A new research project will start in Fiscal Year 2013 to compare results of the analysis of the two data capture methods.	Ongoing
Usage & Impact of the Michigan Vehicle-Infrastructure Integration Program (VII)	2012	S. Cook	L. Mixon, Mixon-Hill of Michigan, Inc.	A follow-up phase (DUAP-II) of this research is under way.	Ongoing
VII Data Use Analysis and Processing (DUAP)	2011	S. Cook	F. Dion and R. Roberson, U of M-UMTRI	Outreach activities of MDOT's VII research efforts will continue.	Ongoing
Michigan Ohio University Transportation Center – Multiple Reports (ITS Related Reports D&E and J&K)	2011	N. Annelin	Multiple PIs, U of M-Detroit Mercy	Implementation completed in 2012.	Completed

Final Report Title	Publication Year (Fiscal Year)	MDOT Project Manager	Principal Investigator & Vendor	2013 Implementation Status	Status Code
Mobility, Systems & Signal Operations					
Implementation of Quick Clearance in Michigan	2012	A. Kremer	D. Krechmer, Cambridge Systematics, Inc.	MDOT will work with first responders to educate the public using traditional and social media outlets. MDOT also will consider implementation of modifications to the statewide incident management database.	Ongoing
Best Practices for Emergency Rerouting	2012	A. Kremer	M. Dunzo, Kimley Horn	The guidance document will be disseminated to the regions/TSCs and other state partners with an emphasis on suggestions for establishing and maintaining effective interagency relationships to foster resource sharing and improved traffic management strategies. Also, recommendations for permanent signing of emergency reroutes will be used in future emergency rerouting plans.	Ongoing
Transportation Reliability and Trip Satisfaction	2013	J. Firman	T. Gates, WSU	Implementation completed in 2012.	Completed
Strategies for Improving Traveler Information	2011	J. Firman	C. Hedden, Cambridge Systematics, Inc.	Implementation completed in 2012.	Completed
Developing a Congestion Mitigation Toolbox	2011	J. Firman	J. Crawford, Texas A&M	Implementation completed in 2012.	Completed
Pavements & Materials					
Cost-Effectiveness of the MDOT Preventive Maintenance Program	2013	E. Chelotti	P. Ram & D. Peshkin, Applied Pavement Technology, Inc.	Study's recommendations are under consideration.	Not Started
Improved Performance of JPCP Overlays	2013	B. Krom	W. Hansen, U of M	Study's recommendations are under consideration.	Not Started
Preparation for Implementation of the MEPDG in Michigan: Part 1, HMA Mixture Characterization	2013	M. Eacker	M. Emin Kutay, MSU	Implementation has not started.	Not Started

Final Report Title	Publication Year (Fiscal Year)	MDOT Project Manager	Principal Investigator & Vendor	2013 Implementation Status	Status Code
Preparation for Implementation of the MEPDG in Michigan: Part 2, Rehabilitation Evaluation	2013	M. Eacker	K. Chatti, MSU	Implementation has not started.	Not Started
Laboratory Evaluation of Warm-Mix Asphalt	2011	J. Barack	Z. You, MTU	Implementation is ongoing.	Ongoing
Extending Life of Asphalt Pavements	2011	A. Iftikhar	H. Von Quintus, ARA	CFS will continue to recommend the use of enhanced mixtures for roadways based on the cost and life expectancy of the repairs.	Ongoing
Backcalculation of Unbound Granular Layer Moduli	2011	M. Eacker	G. Baladi, MSU	The recommendations of the subcommittees will go to the ME Oversight Committee for agreement and approval. It is anticipated that the recommendations of the ME Oversight Committee will need approval of the Engineering Operations Committee before the new software is fully implemented.	Ongoing
Assessment of Pavement Acceptance Criteria and Quantifying Its As-constructed Material and Structural Properties	2011	J. Staton	K. Chatti, MSU	Implementation is ongoing.	Ongoing
Characterization of Traffic for the New ME Design Guide (I-37A) for Michigan	2010	M. Eacker	N. Buch, MSU	MDOT will continue to utilize the results from this project with the new pavement design software. However, the results from pooled fund project TPF-5(242) on Prep-ME software may provide a newer methodology that would supersede this project's results.	Ongoing
Development of New Test Procedures for Measuring Fine and Coarse Aggregate Specific Gravities (108494)	2010	J. Barak	Z. You, MTU	The Project Manager awaits response from the Hot-Mix Asphalt Operations Committee.	Ongoing
Carbon Footprint for Hot-Mix Asphalt and Portland Cement Concrete Pavements	2011	C. Bleech	A. Mukherjee, MTU	The research results suggest ways of implementing the proposed framework within MDOT to help reduce the CO ₂ footprint of highway construction projects. Implementation is complete.	Completed

Final Report Title	Publication Year (Fiscal Year)	MDOT Project Manager	Principal Investigator & Vendor	2013 Implementation Status	Status Code
Impact of Hydrated Cement Paste Quality & Entrained Air-Void System on the Durability of Concrete	2011	J. Staton	L. Sutter, MTU	Implementation completed in 2012.	Completed
Durability Study of US-23 Aggregate Test Road and Recent JCP Project with Premature Joint Deterioration	2011	D. Smiley	Dr. W. Hansen, U of M	Implementation completed in 2012.	Completed
Sustainable Recycled Materials for Concrete Pavements	2011	J. Staton	P. Ram & T. Van Dam, Applied Pavement Technology, Inc.	Implementation completed in 2012.	Completed
Using Recycled Concrete in MDOT's Transportation Infrastructure—Manual of Practice	2011	J. Staton	T. Van Dam & S. Vitton, MTU	The research results were disseminated, and the report was posted on the MDOT research Web site. Implementation is complete.	Completed
Fifteen-Year Performance Review of Michigan's European Concrete Pavement	2010	D. Smiley	D. Smiley, MDOT	Implementation completed in 2010.	Completed
Evaluation of Concrete Pavements with Material-Related Distress	2010	D. Smiley	L. Sutter, MTU	Implementation completed in 2012.	Completed
Feasibility of Digital Imaging to Characterize Earth Materials	2012	R. Endres	R. Hryciw & H. Ohm, U of M	The project's final deliverables were submitted to MDOT. However, the camera images of aggregate materials were not conclusive enough to support practical use. Implementation terminated.	Terminated
Research Advisory Committee: Multi-Modal Transportation					
Freight Rail					
Timing Issues for Traffic Signals Interconnected with Highway-Railroad Grade Crossings	2013	K. Foondle	T. Datta & Others, WSU	Implementation under consideration in 2013.	Not Started

Final Report Title	Publication Year (Fiscal Year)	MDOT Project Manager	Principal Investigator & Vendor	2013 Implementation Status	Status Code
Research Advisory Committee: Planning and Finance					
Asset Management					
A Framework for Statewide Roadway Asset Management	2012	N. Annelin	B. Dye, Dye Management Group	Implementation completed in 2012.	Completed

Chapter 2

Transportation Research Board Meeting Takeaways

Introduction

In an effort to do business better, faster, cheaper, safer and smarter, MDOT encourages staff to seek out and apply innovative technologies and practices. Identifying these innovations requires active engagement with other transportation professionals across the country. The Transportation Research Board (TRB) meeting, held annually in Washington, D.C., provides a tremendous opportunity to learn about innovations in other states that could be implemented at MDOT. The TRB meeting brings together more than 10,000 transportation professionals to share research results, successful practices, new approaches and exciting opportunities across a wide range of transportation topics. Each year, MDOT sends 15 to 30 employees from various administration and operations areas to attend a diverse group of sessions and committee meetings at the conference.

To maximize the benefits of attending the TRB meeting for MDOT, the Engineer of Research organizes and facilitates a planning meeting with those individuals selected to participate. The group coordinates attendance at the various sessions and committee meetings to minimize overlapping participation and maximize opportunities for capturing new information. After the meeting, each participant summarizes the key takeaways from each of the sessions attended and notes opportunities for information sharing or implementation of new ideas within MDOT.

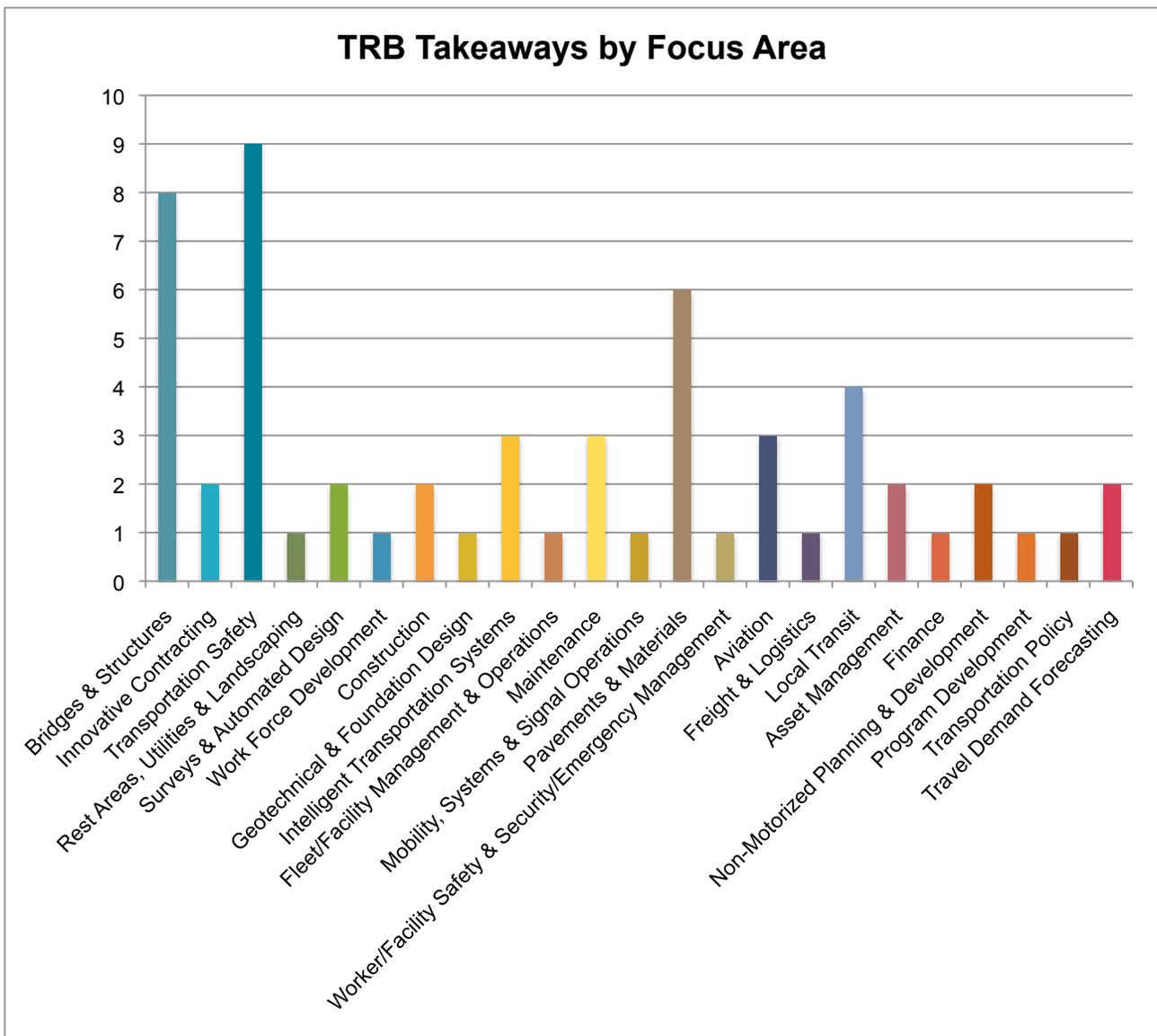
This chapter provides an overview of all takeaways from the TRB Annual Meetings in 2012 and 2013. The summary table on pages 18 to 29 lists each of these action items reported by MDOT staff after the meetings. The table includes the year of attendance, the identifying number of the session or committee meeting attended, the MDOT attendee, and the MDOT contact for implementation action. The table also includes the latest available update on the status of implementation efforts made on each action item. To facilitate a high-level review of implementation progress, two colored status codes are used:

- Open (Yellow): Implementation activities are under way.
- Closed (Green): The TRB takeaway has been shared and/or implemented.

As in Chapter 1, the action items are organized by the four RACs that make up the research program committee structure: Highways Program & Project Development, Highways Delivery & Operations, Multi-Modal Transportation, and Planning and Finance. Within each RAC, there are seven to eight focus areas that are used to further group the projects by topic.

For each of the action items summarized in the table in this chapter, there is a corresponding detailed action item summary in Appendix B. Refer to these detailed tables to review the takeaway information reported by staff and any implementation activities prior to 2013. Presentations, video sessions, papers and other materials from the TRB Annual Meeting are available at <http://amonline.trb.org>. MDOT employees can access full versions of these materials for free by registering for an account using a State of Michigan e-mail address.

Of the 58 action items reported to Research Administration, 15 have concluded and 43 are in progress. None of the items has been rejected for implementation. The action items apply to a diverse range of topics, touching on 23 of the possible 31 focus areas. See the chart below for a breakdown of TRB takeaways by focus area.



The action items catalogued in this chapter represent a significant commitment throughout MDOT to bringing innovation into the agency. MDOT executives can use the information in this chapter to share the impacts of these innovations with legislators and other stakeholders. In addition, MDOT managers can use this chapter to review implementation progress in their areas of expertise and to identify those action items that may need additional assistance or resources.

TRB Action Item Summary by Focus Area

For details on each of the projects listed in the table below, refer to Appendix B.

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Research Advisory Committee: Highways Program & Project Development						
Bridges & Structures						
ABCs of Accelerated Bridge Construction Policy Development	2013	561	Bob Ranck, Matt Chynoweth	Bob Ranck, Matt Chynoweth	Bob Ranck planned to discuss Utah's public outreach strategies with executive leadership and the Office of Communications. Matt Chynoweth will share the policy information from Iowa and Utah with the Bridge Committee.	Open
Characterizing Performance of Bridge Deck Systems	2013	335	Michael Townley	Steve Kahl	Michael Townley will convey several new technologies to Steve Kahl, including: <ul style="list-style-type: none"> • Using deck cracking prediction software to avoid designs that might result in early deck cracking. • Using X-ray fluorescence (XRF) as a practical method for positively identifying corrosion-resistant rebar for inspection acceptance. 	Open
Accelerated Bridge Construction	2012	170, 775	Dave Juntunen, Paul Ajegba	Dave Juntunen, Paul Ajegba	<ul style="list-style-type: none"> • The University Region has programmed a 2015 ABC project to replace all of the structures at the I-96/US-23 interchange near Brighton. • 60 percent of programmed 2013 projects use ABC design techniques in some way. ABC is being incorporated into MDOT's bridge scoping and design manuals and annual Call for Projects. 	Closed
Carbon Fiber Repair for Bridge Foundation Piles	2012	320	Dave Juntunen	Dave Juntunen	A research project titled "Design and Construction Guidelines for Strengthening Bridges Using Fiber-Reinforced Polymers" will begin in Fiscal Year 2013. The project will be led by Wayne State University.	Closed
Long-Span, Spliced and Continuous Prestressed Girder Bridges	2012	219	Dave Juntunen	Dave Juntunen	Information has been shared with the Bridge Committee. Spliced prestressed beams are being considered for use on the I-96/US-23 interchange project.	Closed

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Epoxy Overlay Testing	2012	365	Dave Juntunen	Dave Juntunen	Information on this topic has been shared with Bridge Field Services.	Closed
Long-Term Bridge Performance Program	2012	804	Dave Juntunen	Dave Juntunen	Information on this topic is shared with the Bridge Committee on an ongoing basis. As state coordinator of the Long-Term Bridge Performance (LTBP) program, Dave Juntunen recently participated in an LTBP meeting.	Closed
AASHTOWare Bridge Management Software (Formerly Pontis) Update	2012	776	Dave Juntunen	Dave Juntunen	The developer of the AASHTO BrM bridge management software recently gave a presentation to MDOT staff. MDOT is participating in a national pooled fund study on BrM and discussing next steps with the bridge authorities for Michigan's long-span bridges.	Closed
Innovative Contracting						
Successes in Accelerated Project Delivery	2013	165	Tony Kratofil	Chris Youngs	Tony Kratofil will talk with Chris Youngs, Innovative Contracting, about the expanded use of construction manager/general contractor projects. Tony Kratofil talked with Chris Youngs about piloting design-bid-build ATCs in lieu of post-award Value Engineering Change Proposals. This would allow MDOT to realize the entire value of the improved solution. EOC recently approved this approach on several projects at the February 2013 meeting.	Open
Best Value Contracting	2012	N/A	Steve Bower	Chris Youngs	Best Value and Quality Based Selection have been used on design-bid-build, design-build, and construction manager/general contractor projects in recent years. The need for transparency and clear selection criteria has been discussed with MDOT project managers. Efforts have been made to reduce subjective selection criteria as much as possible and provide detailed explanations to the teams that submit proposals on these projects.	Closed
Transportation Safety						
All You Wanted to Know about Roundabouts	2013	542	Bob Ranck	Imad Gedaoun	Bob Ranck will pass this information on to Imad Gedaoun, Lansing Geometrics.	Open

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Pedestrian Planning, Policy and Demand Analysis	2013	340	Michael Townley	Deirdre Thompson	<p>Mike Townley will speak with Deirdre Thompson, Traffic & Safety, regarding:</p> <ul style="list-style-type: none"> • Parking limitations and advance yield pavement markings should be considered to limit pedestrian exposure to multiple vehicle threats. • To improve pedestrian safety, yielding rates in communities with yield laws can be improved with education and enforcement. • MDOT could follow a plan similar to the effective Gainesville education and enforcement program outlined in the presentation. 	Open
Performance-Based Tools to Access Geometric Design Decisions	2013	679	Bill Wahl	Mark Bott	Bill Wahl will forward information on this topic to Mark Bott, Traffic & Safety, for further investigation.	Open
Innovations Worth Deploying Now: High-Value Research Results	2013	744	Steve Bower	Angie Kremer	Steve Bower will forward to Angie Kremer, Operations, for further investigation on rural road applications.	Open
Retroreflectivity and Wet Night Visibility of Pavement Markings	2013	774	Steve Bower	Mark Bott	Steve Bower will forward on to Mark Bott, Pavement Marking Technical Agenda Team Leader, for further investigation.	Open
Pavement Marking Management: Best Practices and Safety Benefits	2013	107	Steve Bower	Mark Bott	Steve Bower will forward on to Mark Bott for further investigation.	Open

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Systemic Safety Program Improvement Location Prioritization	2013	113	Dean Kanitz	Dean Kanitz	<p>Dean Kanitz will work with other safety staff to investigate the following:</p> <p>Local Systemic Safety Process:</p> <ul style="list-style-type: none"> • Examine the processes developed by Thurston County, WA, and Rutgers University and summarize their systemic safety. • Evaluate Roadsoft for potential use in defining systemic safety applications. • Evaluate Local Agency Safety Program for potential application changes for systemic safety project submittals. • Develop processes to address systemic applications of safety for statewide, regional, TSC and local levels. <p>Local Data Collection Processes:</p> <ul style="list-style-type: none"> • Look at what data can come from existing data and images. • Consider commitment for usRAP or potential modification to Roadsoft. • Determine local training needs (self-paced). • Shift Local Safety Initiative to support agency data collection efforts, use of student help to enhance collection. 	Open
Pedestrian Safety	2012	260	Steve Bower	Deirdre Thompson	The Danish Offset has already been implemented in Michigan; it is in MDOT's design toolbox when addressing pedestrian safety at mid-block locations. Zigzag pavement markings are not currently approved by the Michigan Manual on Uniform Traffic Control Devices. Before MDOT moves forward with implementing zigzag markings, Traffic & Safety recommends waiting for additional research on this topic.	Closed
Toward Zero Deaths	2012	N/A	Gregg Brunner	Gregg Brunner	The presentation has been shared with Lansing Traffic & Safety staff. Gregg Brunner also met with other MDOT staff to develop a Toward Zero Deaths message for possible inclusion in the upcoming Strategic Highway Safety Plan. The TZD presentation has also been given to the Saginaw Valley Traffic Safety Committee.	Closed
Rest Areas, Utilities & Landscaping						
Roadway Illumination Systems: Meeting Drivers' Visual Needs	2013	371	Steve Bower	Steve Urda	Steve Bower will speak with Steve Urda and Terry Frake, Design Services, regarding further action.	Open

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Surveys & Automated Design						
Best Practices and Lessons Learned Involving Virtual Design and Construction	2013	693	Dan Belcher	Dan Belcher	Dan Belcher, Design Surveys, will investigate the Penn State standard to see if it is applicable to MDOT. MDOT needs to begin developing standards for this new design technology.	Open
Digital Design Technology	2012	318	Steve Bower	Dan Belcher	<p><u>LiDAR</u> Design Surveys has two static LiDAR scanners that have been used for bridge and intersection mapping. The equipment is available for regional office use with Survey Support Unit assistance provided. Mobile LiDAR, through consultant contracts, continues to expand. The Survey Support Unit has the capability to process the LiDAR data into the topographic mapping and digital terrain models required by designers.</p> <p><u>3-D Models</u> GEOPAK Roadway Designer training is currently being provided to MDOT design staff. This is the first step in creating 3-D models for construction. Reference Information Documents (RID) have been added to eProposal to provide contractors with as much electronic information as possible on projects. The number of projects with RID will continue to expand as it goes from pilot to standard practice. 3-D model availability on MDOT-letted projects will continue to increase as projects are completed using Roadway Designer.</p> <p><u>Automated Machine Guidance (AMG)</u> With Roadway Designer now in place, we are able to produce the information necessary for AMG. The Engineering Support and Survey Support Units are now working with Construction staff to develop methods for stakeout and inspection on AMG jobs. We are providing training with GPS equipment and finding ways to use existing software for inspection activities.</p> <p>The first pilot project, the I-96/Latson Road Interchange, will incorporate all three technologies and will start later this year.</p>	Closed

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Work Force Development						
Disadvantaged Business Enterprise Committee	2013	AFH 80	Greg Johnson	Greg Johnson	Greg Johnson will convey this information to Pat Collins, DBE Office, for further investigation.	Open
Research Advisory Committee: Highways Delivery & Operations						
Construction						
Post-Installation Inspection of Buried Pipe	2012	100	Michael Townley	Michael Townley	<p>An MDOT research project made pipe inspection recommendations on the following topics because of our increased awareness of critical issues from TRB:</p> <ol style="list-style-type: none"> 1. MDOT's current standard of deflection. 2. A laser inspection form for acceptance, allowing engineers to make better field decisions. 3. How to measure deflection. 4. Timing of inspection. 5. A joint opening standard. 6. Installation training and inspector training. <p>Recommendations will be presented to the Engineer of Construction for consideration.</p>	Open
Project Management on Complex Projects	2012	118	Steve Bower	Terry Stepanski, Mohammed Alghurabi	<p>A workshop occurred in the Fall of 2012 at the Metro Region office. The SHRP 2 team for project R10 is providing the workshop because they are interested in applying the concepts of five-dimensional project management (Project Complexity Pentium) to some of MDOT's large projects such as the I-75 and I-94 megaprojects in the Detroit area. These projects will ultimately be used as case studies for further national research. MDOT was also awarded SHRP 2 Implementation funding for R10.</p>	Closed

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Geotechnical & Foundation Design						
Non-Nuclear Methods for Compaction Control	2012	510	Steve Bower	Dave Gauthier	A 2013 NCHRP synthesis project topic submitted by MDOT was selected for funding. The project, "NCHRP Synthesis 20-05/Topic 44-10: Non-Nuclear Methods for Compaction Control," is starting, and MDOT's Dave Gauthier is on the national project oversight panel.	Closed
Intelligent Transportation Systems						
Challenges and Opportunities for Road Vehicle Automation	2013	834	Tony Kratofil	Matt Smith	Tony Kratofil will speak with Matt Smith, ITS section, about using I-69 as a test bed for some of these technologies.	Open
Work Zone Intelligent Transportation Systems: Where Are They Now?	2013	573	Colin Castle	Angie Kremer	MDOT needs to learn more about utilizing ITS technologies to increase safety and efficiencies in work zones. Colin Castle will discuss further with Angie Kremer, Operations.	Open
Active Traffic Management	2012	206	Steve Bower	Matt Smith	The ITS Section is working with the Metro Region to explore the potential for Michigan's first ATM application on I-96 in Oakland County. The consultant has been selected for the study work, and was scheduled to begin work in Fiscal Year 2013.	Open
Fleet/Facility Management & Operations						
Critical Issues in Maintaining the Equipment Fleet	2013	770	Bill Wahl	Sonja Scheurer	Bill Wahl will communicate this information to Sonja Scheurer, OAS fleet services, for review and consideration.	Open
Maintenance						
Anti-Icing Chemical Performance	2013	204	Bill Wahl	Gary Mayes	Bill Wahl will forward this information to Gary Mayes, Roadway Maintenance, for further investigation.	Open
Benefits of Winter Maintenance and Road Condition Information	2013	351	Bill Wahl	Matt Smith	Bill Wahl will forward this information on to the Matt Smith, ITS section, for further investigation.	Open

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Maintenance Management Systems and Contracting	2012	N/A	Gregg Brunner	Gregg Brunner	Gregg Brunner is part of a team working to implement an Enterprise Asset Management System at MDOT. Utilizing the knowledge gained in both the Maintenance Contracting and Maintenance Management System sessions, the team is in the beginning stages of developing a Request for Proposals for the purchase of software. This software will allow MDOT to better manage its assets and will create a work-order-type process to track and report maintenance activities completed by direct forces, contract counties and maintenance contractors.	Closed
Mobility, Systems & Signal Operations						
Simulation-Based Evaluation of Dynamic Queue Warning System Performance	2013	339	Bill Wahl	Hilary Owen	Bill Wahl will convey this information to Hilary Owen, Traffic Operations, for further investigation.	Open
Pavements & Materials						
Development of In-Place Stabilization	2013	740	Bill Wahl	Curtis Bleech	Bill Wahl will communicate information on this topic to Curtis Bleech, Pavement Operations, for further investigation.	Open
Daring to Unpave	2013	739	Ron Vibbert	Ron Vibbert	Ron Vibbert will talk with Tim Colling at Michigan LTAP about incorporating the information into future training sessions for local agencies and the Transportation Asset Management Council.	Open
Don't Break It, Test It: Nondestructive Asphalt Testing	2013	207	Steve Bower	Curtis Bleech	Steve Bower will discuss with Curtis Bleech, Pavement Operations, to determine further action.	Open
Pavement Condition Evaluation: What's Below the Surface?	2013	260	Steve Bower	Curtis Bleech	Steve Bower will discuss with Curtis Bleech, Pavement Operations, to determine further action.	Open
Precast Concrete Pavement Patches	2012	726	Steve Bower	John Staton	The Materials Section in CFS and the Design Division developed design details and specifications for two precast concrete repair demonstration projects in Michigan. This information was included in SHRP 2 Project R05. The Materials Section will be reviewing the Project R05 report when it is released to determine what course of action is appropriate. Materials Section staff are also field-testing new concrete patch mixtures (cast-in-place patches) that provide the possibility of early opening to traffic (four to six hours) without sacrificing patch performance. This work continues, and evaluation will follow.	Open

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Pavement Design/Materials	2012	111, N/A	Mike Eacker	Mike Eacker	<ul style="list-style-type: none"> A new research project has been initiated to further develop data inputs needed to fully implement the mechanistic pavement design procedure. MDOT sent out a nationwide questionnaire to gather information on other states' experiences with implementation of MEPDG. Results have been received and documented. MDOT has joined the pooled fund effort "Traffic and Data Preparation for AASHTO DARWin-ME Analysis and Design." Mechanistic-empirical pavement design training for MDOT employees is being planned using Web-based methods, which is an idea suggested at a TRB workshop. 	Open
Worker/Facility Safety & Security/Emergency Management						
Superstorm Sandy: Transportation Challenges and Research Opportunities in the Aftermath of a Disaster	2013	N/A	Hilary Owen	Hilary Owen, Eileen Phifer	Hilary Owen is working with Eileen Phifer, Safety & Security, to initiate a review of MDOT emergency planning Standard Operating Procedures for the Statewide Transportation Operations Center (STOC). Owen also is initiating simulation workshops for TOC operators to train for various incidents.	Open
Research Advisory Committee: Multi-Modal Transportation						
Aviation						
Airports and Their Communities: Communicating Benefits beyond Economic Contribution	2013	314	Mike Trout	Mike Trout	Aeronautics staff are currently working with State of Washington staff, as they are willing to share their new airport mapping application.	Open
Commercial Space Transportation Past & Present: Money Wasted or Opportunities Galore—Where Will the Future of Space Exploration Lead Us?	2013	523	Mike Trout	Mike Trout	Aeronautics is working with advanced aerial systems consortium and should identify whether opportunities for spaceports in the state exist. Given the various military facilities in the state, both active and civilian airbases should be studied for this potential. Mike Trout will direct Aeronautics staff to review the possibility of conducting an asset review for potential spaceports in the state, perhaps as part of a statewide system plan update.	Open

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
What's Happening to General & Business Aviation: Understanding the Implication of Recent Trends	2013	786	Mike Trout	Mike Trout	MDOT Aeronautics continues to support business aviation as a significant part of the aviation system in Michigan and making investment in facilities to attract and retain businesses in communities. Mike Trout will discuss these items with staff, especially the Business Aviation Environment presentation, to look for additional uses at MDOT.	Open
Freight & Logistics						
Planning and Programming Reforms: Freight Planning	2013	720	Aarne Frobom	Lina Chapman	This information is being used to refine the department's freight plan and set up the freight advisory committee mandated by MAP-21. It may also help in amending the Supply Chain Management Commission Act of 2008 to reflect MAP-21. The experience of other agencies is expected to help integrate the freight plan with other MDOT plans and programs. Information from this session will also be used by the Bureau of Transportation Planning in commenting on Federal Highway Administration (FHWA) rulemaking under MAP-21, and in complying with future FHWA rules.	Open
Local Transit						
Bus Rapid Transit in Developing Nations	2013	125	Sharon Edgar	Sharon Edgar	Sharon Edgar is proposing to make a presentation to the Woodward Avenue Steering Committee about this issue. Key findings include: <ul style="list-style-type: none"> • BRT is not an end or a goal but a tool in the mobility toolbox. • Single-mode authorities are outdated. • It is harder for a user to figure out how to use an integrated, multimodal system than a single bus route and, therefore, harder to help riders make use of the system. • For more mature BRT systems, the next challenge is quality of service. The obstacles are political and organizational, not technological. 	Open
Innovative Approaches and Case Studies in Transit Management and Performance	2013	352	Sharon Edgar	Sharon Edgar	Sharon Edgar will convey information on this topic to Paul Lott, University Region Planner.	Open

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
New Approach for Measuring Transit System and Network Performance	2013	536	Andy Brush	Andy Brush	Andy Brush, Office of Passenger Transportation, will investigate whether this approach can be incorporated into existing MDOT efforts to measure the condition of the transit system in Michigan.	Open
Travel Behavior and Carsharing	2013	591	Andy Brush	Andy Brush	Andy Brush will investigate whether this activity is eligible for federal funding.	Open
Research Advisory Committee: Planning and Finance						
Asset Management						
Alignment of Highway Asset Level-of-Service Activities and Targets with Agency Strategic Performance Measures and Goals	2013	362	Tony Kratofil	Tony Kratofil	Tony Kratofil will discuss the session contents with MDOT staff involved in performance-based operations. This may assist MDOT in selecting the right targets for performance-based contracting and customer satisfaction WIG efforts.	Open
Data for Decisions and Performance Measures Task Force	2012	Task Force A0030T	Roger Safford	Roger Safford	N/A	Closed
Finance						
TIGER Grants	2012	N/A	Dave Wresinski	Dave Wresinski	\$55 million in TIGER grants were awarded for Woodward Avenue light rail and Port Huron bridge.	Closed
Non-Motorized Planning & Development						
Application of ITE's Recommended Practice: Designing Walkable Urban Thoroughfares	2013	781	Josh DeBruyn	Josh DeBruyn	Josh DeBruyn, Planning, will discuss implementing these concepts at MDOT with Brad Wieferich, Design Division.	Open
Cycling Infrastructure and Safety	2013	484	Josh DeBruyn	Josh DeBruyn	Josh DeBruyn will investigate the effort needed to perform an overall analysis of bicycle networks in various urbanized areas. The effort would identify deficiencies in safety and connectivity on various regional bicycle networks around Michigan. An additional benefit would be to provide improved coordination of planned infrastructure improvements for both non-motorized and motorized needs.	Open
Program Development						
MDOT MPINS Software Update	2013	N/A	Denise Jackson	Denise Jackson	Denise Jackson plans to contact PennDOT to determine whether there are any opportunities for technology transfer.	Open

Action Item	TRB Year	Session No.	TRB Attendee	Action Contact	2013 Action Status	Status Code
Transportation Policy						
Communicating Finance Concepts with John Q. Public—Annual Contest Winners	2013	589	Aarne Frobom	Aarne Frobom	Material from this session has been used by Polly Kent to help in devising an instructive game-style presentation to explain to the public the difficult choices inherent in budgeting for road preservation. This may be used by the Office of Communication to inform the public debate over road funding.	Open
Travel Demand Forecasting						
Data Warehousing and Management	2012	ABJ30	Larry Whiteside	Larry Whiteside, Karen Faussett	Information was passed on to MDOT's travel demand modeling staff. Modeling staff have reviewed information about the National Renewable Energy Laboratory (NREL) and its Transportation Secure Data Center program. The transportation data that the NREL stores may be useful for MDOT staff as a future resource.	Open
Travel Demand Forecasting	2012	714	Steve Bower	Matt Smith	MDOT currently has two initiatives under way that are related to this topic area: 1) Data Use Analysis and Processing (DUAP) and 2) an effort with the Center for Automotive Research involving the structuring and storing of data generated by intelligent transportation systems (ITS). One of the primary intents of both of these efforts is to determine how to store and use connected vehicle and ITS data for all uses (both ITS and non-ITS), which includes providing input into transportation planning models.	Open

Chapter 3

Innovation Initiatives and Best Practices

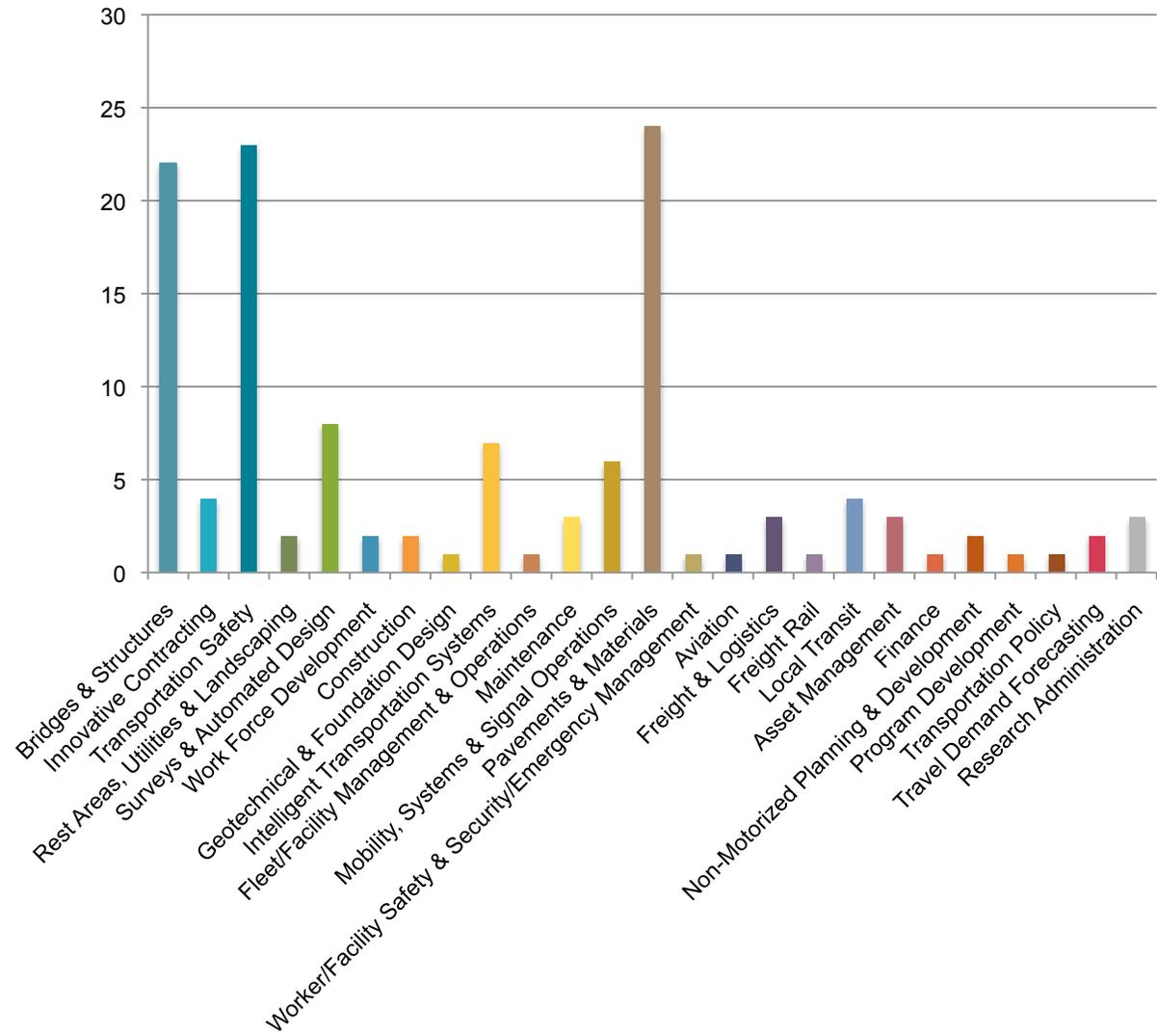
Introduction

MDOT technical experts identify opportunities for innovation in the department through active participation in American Association of State Highway and Transportation Officials (AASHTO) meetings and events, TRB committee activities, and interactions with peers from other state transportation departments. Department leaders encourage employees to share and apply new ideas and practices as a routine approach to improving MDOT's efficiency and effectiveness. Employees may initiate a change in operation with supervisor approval if the selected innovation doesn't require a change to an MDOT policy or standard procedure. When changes are necessary to implement an operational improvement, MDOT's leadership must approve the change before implementation.

Each year, MDOT sponsors the Highway Operations Alignment Meeting, where managers update agency leaders about initiatives that are improving MDOT operations. During the meeting, managers share information about innovation initiatives that are either in progress, planned or under consideration. The summaries of innovation and best practice initiatives included in this chapter were presented at the 2013 Highway Operations Alignment Meeting in Lansing.

As in previous chapters, the innovations are organized by RAC and focus area to facilitate review of activities by topic. The projects address a wide range of topics, covering 25 of the 31 focus areas. Bridges & Structures, Transportation Safety and Pavements & Materials experienced the most activity. See the chart on the next page for a breakdown of innovations by focus area.

Innovations and Best Practices by Focus Area



Innovation Initiatives and Best Practices by Program Area

Research Advisory Committee: Highways & Project Development

Bridges & Structures

Design of Carbon Fiber Bridge

Using carbon fiber reinforced polymer (CFRP) as reinforcing and prestressing materials in concrete bridges has many advantages, the most important of which is the anticipated long-term durability of the concrete element containing corrosion-resistant materials. When used for transverse post-tensioning, the CFRP materials can be stressed at higher levels than standard steel tendons (greater than 170 kips for CFRP compared to 120 kips for steel). Since the materials are non-corrosive, the transverse post-tensioning duct does not need to be grouted after stressing. To avoid creep rupture concerns, the optimal stress in the materials is 0.60 to 0.65 of the guaranteed ultimate tensile strength. Because the CFRP materials can be stressed to equivalent levels of steel materials, they are a competitive option in corridors of significance.

MDOT has built two structures using CFRP elements:

- **Project S09 of 82193, JN 79532A: Pembroke Avenue over M-39 in Detroit.** This bridge uses CFRP grid deck reinforcement and CFRP transverse post-tensioning of side-by-side box beams.
- **Project R01 of 38072, JN 79005A: M-50/US-127 BR over NS RR in Jackson.** This bridge uses CFRP transverse post-tensioning of side-by-side box beams.

Currently MDOT has one structure under construction using CFRP elements:

- **Project B03 of 82141, JN 106636A: M-102 over Plum Creek in Detroit.** This bridge uses CFRP longitudinal prestressing, all beam reinforcement of spread box beams and deck reinforcement.

MDOT also has one structure under design using CFRP elements:

- **Project S18 of 77111, JN 79545A: I-94 over Lapeer Road in St. Clair County.** This bridge uses CFRP transverse post-tensioning of side-by-side box beams.

Bridge-in-a-Backpack

The rigidified fiber reinforced polymer (FRP) structure, also known as the Bridge-in-a-Backpack, is a lightweight, corrosion-resistant system for short- to medium-span bridge construction using FRP composite arch tubes that act as reinforcement and formwork for self-consolidating cast-in-place concrete. The arches are easily transportable, rapidly deployable and do not require the

heavy equipment or large crews needed to handle the weight of traditional construction materials. The structures also feature composite mechanically stabilized earth walls and fiberglass corrugated fiber reinforced plastic decking installed on top of the arches.

MDOT has designed two of these structures:

- Project B04 of 23052, JN 105923A: M-50 over Mud Creek in Eaton.
- Project C19 of 32092, JN 100622A: M-25 over Harbor Beach Creek in Huron County.

These structures are best used on deep cuts with bedrock foundation materials where the arch shape can be optimized and arch kick-out forces can be resisted. Access to facilities that can produce self-consolidating concrete is also important.

Innovative Contracting

Expedited Procurement for Gateway Project Ambassador Bridge

Background. In 2004, MDOT and the Detroit International Bridge Company (DIBC) entered an agreement to connect the Ambassador Bridge directly to I-75 and I-96, removing commercial trucks and other vehicles from local streets and neighborhoods. DIBC was responsible for building improvements in the plaza necessary to complete these connections. The entire project was scheduled to be opened to traffic by December 2009.

However, DIBC's improvements were not built according to specifications of the agreement, jeopardizing federal funding allocated for the public portion of the work. Litigation began in 2008, and although the Wayne County Circuit Court ruled in favor of MDOT in February 2010, DIBC failed to complete its work. In March 2012, after additional litigation, the court ordered DIBC to provide funds in an escrow account to pay for the remaining work and ordered MDOT to complete the work.

Implementation. MDOT created an aggressive schedule to complete this project. The project team, led by staff from the Detroit Transportation Service Center, issued a Request for Qualifications in March 2012 to short-list the most qualified teams. The final bidding documents were issued April 4, with bids due April 9. The project was awarded April 11 and work began April 13. The dedicated truck route to I-75 was opened May 14, and the I-75 and I-96 freeway ramp connections for vehicles entering the plaza were opened September 20.

Advanced Contracting Innovations

MDOT continues to advance its use of various innovative contracting methods by letting projects with different procurement methods, including design-build, construction manager/general

contractor (CMGC), alternate pavement bidding and fixed price variable scope (FPVS). In 2012 MDOT piloted its first FPVS project using a design-bid-build procurement. The department also used design-build to complete work on two projects and piloted additional CMGC methods on unique projects in Detroit, Saginaw and Kent County. Each innovative contracting method has specific benefits, including expedited construction and implementation of innovative construction methods that provide the best value for the public.

Transportation Safety

Wrong-Way Movement Protection on Ramps

Background. A study completed in 2011 by MDOT and FHWA-MI safety staff found that over a five-year period, Michigan experienced 110 wrong-way entries onto freeways that resulted in a crash—not because the driver lost control of the vehicle but because the driver entered the system via an exit ramp. The crashes resulted in 66 fatal or disabling injuries, a crash rate of 60 percent. Typically freeway-related crashes have a severe crash rate of only 2 percent.

Significant trends in the data show that the majority of these crashes (78 percent) occur under conditions of darkness. When driver condition could be determined, 59 percent of drivers were under the influence of drugs or alcohol. Interchange type was examined if the reporting officer identified the point of entry. Seventy-one percent of the known entry points occurred at partial cloverleaf or trumpet interchanges, where exit and entrance ramps are parallel to each other and perpendicular to the crossroad. Only 23 percent of all interchanges in the state are partial cloverleaf or trumpet designs.

Implementation. MDOT targeted low-cost treatments for these interchanges, including:

- Lowering the bottom height of the Wrong Way/Do Not Enter signs to a 4-foot bottom height.
- Providing reflective sheeting on the Wrong Way/Do Not Enter signposts.
- Providing turning guidelines.
- Providing a wrong-way pavement marking arrow on the exit ramp.
- Painting the separator island between the exit and entrance ramps.
- Providing stop bars.
- Providing wrong-way (red) delineation on the exit ramp.

The total estimated cost to treat 161 interchanges (245 ramps) is \$2 million.

Truck Overturn Study

In 2012, the American Transportation Research Institute released a truck overturn study that highlighted the interchanges most prone to truck rollovers in 31 states. The study identified 10 such interchanges in Michigan.

In response to the study, the MDOT Safety Programs staff gathered data about single-vehicle truck overturn crashes from 2002 to 2011 and coded them to the appropriate portion of each interchange to determine the cause of each crash and any appropriate action that could be taken. The Traffic Signing Unit reviewed each location in the field and developed a signing plan to guide trucks along the ramps within these interchanges. Plan improvements included additional curve warning signs, chevrons, truck rollover warning signs and reflective strips on signposts.

Improvements have been completed at eight of the 10 interchanges; improvements to the remaining two interchanges are scheduled in 2013.

Rest Areas, Utilities & Landscaping

Rest Area Value and Assessment Tool

To support MDOT's methodology for evaluating the value of Michigan rest areas and welcome centers, researchers created an Excel tool that allows administrators, policymakers and technical staff to evaluate the potential economic, safety and functional impacts associated with the removal of an existing facility or the addition of a new facility to the system. This tool will be used along with condition and service data to develop an asset management strategy for rest areas. The spreadsheet gives MDOT a simple, focused planning tool that will enable improved decision-making by accurately weighing the costs and benefits of rest areas—both individually and as a system.

Surveys & Automated Design

Reference Information Documents

MDOT has developed the Reference Information Document process for contractors bidding on construction projects. This initiative has been implemented for trunkline projects containing survey and/or plan sets. When a project is advertised, electronic files such as existing terrain surface, CAD base design files, survey control files and 3D models (optional at this time) are provided to contractors. While these files are furnished for reference only and are not part of the contract, the information reduces risk to contractors by streamlining electronic design information before bids are generated, which results in lower bids.

ProjectWise External Access

MDOT has initiated a pilot study that provides contractors with external access to ProjectWise, the department's engineering document management system. All construction documents for four construction projects were submitted to ProjectWise externally. Automated workflows along with electronic signatures have increased the transparency and promptness of submittals and approvals. Design consultant pilot projects also are being identified. In addition, FHWA has been given direct access to the milestone folders on federal oversight projects.

Power GEOPAK Replacing CAiCE

Power GEOPAK has replaced CAiCE as the automated survey terrain modeling and mapping tool for both MDOT and its survey consultants. Since the survey processing component shares the same platform used for road design, the deliverable process is more seamless, and enhanced intelligence for existing topographic features is passed to the designer with greater ease. The single-platform approach negates the need to maintain multiple sets of resource files, promoting efficiency in terms of CAD support.

Updating Sample Plans

The initial set of MDOT's sample plans has been released, incorporating recent changes brought about by the Design Deliverable Enhancement Project and Right of Way Process Improvement. The sample plans gives guidance on plan sheet layout and content. For the first time the CAD files also have been released, making it easier to see the CAD standards behind the plan sheets.

Survey and Design Training via Adobe Connect

The Design Division's Engineering Support Services and Survey Support units are offering several software training options to employees. Bentley LEARN is a new service that provides free training on most Bentley Systems software. These sessions are primarily for beginners and those who want to brush up on certain aspects of the software. In addition, MDOT support staff is conducting periodic online training classes on Power GEOPAK for survey and road design. These sessions are for all levels of experience and are provided using Adobe Connect. Finally, support staff is available to provide on-site one-on-one or group training. Contact Rachelle VanDeventer, Engineering Support supervisor, or John Lobbestael, Survey Support supervisor, for more information.

Latson Road—3D Model

In 2012, MDOT began construction of a new interchange at I-96 and Latson Road in Livingston County. This project, dubbed the "perfect storm," brings together many new MDOT initiatives. It was the first project to pilot the Design Deliverable Enhancement Project initiatives. The project minimized the use of typicals in the plan set by supplementing with design cross sections and a 3D model for machine control. Instead of providing quantities per sheet, it gives total

project quantities. This project was also one of the first to include Reference Information Documents for contractors during the bidding process.

In the construction phase, the project was the first to mandate electronic submission and signatures using the ProjectWise document management system, which provides transparency between MDOT and contractors and results in timely approvals and payments. The project was also one of the first to experiment with iPad technology and applications to enable more efficient inspection activities.

Research Administration

MDOT Web Site Redesign

In Fiscal Year 2013, RA implemented significant improvements to MDOT's research Web site, including a complete redesign of the site and the addition of many documents related to program development, outreach and research results. In the past, final research reports were only available online for a limited time. To enhance the value of the Web site and provide additional research information to both internal and external customers, RA initiated an effort to increase the percentage of reports available online from 10 to 80 percent by the end of 2013.

Research Program Committee Structure

MDOT continues to diversify the research program to reflect the department's multi-modal focus. The MDOT Research Program Committee Structure now has 31 research focus areas distributed across four Research Advisory Committees. MDOT's research outreach initiatives consist of success stories, Research Spotlights, Research Updates and RA newsletter articles. The At-A-Glance publication provides information about program expenditures, including project costs, project timeline and research vendor.

Research Advisory Committee: Highways Delivery & Operations

Geotechnical & Foundation Design

Intelligent Compaction

Intelligent Compaction refers to the compaction of road materials, such as soils and aggregate bases, using modern vibratory rollers. These rollers are equipped with an integrated measurement system such as GPS, accelerometers, an onboard computer reporting system and optional feedback control to allow for real-time monitoring and corrections in the compaction process.

Compaction is one of the most important processes in roadway construction. It provides uniform support for paving, which in turn increases pavement life. A pilot project is planned for Iron County in FY 2013.

Geosynthetic Reinforced Soil Integrated Bridge System

An alternative to traditional bridge support systems, Geosynthetic Reinforced Soil Integrated Bridge System (GRS-IBS) technology uses alternating layers of compacted granular fill soils with embedded fabric sheets of geotextile reinforcement to form abutments and support bridges. In this system, abutments are faced with concrete block. This technology is most appropriate for small, low-volume, one-span bridge crossings, where the threat of streambed scour is low, such as county systems.

According to Federal Highway Administration (FHWA) estimates, GRS-IBS will yield a construction cost savings of 25 to 60 percent over conventional construction methods. Currently in Michigan, consultants are designing a pilot project for Ionia County; construction is expected to begin in 2013.

Intelligent Transportation Systems

Safety Pilot Model Deployment

Background. The Safety Pilot Model Deployment is an important part of the U.S. Department of Transportation's (U.S. DOT) Intelligent Transportation Systems (ITS) safety research program. It involves a large-scale test of connected vehicle technologies in a real-world, multi-modal setting. The program will determine how effective connected vehicle safety applications are at reducing crashes and will show how drivers respond to these technologies while operating a vehicle.

The University of Michigan successfully teamed with several private and public partners, including MDOT, in the application of this high-priority U.S. DOT program. The project supports a 2013 National Highway Traffic Safety Administration decision on whether to enter a rulemaking process for incorporating connected vehicle technologies into new vehicle construction (similar to the process for seat belts, air bags and electronic stability control requirements).

Implementation. MDOT successfully deployed the Safety Pilot August 21, 2012, in Ann Arbor. The Model Deployment team, which includes MDOT representatives, has successfully instrumented more than 2,800 vehicles and more than 30 roadside equipment installation locations. Pilot deployments include 21 signalized intersections, three curve locations, five freeway sites and 73 lane-miles of roadway.

The amount and quality of the data generated from the vehicles and roadside equipment since August 2012 has exceeded the team's expectations. MDOT is using the data as a cornerstone for its Data Use and Analysis Processing project. U.S. DOT will use the results of this deployment to determine whether to enter into a rulemaking process to mandate the installation of connected vehicle technologies in new vehicles. U.S. DOT's decision is anticipated in fall 2013.

Automated Vehicles

MDOT continues to develop partnerships to facilitate the development and testing of automated vehicle technology in Michigan. Recent activities include coordinating the efforts of automotive manufacturers, robotic technology companies and technology firms to introduce state legislation that will promote the development and testing of this technology in Michigan. MDOT also has partnered with truck development companies to explore the use of controlled segments of Michigan roadways to test automated vehicle technologies for heavy vehicles. On the federal level, MDOT is working with several partners, including U.S. DOT and the U.S. Department of Defense, to test automated vehicle systems on Michigan highways, and is an active participant in TRB's Road Vehicle Automation forum.

Maintenance

Salt Bounce and Scatter Study

MDOT initiated a study that determined the bounce and scatter of salt on roadways to demonstrate how much material drifts from the intended target area of the road. The goals of this project are to reduce costs and minimize environmental impacts by understanding how truck speed, salt-delivering equipment and salt type (treated versus untreated) affect salt displacement during application. By determining precisely where the salt disperses after it leaves the truck and measuring how much material landed inside and outside of the target area, investigators will be able to establish how much salt scatters from the centerline into the target areas and beyond.

Tow Plow

In 2012 MDOT purchased and deployed its first tow plow unit. According to maintenance operators, the unit was a very useful tool during the past winter season. To encourage the use of these units, operators have developed training materials and currently are sharing lessons learned with other maintenance garage operators interested in deploying tow plow units in the near future.

Maintenance Decision Support System and Integrated Mobile Observation 2.0

As a member of the Transportation Pooled Fund Program's Maintenance Decision Support System (MDSS) study, MDOT has initiated a pilot project that implements MDSS on a 130-mile section of I-94 through the Southwest Region. This system provides weather and pavement forecasts as well as treatment recommendations for eight snowplow routes in the region. Using MDSS software installed on garage computers, the garage supervisor or foreman relays the forecast and treatment recommendations to the truck operators before and during their shifts. The foreman also enters the actual weather conditions into the MDSS as well as the actual maintenance actions taken if they were different from the MDSS recommendations.

MDSS has proved to be beneficial and seems to provide accurate weather forecasts and treatment recommendations during most winter events. However, additional modifications to the system are recommended to predict lake-effect snowstorms. Since this area receives a significant amount of lake-effect snow, MDOT is contributing to the pooled fund study by providing an ideal location to test lake-effect storm models and algorithms that are being developed by the weather forecasting vendor.

Integrated Mobile Observation 2.0

MDOT is partnering with the FHWA Road Weather Management Program and Minnesota and Nevada transportation departments on the Integrated Mobile Observation 2.0 project. For this project, MDOT is collecting data from 20 snowplows and 40 fleet vehicles using a Droid smartphone equipped with the DataProbe application, which was developed specifically for this project.

Every five minutes, DataProbe collects data—GPS coordinates, pictures, air and pavement temperatures and other information—from each vehicle's controller area network bus via a Bluetooth connection and transmits the data back to a server at the University of Michigan. The data then is fed to the National Center for Atmospheric Research and other partners to develop useful applications.

Mobility, Systems & Signal Operations

I-94 Truck Parking (Indiana to I-69)

In 2013, the MDOT ITS Program Office will construct a system to assess truck parking availability along the Interstate 94 (I-94) corridor in southwest Michigan and deliver real-time parking availability information to truck drivers. The I-94 Truck Parking Information and Management System was designed by the ITS Program Office and funded by the FHWA Truck Parking Facilities Discretionary Grants Program.

The focus of the project is to help mitigate truck parking overcrowding and associated safety concerns by monitoring and managing parking availability and providing timely information about both public and private truck parking facilities to commercial vehicle operators along the I-94 corridor. Currently expanding MDOT rest areas to provide more truck parking is not feasible. Instead, MDOT is identifying available parking and safe alternatives for the overflow, and then communicating that information to commercial vehicle operators.

A number of high-tech solutions are being designed to allow MDOT to disseminate this information to truck drivers, including dynamic truck parking signs; Mi Drive, MDOT's traveler information Web site (www.michigan.gov/drive); a smartphone application; and on-board connected vehicle equipment, such as Dedicated Short Range Communications. As with any ITS, driver distraction is a critical issue in all aspects of the project design. Both the smartphone and connected vehicle applications will require additional emphasis when implementing capabilities such as text to speech software to reduce driver distraction and improve safety.

Traffic Incident Management and Work Zone Safety Program

The Traffic Incident Management and Work Zone Safety Program ensures safe and reliable travel on the state's transportation system during incidents and through work zones. The program's focus includes tracking incidents; evaluating and implementing incident management best practices; managing data on work zone fatalities and injuries for Michigan's Dashboard; evaluating 4DX WIG performance measures sessions; training and developing new and improved incident management guidelines; and enhancing communication and incident management by expanding public and private partnerships with fire departments, law enforcement agencies, EMS, towing and recovery operations, environmental agencies, local agencies, other state DOTs and FHWA. Additionally, the program creates, modifies and maintains statewide policy, procedures, rules and regulations regarding work zones in Michigan, including design processes, implementation and modifications to work zone traffic control measures on projects.

Traffic Signals

In 2012 MDOT deployed two traffic signal (ASC-lite) systems: one in the University Region and the other in the Bay Region. Both systems automatically collect and analyze real-time traffic volume data and then make appropriate changes in signal timing to accommodate traffic volumes. System operation requires no human intervention, which could reduce labor costs by 75 percent. As of January 1, 2013, both signal systems are operational on MDOT's M-43 (Saginaw Highway) route in the University Region (Lansing) and M-84 (Bay Road) in the Bay Region.

Pavements & Materials

Mechanistic-Empirical Pavement Design

MDOT's leadership has approved the strategic implementation plans for new pavement designs using the Mechanistic-Empirical Pavement Design Guide. The agency has targeted full implementation in 2014. A research project is currently under way in Michigan to help calibrate input values in the pavement performance models of the design software. The scheduled completion date for this project is September 30, 2014.

New Ride Quality Specification

Whenever MDOT rehabilitates and reconstructs a roadway, its goal is to provide the best riding surface possible within budget. In January 2013, MDOT implemented a new ride quality specification. The new special provision was developed as a resource for ride quality requirements on both hot-mix asphalt (HMA) and portland cement concrete pavements. It has been incorporated in the following applicable projects:

- All new concrete and multiple-course HMA paving projects greater than one mile long.
- Cold milling and one-course HMA overlays of any length.
- One-course HMA overlays of any length.
- Diamond grinding projects of any length.

The specification should not be implemented on urban non-freeway projects before consulting the Construction Field Services Division. Also, the specification should not be used on local agency projects except for new concrete or multiple-course HMA paving projects on National Highway System routes.

Since the specification was only implemented recently, very little feedback has been received.

Warm-Mix Asphalt

Another innovation at MDOT is the use of warm-mix asphalt (WMA) materials that in most cases allow paving operations to continue beyond the typical construction season. A few pilot projects have been implemented using WMA, however, no results about its use have been reported from the field. MDOT's current specifications allow the use WMA or HMA on all flexible pavement projects.

Recycled Asphalt Shingles

MDOT continues to promote the use of recycled materials in daily operations. In 2013 the agency began to include recycled asphalt shingles in its recycled asphalt pavement specification.

MDOT is actively reviewing and assessing other opportunities to use asphalt shingles as a recycled material.

Safety Edge

In support of FHWA initiatives to improve safety along the roadway surface, MDOT plans to incorporate the Safety Edge technology during the 2014 construction season. This initiative is part of the Every Day Counts safety focus that FHWA has implemented nationwide.

Longitudinal Joint Specifications

Because of a long-standing problem with excessive longitudinal cracking in HMA pavements, MDOT continues to look for ways to improve the quality and durability of Michigan's bituminous pavements. MDOT's new specification for longitudinal joints was updated for the 2012 construction season. Industry representatives and MDOT technical experts will address concerns and issues regarding the use of the specification during the 2013 post-construction season reviews.

Chapter 4

Pavement Demonstration Program Status Report

Background

Public Act 259 of 2001 allows the Michigan Department of Transportation (MDOT) to construct up to four demonstration projects per year that are not subject to a Life-Cycle Cost Analysis (LCCA). The LCCA process is a tool to select the lowest cost pavement design over the expected service life of the pavement. The LCCA process must include, by law, historical information for initial construction and maintenance costs, and performance (service life). This information may not be available for new pavement designs, precluding them from being chosen as alternatives. Also, new pavement designs and new technologies are generally more expensive than the standard methodologies, which may reduce their chance of being selected as the lowest cost alternative. The pavement demonstration legislation provides an avenue for trying new and innovative ideas.

Potential advantages of pavement demonstration projects include increased service life, improved customer benefits, and lower maintenance costs. Future LCCAs may utilize cost, performance, and maintenance information from the demonstration projects.

Project Selection

Candidate projects are a collaborative effort between central office pavement personnel, region personnel, and industry groups. Once these partners reach a consensus that a project would make a good candidate, the project goes to MDOT's Engineering Operations Committee (EOC) for formal approval. Once approved, the project becomes part of the Pavement Demonstration Program.

Additional costs for the demonstration project are funded by the region's rehabilitation and reconstruction budget.

Project List

The following table contains a list of demonstration projects to date.

Table 1. Pavement Demonstration Project List

FY Let	Route	Region	County	Location	Description	Pavement Costs	
						HMA	Concrete
2003	I-75 NB	North	Ogemaw	Ski Park Road to Roscommon County Line	Low volume unbonded overlay		\$1,980,000
2003	M-84 SB	Bay	Bay/Saginaw	Pierce Road to Delta Road	Perpetual pavement	\$700,000	
2004	M-3	Metro	Wayne	St. Aubin to McClellan	Thin unbonded overlay		\$2,200,000
2005	M-13	Bay	Bay	Mary Drive to North Street	Low volume concrete		\$1,200,000
2005	I-96 WB	Metro	Wayne	M-39 to Schaeffer Road	Perpetual pavement	\$4,800,000	
2006	M-99	Univ.	Jackson	Village of Springport	Low volume concrete		\$100,000
2008	I-75 NB	North	Cheboygan	Topinabee Mail Road north for 2.37 miles	Perpetual pavement over rubblized concrete	\$781,000	
2009	M-1	Metro	Wayne	Tuxedo to Chandler	Thin unbonded overlay		\$931,000

NB = northbound; SB = southbound; WB = westbound

Below is a brief description of the status or condition of each project based on recent field visits.

I-75 Northbound (Ogemaw County): This project, constructed in 2003, is a 6-inch unbonded concrete overlay on the northbound direction only. It includes the following test sections:

- Section 1: 10 foot transverse joint spacing, unsealed joints, no load transfer bars, 0.25 miles
- Section 2: 10 foot transverse joint spacing, sealed joints, no load transfer bars, 0.25 miles
- Section 3: 12 foot transverse joint spacing, unsealed joints, no load transfer bars, 1.5 miles
- Section 4: 12 foot transverse joint spacing, sealed joints, no load transfer bars, 1.5 miles
- Section 5: 12 foot transverse joint spacing, sealed joints, load transfer bars, 0.5 miles

The southbound direction, constructed at the same time, was rubblized and overlaid with 6.5 inches of Hot Mix Asphalt (HMA).

Latest Survey: Section 3 of the unbonded concrete overlay continues to exhibit new cracking, despite a 2011 project that sealed the joints to keep water from infiltrating the pavement section. This pavement was analyzed by the University of Michigan as part of the research project titled *Improved Performance of Concrete Overlays*. The final report has yet to be completed. A

preliminary finding discovered that water was trapped in the HMA separator layer below the concrete overlay causing erosion and loss of support near the shoulders. The new cracks in Section 3 are likely due to damage (erosion) that occurred prior to the joints being sealed. A second finding was that the presence of load transfer bars is helping to reduce the amount of faulting at the joints. The report will recommend several ways to improve drainage in future concrete overlays.

Sections 1, 2, 4, and 5 have little to no distress with only 2 new cracks found in Section 4 and 1 new crack in Section 5.

The rubblize project in the southbound direction is beginning to show both longitudinal and transverse cracking. The longitudinal cracking, which is usually considered to be fatigue damage due to truck loads, is mostly in the passing lane. However, the passing lane carries fewer trucks than the outside lane, so the appearance of longitudinal cracks initially in the passing lane is not yet understood. The cracking along the centerline that has been sealed for several years did show signs of heaving, which would indicate the presence of water that has frozen and expanded (survey was completed in late November).

M-84 Southbound: This project is a 6.5-inch HMA perpetual pavement completed in the fall of 2005. This was a two-lane road that was upgraded to a four-lane boulevard section and was built over a two-year period. The northbound direction contained a standard 6.5-inch HMA cross section and was built in 2004. The southbound contains the perpetual pavement, which is designed for a 40-year life. Polymerization of the HMA and a thicker base are expected to increase the service life over the standard cross section.

Latest Survey: Cracking in the northbound roadway (standard section) increased from 848 to 959 feet. The southbound roadway (perpetual section) increased from 218 to 388 feet. In the southbound roadway, 288 feet of the 388 feet total is in the left turn lanes at turnarounds. When comparing the mainline lanes, the perpetual pavement on the southbound side is outperforming the standard cross section on the northbound side.

M-3: This project is a 4-inch unbonded concrete overlay constructed in the fall of 2005. Normal unbonded overlays are 6 inches or thicker. This project contains four test sections involving a combination of sealed and unsealed joints with two different HMA bond breaking interlayer mixes. The HMA interlayer mixes are a normal dense-graded HMA and a more open-graded (drainable) HMA. The test sections are as follows:

- Section 1: Open-graded HMA interlayer, unsealed joints
- Section 2: Open-graded HMA interlayer, sealed joints

- Section 3: Dense-graded HMA interlayer, sealed joints
- Section 4: Dense-graded HMA interlayer, unsealed joints

Latest Survey: Overall, 265 of the 5 x 5 foot concrete panels have a crack (0.7% of the total in the survey area). Of the 265, 120 are on northbound and 145 on southbound. The sealed sections are exhibiting fewer cracks than the unsealed (109 vs. 156), while the drainable HMA interlayer is exhibiting fewer cracks than the dense-graded HMA (118 vs. 147). These counts do not include the 241 panels that were repaired in 2010.

M-13: This project is a low-volume concrete design constructed in the summer of 2005. The concrete is 6 inches thick compared to the normal 8 inches. Joints are spaced 5.5 feet in both directions and are unsealed. A dense-graded base was used instead of the normal open-graded base material.

Latest Survey: There is very little distress on this pavement with only 6 cracks and a few locations with some minor spalls (small pieces of concrete at joint broken off). Approximately 22 of the 5.5 x 5.5 foot panels are cracked at the south approach to the structure over the Pinconning River (0.3% of the total in the survey area). These are attributed to heavy equipment (large crane, etc.) that was parked there during a 2009 repair project on the structure.

I-96 Westbound: This project is a 14-inch HMA perpetual pavement constructed in the fall of 2005. The eastbound direction was reconstructed with concrete. The concrete is a 20-year design while the perpetual pavement is a 40-year design; this is not a side-by-side comparison.

Latest Survey: There was no change from the previous year's survey. Last year's survey noted the paving joint between lanes in a few areas was beginning to open up. This is typically a construction-related problem and not a problem with the design.

M-99: This is the second low-volume concrete design project and is the same as the M-13 project, except the joints are spaced at 6 feet in both directions. It was constructed in summer/fall of 2006 and is approximately 800 feet in length.

Latest Survey: There are no additional distresses to report from last year's survey. The five year warranty period for this project ended in late 2011. The amount of cracking on this project exceeded the allowable amount for the warranty, so the contractor made repairs this year. One crack was removed and replaced with new concrete. Most of the cracks were repaired with crack sealing techniques. Some of the crack sealing is already failing. In addition, some of the larger spalls were repaired.

I-75 Northbound (Cheboygan County): This is another 40-year HMA perpetual pavement design constructed in the fall of 2008. For this project, the existing concrete pavement was rubblized (broken into smaller pieces resembling gravel) prior to the paving of the HMA. Rubblization is a standard fix; however, the HMA resurfacing is normally a 20-year design.

Latest Survey: The only thing to note on this pavement was longitudinal cracking at the paving joint between lanes and between the outside lane and outside shoulder. This is typically a construction-related problem and not a problem with the design.

M-1 (Woodward Avenue): This project is a 4-inch unbonded concrete overlay similar to the M-3 project. It was constructed in 2010 and does not contain test sections. All joints were sealed and the same HMA interlayer (drainable open-graded HMA) was used throughout. Transverse joints are spaced at 6 feet while the longitudinal joints are spaced at 5 feet.

Latest Survey: A total of 30 of the 6 x 5 foot panels are cracked after two years of service (0.2% of the total in the survey area).

Appendix A

Research Project Details by Focus Area

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BRIDGES & STRUCTURES	TITLE: Review and Revision of Overload Permit Classification		
	PROJECT OVERVIEW		
	MDOT Project Manager: B. Wagner	Report Number: RC-1589	
	Principal Investigator & Vendor: M. Baker, Michael Baker Jr., Inc.	Contract Number: 2010-0317 Z1	
	Publication Year (Fiscal Year): 2013	Study Costs: \$207,668	
	Description: This research project looks at bridge software solutions for updating both the bridge analysis and overall overload permit classification processes.		
	IMPLEMENTATION STATUS		
<u>Implementation Goals</u> N/A	Implementation Recommended?	Yes	
	<u>Implementation Work Plan</u> N/A	2013 Status	Not Started
	<u>2013 Activity</u> Implementation is under consideration.		

BRIDGES & STRUCTURES	TITLE: Stainless and Stainless-Clad Reinforcement for Highway Bridge Use		
	PROJECT OVERVIEW		
	MDOT Project Manager: S. Kahl Principal Investigator & Vendor: S. Kahl, MDOT Publication Year (Fiscal Year): 2012		Report Number: RC-1560 Contract Number: 99G-0329/99G-0330 Study Costs: \$15,000
	Description: N/A		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A		Implementation Recommended? Yes
<u>Implementation Work Plan</u> N/A		2012 Status Not Started	
<u>2012 Activity</u> Implementation under consideration.		2013 Status Not Started	
<u>2013 Activity</u> Implementation under consideration.			

BRIDGES & STRUCTURES	TITLE: Implementation of Sustainable and Green Design and Construction Practices for Bridges					
	PROJECT OVERVIEW					
	MDOT Project Manager: C. Larkins Principal Investigator & Vendor: K. Korkmaz, MSU Publication Year (Fiscal Year): 2013		Report Number: RC-1586 Contract Number: 2010-0294 Z1 Study Costs: \$96,160			
	Description: The goal of this research was to develop a framework for more sustainable design and construction processes for new bridges, and sustainable maintenance practices for existing bridges. The framework includes a green rating system for bridges, which is divided into three sections: design, construction and maintenance.					
	IMPLEMENTATION STATUS					
	Implementation Goals N/A Implementation Work Plan N/A 2013 Activity Various MDOT supervisors were contacted throughout the design, construction, and maintenance divisions and it was decided that the findings of this research will not be implemented at this time but will be kept for possible future bridge applications.		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Implementation Recommended?</td> <td style="text-align: center;">Yes</td> </tr> <tr> <td>2013 Status</td> <td style="background-color: yellow; text-align: center;">Ongoing</td> </tr> </table>	Implementation Recommended?	Yes	2013 Status
Implementation Recommended?	Yes					
2013 Status	Ongoing					

BRIDGES & STRUCTURES	TITLE: Skewed Highway Bridges		
	PROJECT OVERVIEW		
	MDOT Project Manager: P. Jansson Principal Investigator & Vendor: G. Fu, WSU Publication Year (Fiscal Year): 2013	Report Number: RC-1541 Contract Number: 2006-0413 Z4 Study Costs: \$214,976	
	Description: This project conducted a condition assessment of skewed bridges in Michigan and evaluated the feasibility of changes in the bridge design predictive modeling practices and procedures.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> During 2012, the MDOT project manager and research panel members re-established contact with the original project principal investigator. <u>2013 Activity</u> The project manager anticipates acceptance of the final report by September 30, 2013. MDOT plans to use the researcher's modeling recommendation, including design modification factors, for project development.	Implementation Recommended?	Yes
		2012 Status	Ongoing
2013 Status		Ongoing	

TITLE: Identification of Causes and Solution Strategies for Deck Cracking in Jointless Bridges**PROJECT OVERVIEW****MDOT Project Manager:** E. Burns**Principal Investigator & Vendor:** R. Burgueño, MSU**Publication Year (Fiscal Year):** 2012**Report Number:** RC- 1571**Contract Number:** 2009-0746 Z1**Study Costs:** \$169,968

Description: The objective of this research project was to investigate the performance of jointless bridges, identifying the causes that lead to early-age deck cracking, and develop solution strategies to minimize or eliminate this damage. This was accomplished through experimentally calibrated finite-element computer simulations and field assessments.

IMPLEMENTATION STATUS**Implementation Goals**

N/A

Implementation Recommended?

Yes

Implementation Work Plan

N/A

2012 Status

Ongoing

2012 Activity

The report has been posted on the MDOT research Web site.

2013 Status

Ongoing

2013 Activity

The MDOT Materials Section is piloting new concrete mixtures optimized for low shrinkage for possible future bridge deck application. Also, design characteristics such as density of shear connectors will be further examined for possible future application.

TITLE: Investigating Causes and Determining Repair Needs to Mitigate Falling Concrete From Bridge Decks or Falling Deck Concrete Hazards

PROJECT OVERVIEW

MDOT Project Manager: S. Kahl

Principal Investigator & Vendor: N. Grace, LTU

Publication Year (Fiscal Year): 2012

Report Number: RC-1567

Contract Number: 2009-0428 Z1

Study Costs: \$279,279

Description: A comprehensive research study was conducted to develop performance thresholds and procedures to identify decks with spalling potential. The research included detailed field exploratory work supported by analytical and laboratory experimental work.

IMPLEMENTATION STATUS

Implementation Goals

N/A

Implementation Recommended?

Yes

Implementation Work Plan

N/A

2012 Status

Ongoing

2012 Activity

The research results were presented to the MDOT Bridge Committee in 2012.

2013 Status

Ongoing

2013 Activity

The Bridge Committee met in March 2013 to decide on next steps: further research, a pilot demonstration project, and/or statewide implementation of research results.

BRIDGES & STRUCTURES	TITLE: Development and Validation of a Sensor-Based Health Monitoring Model for Parkview Bridge Deck							
	PROJECT OVERVIEW							
	MDOT Project Manager: S. Kahl Principal Investigator & Vendor: O. Abudayyeh, WMU Publication Year (Fiscal Year): 2012		Report Number: RC-1564 Contract Number: 2009-0433 Z1 Study Costs: \$226,658					
	Description: Accelerated bridge construction (ABC) using full-depth precast deck panels is an innovative technique with many benefits. However, this technique needs to be evaluated, and the performance of ABC bridges needs to be monitored. Sensor networks, also known as health monitoring systems, can aid in the determination of the true reliability and performance of a structure by developing models that predict structure behavior and component interaction. The continuous monitoring of bridge deck health can provide stress signatures at the onset of deterioration, which help identify type of distress and prompt corrective measures. This project focused on the continuous monitoring and evaluation of the structural behavior of the Parkview Bridge full-depth deck panels under loads using the sensor network installed.							
	IMPLEMENTATION STATUS							
	Implementation Goals N/A Implementation Work Plan N/A 2012 Activity The project's final deliverables were approved by the PM/RAP and submitted to RA. 2013 Activity Implementation is ongoing.		<table border="1"> <tr> <td>Implementation Recommended?</td> <td>Yes</td> </tr> <tr> <td>2012 Status</td> <td>Ongoing</td> </tr> <tr> <td>2013 Status</td> <td>Ongoing</td> </tr> </table>	Implementation Recommended?	Yes	2012 Status	Ongoing	2013 Status
Implementation Recommended?	Yes							
2012 Status	Ongoing							
2013 Status	Ongoing							

TITLE: High Skew Link Slab Bridge System with Deck Sliding over Backwall or Backwall Sliding over Abutment

PROJECT OVERVIEW

MDOT Project Manager: S. Kahl	Report Number: RC-1563
Principal Investigator & Vendor: H. Aktan, WMU	Contract Number: 2006-0415 Z3
Publication Year (Fiscal Year): 2011	Study Costs: \$265,023

Description: The overall objective of this research was to study the behavior of the high skew bridge structural system through load testing and analytical modeling and analysis. Additionally, the researcher was to develop finite element models of selected components, or combinations of components, of the link slab bridge deck system with deck sliding over backwall and semi-integral abutment to understand the behavior and interaction between components under various load conditions, including volume change load. The goal was to develop recommendations for changes or modifications to the design of the link slab, and bearings, abutment types, and lateral restraint systems of bridges with link slabs.

IMPLEMENTATION STATUS

<p><u>Implementation Goals</u> N/A</p> <p><u>Implementation Work Plan</u> N/A</p> <p><u>2012 Activity</u> Research results were presented to the MDOT Bridge Committee in 2012.</p> <p><u>2013 Activity</u> The Bridge Committee will meet in Fiscal Year 2013 to decide on the research recommendations.</p>	Implementation Recommended?	Yes
	2012 Status	Ongoing
	2013 Status	Ongoing

TITLE: Effects of Debonded Strands on the Production and Performance of Prestressed Concrete Beams

PROJECT OVERVIEW

MDOT Project Manager: S. Kahl

Principal Investigator & Vendor: R. Burgueño, MSU

Publication Year (Fiscal Year): 2011

Report Number: RC-1546

Contract Number: 2006-0411 Z7

Study Costs: \$199,446

Description: There is little guidance or research on debonded strands related to manufacturing practice, length limits, reinforcement within the unbonded region, layout, or cutting sequence. To fill this gap, this study explored the effects of debonded strands, particularly those that can lead to distress, with the goal of improving design and manufacturing practices.

IMPLEMENTATION STATUS

Implementation Goals

N/A

Implementation Recommended?

Yes

Implementation Work Plan

N/A

2012 Status

Ongoing

2013 Status

Ongoing

2012 Activity

The research recommendations were presented to the MDOT Bridge Committee. A special provision requiring the use of sheathing was developed for use in late 2012 and was included in a pilot project that was let in December 2012.

2013 Activity

Ongoing site evaluations and assessments are planned for the 2013 construction season. The MDOT bridge committee will assess if more evaluation on future pilot projects is warranted or whether MDOT is ready to implement a new standard specification in 2014.

BRIDGES & STRUCTURES	TITLE: A Sensor Network System for the Health Monitoring of the Parkview Bridge Deck		
	PROJECT OVERVIEW		
	MDOT Project Manager: S. Kahl	Report Number: RC-1536	
	Principal Investigator & Vendor: O. Abudayyeh, WMU	Contract Number: 2004-0090 Z3	
	Publication Year (Fiscal Year): 2010	Study Costs: \$224,517	
	Description: This project responded to a need for applying continuous bridge health monitoring technologies and real-time data collection systems to bridges using rapid bridge construction techniques. The information gathered from these tools supports problem identification at early stages so that economic measures can be taken to avoid costly replacement and/or bridge failures. A sensor-based bridge health monitoring system had been developed and deployed for the Parkview Bridge in Kalamazoo, Michigan, which was constructed using a precast deck system. The researchers used these sensor networks to develop finite element models and deterioration prediction models to assess the performance of precast components.		
IMPLEMENTATION STATUS			
<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> MDOT will continue to monitor the Parkview Bridge over time. Performance reports will be distributed to design staff. <u>2013 Activity</u> The deterioration prediction model developed for the precast deck system has been disseminated to bridge scoping and inspection engineers for their use.	Implementation Recommended?	Yes	
	2012 Status	Ongoing	
	2013 Status	Ongoing	

TITLE: ECR Bridge Decks: Damage Detection and Assessment of Remaining Service Life for Various Overlay Repair Options (Parts I & II)

PROJECT OVERVIEW

MDOT Project Manager: S. Kahl

Principal Investigator & Vendor: R. Harichandran, MSU

Publication Year (Fiscal Year): 2011

Report Number: RC-1549

Contract Number: 2002-0532 Z19

Study Costs: \$332,075

Description: This project focused on assessing epoxy coating of the bridge deck reinforcement and its effect on remaining deck service life.

IMPLEMENTATION STATUS

Implementation Goals

N/A

Implementation Recommended?

Yes

Implementation Work Plan

N/A

2012 Status

Completed

2012 Activity

The assessment of epoxy coating of the bridge deck reinforcement was completed and implemented into the MDOT bridge design standards. This aspect of the research project has been fully implemented.

2013 Status

Terminated

2013 Activity

The automated acoustic tapping technology requires further development before practical application in the field. Implementation terminated.

BRIDGES & STRUCTURES	TITLE: A Critical Evaluation of Bridge Scour for Michigan-Specific Conditions		
	PROJECT OVERVIEW		
	MDOT Project Manager: D. Juntunen Principal Investigator & Vendor: D. Carpenter, LTU Publication Year (Fiscal Year): 2011	Report Number: RC-1547 Contract Number: 2007-0436 Z1/R1 Study Costs: \$151,834	
	Description: The research project's original focus was to review alternate methods for assessing scour potential under site-specific conditions. This approach did not prove worthy, so MDOT discontinued it. This led to actively monitoring scour at various bridge site locations. However, no significant rain events occurred to support fully assessing potential scour depth predictions against actual real events. Funding was discontinued.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> Project's final deliverables were submitted to RA. Research results were not implementable.	Implementation Recommended?	No
	2012 Status	Terminated	

TRANSPORTATION SAFETY	TITLE: Evaluating the Appropriate Level of Service for Michigan Rest Areas and Welcome Centers Considering Safety and Economic Factors		
	PROJECT OVERVIEW		
	MDOT Project Manager: L. Lynwood Principal Investigator & Vendor: T. Gates, WSU Publication Year (Fiscal Year): 2012		Report Number: RC-1570 Contract Number: 2010-0298 Z1 Study Costs: \$182,618
	Description: This research project was undertaken to determine the value of public rest areas in Michigan, including welcome centers. A benefit/cost economic analysis procedure was utilized to assess rest areas both individually and as a system.		
	IMPLEMENTATION STATUS		
	Implementation Goals N/A		Implementation Recommended? Yes
	Implementation Work Plan N/A		2012 Status Ongoing
2012 Activity The research final report and accompanying rest area functional assessment tool were presented to executive leadership in August 2012. Both the research results and assessment tool have been approved for use in conducting a system-level analysis and developing a rest area performance management process.		2013 Status Ongoing	
2013 Activity The research data and analysis will be used to align the next long-range rest area plan with Michigan Transportation Plan goals and strategies. Starting in 2013, the PM/RAC team will determine steps to start implementing the recommendations, including use of the assessment tool in conducting a system-level analysis and developing a rest area performance management process.			

TRANSPORTATION SAFETY	TITLE: Evaluating the Performance and Effectiveness of Roundabouts		
	PROJECT OVERVIEW		
	MDOT Project Manager: D. Kanitz Principal Investigator & Vendor: J. Bagdade, OPUS, Inc. Publication Year (Fiscal Year): 2012	Report Number: RC-1566 Contract Number: 2010-0278 Z2 Study Costs: \$145,804	
	Description: The objective of this project was to provide an evaluation of the performance and safety effectiveness of roundabouts within the state of Michigan. The study began with the identification of roundabouts within Michigan. This was followed by collecting data on the geometric features of the roundabouts and crash history for each roundabout site from January 1, 2001, to December 31, 2010.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The research results were presented to top executives at MDOT. A Research Spotlight was published and is posted to the MDOT Research Web site. <u>2013 Activity</u> The results were disseminated and are available on the MDOT Web site. MDOT is currently implementing the results into the Michigan roundabout design guide.	Implementation Recommended? 2012 Status 2013 Status	 Yes Ongoing Ongoing

TITLE: Recommendations for Meeting the Transportation Needs of Michigan’s Aging Population

PROJECT OVERVIEW

MDOT Project Manager: K. Lariviere Principal Investigator & Vendor: D. Eby, U of M Publication Year (Fiscal Year): 2011	Report Number: RC-1562 Contract Number: 2010-0296 Z1 Study Costs: \$199,070
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Description: As the population of older adults in Michigan continues to grow, it is becoming more and more critical that MDOT understand the mobility needs of older adults and incorporate these needs into transportation facility design and planning. The objective of this research was to provide the background information needed to help MDOT identify where to concentrate resources to maximize the safe mobility of Michigan’s aging population. The overall goal of the project was to help maintain the safety and well-being of Michigan’s older adult residents by developing a set of low-cost, high-impact measures that could be implemented by MDOT.

IMPLEMENTATION STATUS

<p>Implementation Goals N/A</p> <p>Implementation Work Plan N/A</p> <p>2012 Activity The researchers found that current MDOT practices to address the needs of Michigan’s aging population have been effective. They recommended we continue these practices and further study ways to implement them cost-effectively. MDOT is continuing to evaluate the engineering improvements recommended for older drivers. During 2012, the project team made a presentation at the first International Conference on Aging, Mobility and Quality of Life.</p> <p>2013 Activity In 2013, the project team and PM will make a presentation at the annual Aging in America Conference. The research recommendations included further study on older driver education and development of a safe mobility planning strategy (including planning for driving retirement). As a result, a new research project will get under way in 2013 with this focus.</p>	Implementation Recommended?	Yes
	2012 Status	Ongoing
	2013 Status	Ongoing

TITLE: Educating the Public to Negotiate Roundabouts

PROJECT OVERVIEW

MDOT Project Manager: K. Lariviere Principal Investigator & Vendor: P. Savolainen, WSU Publication Year (Fiscal Year): 2011	Report Number: RC-1542 Contract Number: 2009-0748 Z1 Study Costs: \$199,649
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Description: This research project focused on developing materials to educate the public on the appropriate use of roundabouts. It included a comprehensive state-of-the-art literature review, national and statewide state-of-the-practice surveys, an evaluation of statewide roundabout crash data, a series of field behavioral studies at several roundabout locations, and the implementation of a statewide road user survey.

IMPLEMENTATION STATUS

<p><u>Implementation Goals</u> N/A</p> <p><u>Implementation Work Plan</u> N/A</p> <p><u>2012 Activity</u> The general information brochure developed in 2011 was updated and retitled “How to Use a Roundabout” in 2012. The updated document was disseminated to all Secretary of State branch offices. Another brochure regarding roundabouts and sharing the road was redesigned to distinguish between the two original brochures. Presentations were given at the Michigan Transportation Engineering Conference in 2012. Three 8" x 10" educational posters were developed and given to the regions/TSCs statewide.</p> <p><u>2013 Activity</u> MDOT continues to disseminate information from the study to field staff. In 2013 the central traffic operations area will follow up with regions to determine how they are using the information and whether it is helpful.</p>	Implementation Recommended?	Yes
	2012 Status	Ongoing
	2013 Status	Ongoing

TRANSPORTATION SAFETY	TITLE: Recommendations for Meeting the Mobility Needs of Older Drivers in Rural Michigan		
	PROJECT OVERVIEW		
	MDOT Project Manager: K. Lariviere Principal Investigator & Vendor: D. Eby, UMTRI Publication Year (Fiscal Year): 2013	Report Number: RC-1592 Contract Number: 2010-0296 Z8 Study Costs: \$227,898	
	Description: The objective of this study was to provide background information and recommendations to help MDOT identify areas where its activities significantly impact the safe mobility of Michigan’s rural older adults. The overall goal was to help maintain the safety and well-being of Michigan’s rural older adult residents by providing recommendations on how current alternative transportation services could be improved to be more attractive to older adults, while addressing cultural and psychological barriers to using these services.		
	IMPLEMENTATION STATUS		
	Implementation Goals N/A Implementation Work Plan N/A 2012 Activity Project active. 2013 Activity The project’s final deliverables were submitted to MDOT. Implementation is complete.	Implementation Recommended? 2012 Status 2013 Status	Yes Ongoing Completed

TRANSPORTATION SAFETY	TITLE: Evaluating Pedestrian Safety Improvements		
	PROJECT OVERVIEW		
	MDOT Project Manager: D. Thompson Principal Investigator & Vendor: R. VanHouten, WMU Publication Year (Fiscal Year): 2013	Report Number: RC-1585 Contract Number: 2010-0297 Z1 Study Costs: \$199,605	
	Description: The purpose of this study was to evaluate the impact of new pedestrian countermeasure installations on pedestrian safety to assist in informing future pedestrian safety initiatives.		
	IMPLEMENTATION STATUS		
	Implementation Goals N/A Implementation Work Plan N/A 2012 Activity The research results were published in a Research Spotlight, which is available on the MDOT research Web site. 2013 Activity Implementation is complete.	Implementation Recommended? 2012 Status 2013 Status	Yes Ongoing Completed

TRANSPORTATION SAFETY	TITLE: Impact of Non-Freeway Rumble Strips – Phase I		
	PROJECT OVERVIEW		
	MDOT Project Manager: J. Morena Principal Investigator & Vendor: T. Datta, T. Gates and P. Savolainen, Wayne State University Publication Year (Fiscal Year): 2012	Report Number: RC-1575 Contract Number: 2009-0748 Z3 Study Costs: \$262,432	
	Description: In 2008, MDOT embarked on a significant non-freeway rumble strip installation initiative. Approximately 5,400 miles of non-freeway roadways were included in the initiative. As this initiative was believed to be the largest of its kind in the United States at the time, it was important for MDOT to evaluate the impacts associated with the rumble strip installations to provide guidance for future implementation both within Michigan and other states. The objectives of this study were 1) identification and analysis of “before” traffic crashes using three years of crash data and 2) assessment of the impact of rumble strips on driver behavior, bicyclist safety, roadside noise and short-term pavement performance.		
	IMPLEMENTATION STATUS		

Implementation Goals N/A Implementation Work Plan N/A 2012 Activity The project final deliverables were submitted to MDOT. Implementation is complete.	Implementation Recommended?	Yes
	2012 Status	Completed

TRANSPORTATION SAFETY	TITLE: Sharing the Road: Optimizing Pedestrian and Bicycle Safety and Vehicle Mobility		
	PROJECT OVERVIEW		
	MDOT Project Manager: D. Thompson Principal Investigator & Vendor: J. LaPlante, TY Lin, Inc. Publication Year (Fiscal Year): 2012	Report Number: RC-1572 Contract Number: 2010-0352 Z1 Study Costs: \$188,704	
	Description: This research initiative combined the results of five reports to provide recommendations for improving the multi-modal aspects of the MDOT transportation network. This was done by analyzing the practices, guidelines and policies that MDOT engineers use to design and construct pedestrian, bicycle and automobile facilities.		
	IMPLEMENTATION STATUS		

Implementation Goals N/A Implementation Work Plan N/A 2012 Activity The Best Practices and Mobility Matrix Guide was introduced to regions/TSCs for use. The results were presented at the MiTEC Conference in November 2012 and to representatives of the consultant community. Implementation is complete.	Implementation Recommended?	Yes
	2012 Status	Completed

TRANSPORTATION SAFETY	TITLE: Evaluating the Performance and Making Best Use of Passing Relief Lanes		
	PROJECT OVERVIEW		
	MDOT Project Manager: D. Kanitz Principal Investigator & Vendor: J. Bagdade, OPUS, Inc. Publication Year (Fiscal Year): 2012	Report Number: RC-1565 Contract Number: 2010-1278 Z1 Study Costs: \$156,127	
	Description: The objective of this project was to provide an evaluation of the performance and safety effectiveness of passing relief lanes within the state of Michigan. The study began with the identification of passing relief lanes within Michigan. This was followed by collecting historical volume data, implementation dates and crash history for each of the 10 study sites, as well as for the 100 reference sites and 231 passing lanes in the state.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The research results will be made available as needed for future inquiry on passing lane safety and performance. <u>2013 Activity</u> The results were implemented.	Implementation Recommended? Yes 2012 Status Ongoing 2013 Status Completed	

TRANSPORTATION SAFETY	TITLE: Safety Analysis of 4-Lane to 3-Lane Conversions (Road Diets) in Michigan		
	PROJECT OVERVIEW		
	MDOT Project Manager: J. Gutting Principal Investigator & Vendor: R. Lyles, MSU Publication Year (Fiscal Year): 2012	Report Number: RC-1555 Contract Number: 2010-0294 Z2 Study Costs: \$138,002	
	Description: This research project's objective was to study road diets, specifically 4-lane to 3-lane conversions, implemented in various locations in Michigan. The goals were to determine safety- and delay-related impacts, develop crash modification factors (CMFs), and develop guidelines that would be useful in deciding when it might be desirable to implement such road diets.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The project deliverables were submitted to RA. Implementation is complete.	Implementation Recommended? Yes 2012 Status Completed	

TRANSPORTATION SAFETY	TITLE: Improving Driver Safety with Behavioral Countermeasures		
	PROJECT OVERVIEW		
	MDOT Project Manager: K. Lariviere	Report Number: RC-1561	
	Principal Investigator & Vendor: R. Backs, CMU	Contract Number: 2009-0749 Z1	
	Publication Year (Fiscal Year): 2011	Study Costs: \$139,277	
	Description: The purpose of this research project was to provide MDOT with insight regarding the effectiveness of potential implementations of behavioral countermeasures for increasing driver safety in Michigan.		
	IMPLEMENTATION STATUS		
<p><u>Implementation Goals</u> N/A</p> <p><u>Implementation Work Plan</u> N/A</p> <p><u>2012 Activity</u> The research results ranked (high, medium or low) a number of behavioral countermeasures on their effectiveness, cost and implementation issues. A number of the recommendations were legislative in nature, or outside the scope of MDOT’s functions. Therefore, no future MDOT action will be taken with this specific project. MDOT will share the report with other agencies when necessary. The research final report should be viewed as a resource for MDOT and other agencies to consult when considering the introduction of or modification to behavioral countermeasures in Michigan. Implementation is complete.</p>	Implementation Recommended?	Yes	
	2012 Status	Completed	

TRANSPORTATION SAFETY	TITLE: Evaluation of Steady-Burn Warning Lights on Channelizing Drums in Work Zones		
	PROJECT OVERVIEW		
	MDOT Project Manager: B. Zimmerman Principal Investigator & Vendor: T. Datta, WSU Publication Year (Fiscal Year): 2011	Report Number: RC-1543 Contract Number: 2009-0748 Z2 Study Costs: \$198,968	
	Description: This study evaluated the safety and mobility impacts associated with the elimination of steady-burn warning lights on drums in construction work zones. Project tasks included a comparison of national crash data among states with different policies on the use of steady-burn warning lights, along with an in-depth investigation of Michigan work zone crashes. The project included a series of field studies that examined driver behavior in work zones, both with and without steady-burn warning lights. Additional field studies were conducted to assess the luminance characteristics of drums with and without lights, as well as the condition of drums in each type of work zone.		
	IMPLEMENTATION STATUS		
<u>Implementation Goals</u> N/A	Implementation Recommended?	Yes	
<u>Implementation Work Plan</u> N/A	2012 Status	Completed	
<u>2012 Activity</u> The project deliverables were submitted to RA. Implementation is complete.			

WORK FORCE DEVELOPMENT	TITLE: Examining the Disadvantaged Business Enterprise (DBE) Program		
	PROJECT OVERVIEW		
	MDOT Project Manager: P. Collins Principal Investigator & Vendor: T. Davis, U of M Publication Year (Fiscal Year): 2013	Report Number: RC-1582 Contract Number: 2010-0296 Study Costs: \$167,231	
	Description: This project was undertaken to identify best practices and methods for communicating program roles and responsibilities, determine the level of knowledge about this program by key stakeholders, develop an action plan for communication, and identify effective communications tools to be used to educate and gain the support of stakeholders.		
	IMPLEMENTATION STATUS		
<u>Implementation Goals</u> N/A	Implementation Recommended?	Yes	
<u>Implementation Work Plan</u> N/A	2013 Status	Ongoing	
<u>2013 Activity</u> Implementation is ongoing.			

INTELLIGENT TRANSPORTATION SYSTEMS	TITLE: Slippery Road Detection and Evaluation		
	PROJECT OVERVIEW		
	MDOT Project Manager: S. Cook Principal Investigator & Vendor: R. Roberson, U of M-UMTRI Publication Year (Fiscal Year): 2012	Report Number: RC-1573	Contract Number: 2009-0747 Z1/R1
		Study Costs: \$242,834	
	Description: The objectives of this project were to 1) demonstrate and evaluate a low-cost data acquisition system that would provide a rich data set accumulated from multiple vehicles and 2) establish how this data, coupled with situational data from other sources, might be used to detect slippery road conditions, rough road conditions and potentially for other beneficial uses by MDOT. This work was part of an ongoing research initiative to identify how state DOTs will use and benefit from the large quantities of data to be generated by future connected vehicle programs and to assist in refining connected vehicle system requirements.		
	IMPLEMENTATION STATUS		
<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> In the summer of 2012, the researcher gathered road surface roughness measures from the smart phone application on 10,000 centerline miles of Michigan roadways. PASER windshield assessment ratings were gathered along the same routes. A proposed project will start in 2013 to compare and analyze data from the two methods. <u>2013 Activity</u> A new research project will start in Fiscal Year 2013 to compare results of the analysis of the two data capture methods.	Implementation Recommended?	Yes	
	2012 Status	Ongoing	
	2013 Status	Ongoing	

INTELLIGENT TRANSPORTATION SYSTEMS	TITLE: Usage & Impact of the Michigan Vehicle Infrastructure Integration (VII) Program		
	PROJECT OVERVIEW		
	MDOT Project Manager: S. Cook Principal Investigator & Vendor: L. Mixon, Mixon-Hill of Michigan, Inc. Publication Year (Fiscal Year): 2012		Report Number: RC-1568 Contract Number: 2007-0371 Study Costs: \$3,500,000
	Description: The purpose of this research study was to evaluate the uses and benefits of VII-related data. In addition, the study's focus was to determine how the VII program will impact the way state and local DOTs do business as a result of information collected.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A		Implementation Recommended? Yes
	<u>Implementation Work Plan</u> N/A		2012 Status Ongoing
<u>2012 Activity</u> MDOT continues to advance this technology in its planning and operational activities. A new phase of this research effort began in 2012.		2013 Status Ongoing	
<u>2013 Activity</u> A follow-up phase (DUAP-II) of this research is under way.			

INTELLIGENT TRANSPORTATION SYSTEMS	TITLE: VII Data Use Analysis and Processing (DUAP)		
	PROJECT OVERVIEW		
	MDOT Project Manager: S. Cook	Report Number: RC-1588	
	Principal Investigator & Vendor: F. Dion and R. Roberson, U of M-UMTRI	Contract Number: 2009-0747 Z3	
	Publication Year (Fiscal Year): 2011	Study Costs: \$800,000	
	<p>Description: The Data Use Analysis and Processing (DUAP) program was initiated by MDOT in 2006 to complement research initiatives from the federal government and the car manufacturing industry related to vehicle connectivity. The purpose of this project was to evaluate how emerging applications and data collection capabilities could support the safety, mobility and system management needs of state departments of transportation, with a primary focus on MDOT's needs. The resulting report covered several key subjects related to the generation of IntelliDriveSM probe vehicle data and use of this data in applications of interest to state departments of transportation and local public transportation agencies. The evaluations conducted as part of this project are primarily based on the probe vehicle data collection system that was deployed by the U.S. Department of Transportation around Novi, Michigan, in 2008 for its Vehicle-Infrastructure Integration (VII) Proof-of-Concept test program. This system was designed around the use of the 5.9-GHz Dedicated Short Range Communication (DSRC) wireless protocol to enable vehicles to communicate with Roadside Equipment (RSE). The generation of snapshots further followed the protocols defined within the SAE J2735 DSRC Message Set standard.</p>		
IMPLEMENTATION STATUS			
<u>Implementation Goals</u> N/A	Implementation Recommended?	Yes	
<u>Implementation Work Plan</u> N/A	2012 Status	Ongoing	
<u>2012 Activity</u> Continue marketing MDOT's role and accomplishments in the VII research efforts in Michigan to national and internal ITS initiatives forums.	2013 Status	Ongoing	
<u>2013 Activity</u> Continue outreach activities of MDOT's VII research efforts.			

INTELLIGENT TRANSPORTATION	TITLE: Michigan Ohio University Transportation Center – Multiple Reports (ITS Related Reports D&E and J&K)		
	PROJECT OVERVIEW		
	MDOT Project Manager: N. Annelin Principal Investigator & Vendor: Multiple PIs; U of M-Detroit Mercy Publication Year (Fiscal Year): 2012		Report Number: RC-1545 Contract Number: 2007-0538 Study Costs: \$685,415
	Description: Multiple ITS-related projects, including other topical subject areas.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A		Implementation Recommended? Yes
	<u>Implementation Work Plan</u> N/A		2012 Status Completed
<u>2012 Activity</u> Study results were reported in fiscal year 2012. Implementation completed in 2012.			

TITLE: Implementation of Quick Clearance in Michigan

PROJECT OVERVIEW

MDOT Project Manager: A. Kremer Principal Investigator & Vendor: D. Krechmer, Cambridge Systematics, Inc. Publication Year (Fiscal Year): 2012	Report Number: RC-1583 Contract Number: 2011-0477 Study Costs: \$171,150
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Description: The objective of this research was to determine what actions could be taken to improve understanding of the quick clearance law, and compliance with it, in order to attain the full mobility and safety benefits of the law.

IMPLEMENTATION STATUS

<p><u>Implementation Goals</u> N/A</p> <p><u>Implementation Work Plan</u> N/A</p> <p><u>2012 Activity</u> The research results included a variety of low-cost marketing and outreach strategies. Depending on available funds and support from MDOT’s leadership represented on the REC/RAC committees, proposed strategies will be considered for deployment into statewide operations.</p> <p><u>2013 Activity</u> MDOT will work with the Michigan State Police, the Michigan Sheriffs’ Association and other first responders to educate the public. Proposed strategies to use both traditional and social media outlets will be considered. Consideration will be given to implementation of modifications to the statewide incident management database.</p>	Implementation Recommended?	Yes
	2012 Status	Ongoing
	2013 Status	Ongoing

MOBILITY, SYSTEMS & SIGNAL OPERATIONS	TITLE: Best Practices for Emergency Rerouting							
	PROJECT OVERVIEW							
	MDOT Project Manager: A. Kremer Principal Investigator & Vendor: M. Dunzo, Kimley Horn Publication Year (Fiscal Year): 2012		Report Number: RC-1581 Contract Number: 2011-0497 Study Costs: \$175,603					
	Description: The research effort was intended to combine feedback from Michigan stakeholders with the key findings, lessons learned and experiences from other states to create a standard, statewide practice for developing emergency reroutes. The goal was to summarize recommendations that stakeholders could take forward during the development and implementation of emergency reroutes on a regional level. With the diversity of Michigan’s regions, it was recognized that a one-size-fits-all approach would not be feasible. Rather, regions would need to adapt emergency rerouting plans to the specific agencies, partnerships and roadway networks within their respective regions.							
	IMPLEMENTATION STATUS							
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The final deliverables included a guidance document that included nationwide best practices in incident management and emergency rerouting. Components of the best practice programs that were deemed applicable and easy to adopt in Michigan were identified in the document. <u>2013 Activity</u> The guidance document will be disseminated to the regions/TSCs and other state partners with an emphasis on suggestions for establishing and maintaining effective interagency relationships to foster resource sharing and improved traffic management strategies. Also, recommendations for permanent signing of emergency reroutes will be used in future emergency rerouting plans.		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Implementation Recommended?</td> <td style="text-align: center;">Yes</td> </tr> <tr> <td style="text-align: center;">2012 Status</td> <td style="text-align: center;">Ongoing</td> </tr> <tr> <td style="text-align: center;">2013 Status</td> <td style="text-align: center;">Ongoing</td> </tr> </table>	Implementation Recommended?	Yes	2012 Status	Ongoing	2013 Status
Implementation Recommended?	Yes							
2012 Status	Ongoing							
2013 Status	Ongoing							

TITLE: Transportation Reliability and Trip Satisfaction

PROJECT OVERVIEW

MDOT Project Manager: J. Firman Principal Investigator & Vendor: T. Gates, WSU Publication Year (Fiscal Year): 2013	Report Number: RC-1584 Contract Number: 2010-0298 Study Costs: \$171,882
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Description: Research was performed to develop appropriate communication techniques for distribution of travel reliability and related information to travelers through the MDOT Mi Drive Web site based on the needs of users of the transportation network in Michigan.

IMPLEMENTATION STATUS

<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The project's deliverables are available to all regions and TSCs for their use. Implementation completed.	Implementation Recommended?	Yes
	2012 Status	Completed

MOBILITY, SYSTEMS & SIGNAL OPERATIONS	TITLE: Strategies for Improving Traveler Information		
	PROJECT OVERVIEW		
	MDOT Project Manager: J. Firman Principal Investigator & Vendor: C. Hedden, Cambridge Systematics, Inc. Publication Year (Fiscal Year): 2011		Report Number: RC-1559 Contract Number: 2009-0669 Z1 Study Costs: \$173,662
	Description: This research project allowed MDOT to take a systematic view of the state of the practice of Advanced Traveler Information Systems (ATIS), explore the capabilities of research currently being conducted, and provide a clear roadmap for MDOT as it grows and enhances its own ATIS capabilities. The project had three main tasks: 1) a literature search, 2) a survey of the traveling public, and 3) a scan of other significant statewide ATIS deployments.		
	IMPLEMENTATION STATUS		
	Implementation Goals N/A		Implementation Recommended? Yes
Implementation Work Plan N/A		2012 Status Completed	
2012 Activity The project's deliverables are available to all regions and TSCs for their use. Implementation is complete.			

TITLE: Developing a Congestion Mitigation Toolbox

PROJECT OVERVIEW

MDOT Project Manager: J. Firman Principal Investigator & Vendor: J. Crawford, Texas A & M Publication Year (Fiscal Year): 2011	Report Number: RC-1554 Contract Number: 2009-0661 Z2 Study Costs: \$154,580
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Description: Researchers created “A Michigan Toolbox for Mitigating Traffic Congestion” to be a useful desk reference for practitioners and an educational tool for elected officials acting through public policy boards to better understand the development, planning and implementation of congestion mitigation strategies. The toolbox provides an overview of traffic congestion, the need for local and state solutions, and project survey responses. Forty-seven specific strategies are presented in the toolbox. Strategies are organized by transportation system management and travel demand management categories.

IMPLEMENTATION STATUS

<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The toolbox was disseminated to all regions and TSCs for their use. Implementation is complete.	Implementation Recommended?	Yes
	2012 Status	Completed

PAVEMENTS & MATERIALS	TITLE: Cost-Effectiveness of the MDOT Preventive Maintenance Program		
	PROJECT OVERVIEW		
	MDOT Project Manager: E. Chelotti Principal Investigator & Vendor: P. Ram and D. Peshkin, Applied Pavement Technology, Inc. Publication Year (Fiscal Year): 2013	Report Number: RC-1579 Contract Number: 2006-0414 Z21 Study Costs: \$179,988	
	Description: This study evaluated the benefits and costs of various preventive maintenance treatments used in MDOT's Capital Preventive Maintenance (CPM) program. The overall performance of MDOT's CPM program was also examined by comparing the life-cycle costs of a rehabilitation strategy to a preservation strategy using a simplified approach. The research showed that MDOT's preservation strategy results in agency cost savings of approximately 25 percent per lane-mile over the rehabilitation strategy.		
	IMPLEMENTATION STATUS		
	Implementation Goals N/A Implementation Work Plan N/A 2013 Activity Study's recommendations under consideration.	Implementation Recommended? 2013 Status	Yes Not Started

PAVEMENTS & MATERIALS	TITLE: Improved Performance of JPCP Overlays		
	PROJECT OVERVIEW		
	MDOT Project Manager: B. Krom Principal Investigator & Vendor: W. Hansen, U of M Publication Year (Fiscal Year): 2013	Report Number: RC-1574	Contract Number: 2009-0747 Z4 Study Costs: \$324,369
	Description: Recent JPCP overlay projects have developed premature distress with signs of pumping. A joint U of M/MDOT forensic investigation was initiated in December 2009 to determine the causes for these distresses.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2013 Activity</u> Implementation has not started yet.	Implementation Recommended?	Yes
		2013 Status	Not Started

PAVEMENTS & MATERIALS	TITLE: Preparation for Implementation of the MEPDG in Michigan: Part 1, HMA Mixture Characterization		
	PROJECT OVERVIEW		
	MDOT Project Manager: M. Eacker		Report Number: RC-1593
	Principal Investigator & Vendor: M. Emin Kutay, MSU		Contract Number: 2010-0294 Z5
	Publication Year (Fiscal Year): 2013		Study Costs: \$147,214
	Description: The main objectives of Part 1 were to conduct a literature search to determine the existing and past research on HMA mixture characterization for MEPDG, review MDOT's HMA testing program, and conduct laboratory tests on samples collected.		
	IMPLEMENTATION STATUS		
<u>Implementation Goals</u> N/A		Implementation Recommended? Yes	
<u>Implementation Work Plan</u> N/A		2013 Status Not Started	
<u>2013 Activity</u> Implementation has not started yet.			

PAVEMENTS & MATERIALS	TITLE: Preparation for Implementation of the MEPDG in Michigan: Part 2, Rehabilitation Evaluation		
	PROJECT OVERVIEW		
	MDOT Project Manager: M. Eacker Principal Investigator & Vendor: K. Chatti, MSU Publication Year (Fiscal Year): 2013		Report Number: RC-1594 Contract Number: 2010-0294 Z5 Study Costs: \$161,816
	Description: N/A		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A		Implementation Recommended? Yes
	<u>Implementation Work Plan</u> N/A		2013 Status Not Started
<u>2013 Activity</u> Implementation has not started yet.			

PAVEMENTS & MATERIALS	TITLE: Laboratory Evaluation of Warm-Mix Asphalt		
	PROJECT OVERVIEW		
	MDOT Project Manager: J. Barack Principal Investigator & Vendor: Z. You, MTU Publication Year (Fiscal Year): 2011		Report Number: RC-1556 Contract Number: 2006-0414 Z21 Study Costs: \$190,001
	Description: The main objectives of this study were to 1) review and synthesize information on the available warm-mix asphalt (WMA) technologies; 2) measure the complex/dynamic modulus of WMA and the control hot-mix asphalt (HMA) for comparison and for use in mechanistic-empirical design comparisons; 3) assess the rutting and fatigue potential of WMA mixtures; and 4) provide a recommendation for the proper WMA for use in Michigan considering the aggregate, binder and climatic factors.		
	IMPLEMENTATION STATUS		
	Implementation Goals N/A		Implementation Recommended? Yes
Implementation Work Plan N/A		2012 Status Ongoing	
2012 Activity During the 2012 construction season, the HMA contractors were allowed to have the option of using water-based WMA technologies on paving projects. One significant item that was learned was that the addition of the water to the liquid asphalt binder does not alter the Superpave binder properties that MDOT tests for in order to ensure proper grade and quality.		2013 Status Ongoing	
2013 Activity Implementation is ongoing.			

TITLE: Extending Life of Asphalt Pavements

PROJECT OVERVIEW

MDOT Project Manager: A. Iftikhar

Principal Investigator & Vendor: H. Von Quintus, ARA

Publication Year (Fiscal Year): 2011

Report Number: RC-1551

Contract Number: 2009-0670 Z1

Study Costs: \$100,355

Description: The goal of this project was to identify common features of good and poor performing asphalt pavements. The types of asphalt pavements included in the study were grouped into four categories: new construction, crush and shape with HMA surface, mill and resurface, and HMA overlay. Deterioration relationships were used to identify roadway segments with good and poor performance based on three performance indicators: distress index (composed of multiple distresses), rut depth and smoothness.

IMPLEMENTATION STATUS

Implementation Goals

N/A

Implementation Work Plan

N/A

2012 Activity

MDOT continues to study its system of roads' preventive maintenance performance. The research results recommended continued use of the Longitudinal Joint Density Specification, which MDOT is doing. MDOT has adopted the practice of visual biased sampling techniques for certain aspects of new pavements; also recommended under this study was the use of a random statistical approach to sampling. Both FHWA and industry concur with this practice.

Another change in MDOT's design practice was to modify its Superpave design specifications, which increased the amount of asphalt cement in the mixture.

A change in the laboratory testing gyration levels was considered, but other changes were made as a first step. The researchers recommended using enhanced mixture properties in the wearing surface. The HMA selection guidelines already allow for the use of enhanced mixtures in the top course.

2013 Activity

Implementation is ongoing.

Region/TSC personnel determine which roadways they will use the enhanced mixes on based on cost and life of expected fix. Construction Field Services (CFS) typically recommends the enhanced mixtures on freeway top courses. CFS will continue to recommend the use of enhanced mixtures.

Implementation Recommended?	Yes
2012 Status	Ongoing
2013 Status	Ongoing

PAVEMENTS & MATERIALS	TITLE: Backcalculation of Unbound Granular Layer Moduli		
	PROJECT OVERVIEW		
	MDOT Project Manager: M. Eacker Principal Investigator & Vendor: G. Baladi, MSU Publication Year (Fiscal Year): 2011	Report Number: RC-1548 Contract Number: 2006-0411 Z15 Study Costs: \$157,725	
	Description: In this study, the value of the resilient modulus of commonly used granular materials was backcalculated using two- and three-layer systems and Nondestructive Deflection Test data obtained by MDOT.		
	IMPLEMENTATION STATUS		
	Implementation Goals N/A	Implementation Recommended?	Yes
	Implementation Work Plan N/A	2012 Status	Ongoing
2012 Activity This project recommended resilient modulus values of unbound base and subbase materials to be used with the new mechanistic-empirical (ME) pavement design software. These values will be evaluated by the Hot-Mix Asphalt (HMA) and Concrete Subcommittees to determine if they will be recommended to the ME Oversight Committee as standard inputs in the new software. A final decision is expected in 2013.	2013 Status	Ongoing	
2013 Activity The recommendations of the subcommittees will go to the ME Oversight Committee for agreement and approval. It is anticipated that the recommendations of the ME Oversight Committee will need approval of the Engineering Operations Committee before the new software is fully implemented.			

PAVEMENTS & MATERIALS	TITLE: Assessment of Pavement Acceptance Criteria and Quantifying Its As-constructed Material and Structural Properties		
	PROJECT OVERVIEW		
	MDOT Project Manager: J. Staton Principal Investigator & Vendor: K. Chatti, MSU Publication Year (Fiscal Year): 2011		Report Number: RC-1540 Contract Number: 2006-0411 Z4 Study Costs: \$220,090
	Description: This research project investigated the design criteria practices used by MDOT to develop pavement material sections. The focus was on past and present technologies. The assessment portion of this project was to be used to develop state-of-the-art innovation in pavement design procedures, especially as MDOT implements the new mechanistic-empirical characteristics in pending future design methods.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A		Implementation Recommended? Yes
<u>Implementation Work Plan</u> N/A		2012 Status Ongoing	
<u>2012 Activity</u> The research assessment portion of the project was made available to another MDOT research project, "Preparation for Implementation of the Mechanistic-Empirical Pavement Design Guide in Michigan" with Michigan State University.		2013 Status Ongoing	
<u>2013 Activity</u> Implementation is ongoing.			

PAVEMENTS & MATERIALS	TITLE: Characterization of Traffic for the New ME Design Guide (I-37A) for Michigan		
	PROJECT OVERVIEW		
	MDOT Project Manager: M. Eacker Principal Investigator & Vendor: N. Buch, MSU Publication Year (Fiscal Year): 2010		Report Number: RC-1537 Contract Number: 2006-0411 Z8 Study Costs: \$118,214
	Description: The purpose of this study is to characterize traffic inputs in support of the new Mechanistic-Empirical Pavement Design Guide (MEPDG) for the state of Michigan.		
	IMPLEMENTATION STATUS		
	Implementation Goals N/A		Implementation Recommended? Yes
	Implementation Work Plan N/A		2012 Status Ongoing
2012 Activity The newly established MDOT ME Oversight Committee will help determine appropriate inputs for use in the new software. The Traffic Subcommittee will help decide on the disposition of the recommended traffic inputs from Report RC-1537. A concern is that the research results were based on traffic data from 2005, and the analysis done under this research may need to be repeated using newer traffic data. If and when the original analysis is repeated using current traffic data, it is most likely that the same methodology used during the original research will be utilized. In the meantime, we are beginning to use the results from the research project as traffic inputs as we explore and use the new software.		2013 Status Ongoing	
2013 Activity MDOT will continue to utilize the research results from Report RC-1537 as traffic inputs in the new pavement design software. MDOT's involvement in the development of the Prep-ME software (pooled fund project TPF-5(242)) may replace the need for a reanalysis of the work done under this project. In this case, results from this project would be superseded by newer methodology and results based on the most recent traffic data, thereby making it so that no results are implemented.			

PAVEMENTS & MATERIALS	TITLE: Development of New Test Procedures for Measuring Fine and Coarse Aggregate Specific Gravities (108494)		
	PROJECT OVERVIEW		
	MDOT Project Manager: J. Barak Principal Investigator & Vendor: Z. You, MTU Publication Year (Fiscal Year): 2010		Report Number: RC-1535 Contract Number: 2006-0414 Z8 Study Costs: \$181,925
	Description: The objective of the research was to develop and evaluate new test methods for determining the specific gravity and absorption of both fine and coarse aggregates.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A		Implementation Recommended? Yes
	<u>Implementation Work Plan</u> N/A		2012 Status Ongoing
<u>2012 Activity</u> The project manager plans to present the project abstract and executive summary to MDOT representatives of the Hot-Mix Asphalt Operations Committee (HMAOC) for review and possible addition to the agenda for future HMAOC meetings.		2013 Status Ongoing	
<u>2013 Activity</u> The project manager awaits response from the Hot-Mix Asphalt Operations Committee.			

PAVEMENTS & MATERIALS	TITLE: Carbon Footprint for Hot-Mix Asphalt and Portland Cement Concrete Pavements		
	PROJECT OVERVIEW		
	MDOT Project Manager: C. Bleech Principal Investigator & Vendor: A. Mukherjee, MTU Publication Year (Fiscal Year): 2011	Report Number: RC-1553 Contract Number: 2006-0414 Z22 Study Costs: \$199,650	
	Description: This research study developed and implemented a project-based life cycle framework that can be used to estimate the carbon footprint for typical construction work items found in reconstruction, rehabilitation and Capital Preventive Maintenance projects.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A	Implementation Recommended?	Yes
	<u>Implementation Work Plan</u> N/A	2012 Status	Completed
<u>2012 Activity</u> The research results were disseminated, and the final report was posted to MDOT's research Web site. The research results suggest ways of implementing the proposed framework within MDOT to help reduce the CO ₂ footprint of highway construction projects. Implementation is complete.			

TITLE: Impact of Hydrated Cement Paste Quality & Entrained Air-Void System on the Durability of Concrete

PROJECT OVERVIEW

MDOT Project Manager: J. Staton Principal Investigator & Vendor: L. Sutter, MTU Publication Year (Fiscal Year): 2011	Report Number: RC-1552 Contract Number: 2006-0414 Z10 Study Costs: \$304,826
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Description: This study was designed to examine whether traditional limits used to describe the air-void system still apply to concrete prepared with new admixtures and materials. Current limits on both total air content and air-void system parameters were established many years ago with different cements, different admixtures, and limited use of supplementary cementitious materials (SCMs). Overall, this study reported that modern cements, modern admixtures and the use of SCMs lead to a hardened cement paste that can potentially have a higher tensile strength and lower permeability, which indicates that durable concrete can still be produced using these newer vintage materials, as measured by traditional means and methods.

IMPLEMENTATION STATUS

<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> Overall, the research results confirmed that our specification’s traditional thresholds are still valid for use with today’s newer materials and demonstrated that modern cements and the use of supplementary cementitious materials (SCMs) such as fly ash and slag cement lead to a hardened cement paste that can potentially have a higher tensile strength and lower permeability. The evidence indicated that the traditional specifications for air content should provide a conservative estimate of performance, and incorporating SCMs into concrete mixtures does not necessarily require deviation from these traditional air-void system thresholds. The production of paving concretes with reduced cementitious material content (CMC) has become more common, and the durability of these concretes, in terms of the laboratory ASTM C666 testing conducted in this study, is superior to the traditional 564 lbs/yd ³ CMC concrete, especially for concrete that falls below the construction requirement of 6.5 ± 1.5 percent air by volume.	Implementation Recommended?	Yes
	2012 Status	Completed

PAVEMENTS & MATERIALS	TITLE: Durability Study of US-23 Aggregate Test Road and Recent JPCP Projects with Premature Joint Deterioration		
	PROJECT OVERVIEW		
	MDOT Project Manager: D. Smiley Principal Investigator & Vendor: W. Hansen, U of M Publication Year (Fiscal Year): 2011		Report Number: RC-1534 Contract Number: 2006-0412 Z1 Study Costs: \$228,923
	Description: The main objective for this project was to isolate the major cause(s) for suspected freeze-thaw deterioration, and to provide recommendations for improved materials specifications in order to ensure long-term freeze-thaw resistance to severe surface exposure conditions (i.e., surface contact with either water or 3 percent sodium chloride) during repeated freezing and thawing.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A		Implementation Recommended? Yes
	<u>Implementation Work Plan</u> N/A		2012 Status Completed
<u>2012 Activity</u> The research results suggest that MDOT increase its allowable air void content to 7.0 percent to minimize the effects of freezing and thawing deterioration and salt decomposition. MDOT implemented the results in part; the allowable air void content was increased to 6.5 percent.			

PAVEMENTS & MATERIALS	TITLE: Sustainable Recycled Materials for Concrete Pavements		
	PROJECT OVERVIEW		
	MDOT Project Manager: J. Staton Principal Investigator & Vendor: P. Ram & T. Van Dam, Applied Pavement Technology, Inc. Publication Year (Fiscal Year): 2011	Report Number: RC-1550 Contract Number: 2009-0663 Z1 Study Costs: \$149,978	
	Description: In this research project, life-cycle cost analysis and environmental life-cycle assessment techniques were used to quantify the economic and environmental impacts for a selected number of MDOT concrete pavement sections. Pavements studied include those constructed with and without supplementary cementitious materials (SCMs), with and without crushed concrete aggregate (CCA), and with and without air-cooled blast furnace slag coarse aggregate (ACBFS).		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The research results were disseminated, and the report was posted on the MDOT research Web site. Implementation is complete.	Implementation Recommended? 2012 Status	Yes Completed

PAVEMENTS & MATERIALS	TITLE: Using Recycled Concrete in MDOT's Transportation Infrastructure—Manual of Practice		
	PROJECT OVERVIEW		
	MDOT Project Manager: J. Staton		Report Number: RC-1544
	Principal Investigator & Vendor: T. Van Dam & S. Vitton, MTU		Contract Number: 2006-0414 Z12
	Publication Year (Fiscal Year): 2011		Study Costs: \$180,181
	Description: The purpose of this research study was to determine the effective characterization of crushed concrete aggregate (CCA) materials during their production and throughout the design and construction process so as to lead to their successful use and application. The report was intended to help guide MDOT engineers in using CCA in the state's transportation infrastructure, with particular focus on pavement applications.		
	IMPLEMENTATION STATUS		
<u>Implementation Goals</u> N/A		Implementation Recommended? Yes	
<u>Implementation Work Plan</u> N/A		2012 Status Completed	
<u>2012 Activity</u> The research results were disseminated, and the report was posted on the MDOT research Web site. Implementation is complete.			

PAVEMENTS & MATERIALS	TITLE: Fifteen-Year Performance Review of Michigan's European Concrete Pavement		
	PROJECT OVERVIEW		
	MDOT Project Manager: D. Smiley Principal Investigator & Vendor: D. Smiley Publication Year (Fiscal Year): 2010	Report Number: RC-1538 Contract Number: N/A Study Costs: N/A	
	Description: In 1993, a special pavement demonstration project was constructed in Detroit on NB I-75. The demo project focus was to evaluate the design features of some highly acclaimed European rigid pavements. This report is a compilation of the condition data of the Euro-pavement since its construction.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> No 2012 activity. Study results were reported in fiscal year 2010. Implementation is complete.	Implementation Recommended? 2012 Status	Yes Completed

PAVEMENTS & MATERIALS	TITLE: Evaluation of Concrete Pavements with Material-Related Distress		
	PROJECT OVERVIEW		
	MDOT Project Manager: D. Smiley Principal Investigator & Vendor: L. Sutter, MTU Publication Year (Fiscal Year): 2010	Report Number: RC-1533 Contract Number: 2003-0063 Z20 Study Costs: \$202,796	
	Description: An evaluation of cores sampled from six concrete pavements was performed. Factors contributing to pavement distress observed in the field were determined, including expansive alkali-silica reactivity and freeze-thaw deterioration related to poor entrained air-void parameters. A laboratory study to investigate the role of alkali-silica reactivity through accelerated mortar bar and concrete prism testing was proposed.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The research results suggest that MDOT use crushed concrete as a base material and that it be treated with asphaltic material. MDOT found that stabilizing the base with cementitious material both inhibited leachate and contributed to a strong and stable base product. Thus, MDOT implemented the use of crushed concrete in its base materials, provided they have been treated with cementitious material.	Implementation Recommended?	Yes
	2012 Status	Completed	

PAVEMENTS & MATERIALS	TITLE: Feasibility of Digital Imaging to Characterize Earth Materials		
	PROJECT OVERVIEW		
	MDOT Project Manager: R. Endres Principal Investigator & Vendor: R. Hryciw & H. Ohm, U of M Publication Year (Fiscal Year): 2012	Report Number: RC-1557 Contract Number: 2010-0296 Z2 Study Costs: \$129,707	
	Description: The goal of this project was to assess the feasibility of using digital imaging to characterize earth materials. The researchers explored the use of cameras and software that may eventually replace the use of screen sieves in sizing and assessing crushed aggregate for pavement construction. This research explored approaches to imaging aggregate as a way to move on from a dusty, slow, energy-intensive process.		
	IMPLEMENTATION STATUS		
	<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> The project's final deliverables were submitted to MDOT. However, the project manager concluded that the camera images of aggregate materials were not sufficient to characterize materials as well as the old standard using the screen sieve test. Originally, it was thought that Michigan contractors might be interested in using camera images as a quality control measure. Contractors were brought to the testing laboratory to assess the results, but they were not conclusive enough to support practical use. Implementation was terminated.	Implementation Recommended? 2012 Status	No Terminated

FREIGHT RAIL	TITLE: Timing Issues for Traffic Signals Interconnected with Highway-Railroad Grade Crossings		
	PROJECT OVERVIEW		
	MDOT Project Manager: K. Foondle	Report Number: RC-1578	
	Principal Investigator & Vendor: T. Datta & Others, WSU	Contract Number: 2010-0298 Z2	
	Publication Year (Fiscal Year): 2013	Study Costs: \$89,458	
	Description: The Manual on Uniform Traffic Control Devices provides guidance concerning the use of preemption where the signalized intersection is within 200 feet of a railroad crossing. There is, however, minimal guidance for locations where intersections are more than 200 feet beyond the railroad crossings. The purpose of this research was to compile and review literature and current practices related to interconnected traffic signals and preemption in order to determine solutions for providing safe and efficient timing for the traffic signals and nearby highway-railroad grade crossing warning signals.		
IMPLEMENTATION STATUS			
<u>Implementation Goals</u> N/A	Implementation Recommended?	Yes	
<u>Implementation Work Plan</u> N/A	2013 Status	Not Started	
<u>2013 Activity</u> Implementation is under consideration.			

ASSET MANAGEMENT	TITLE: A Framework for Statewide Roadway Asset Management		
	PROJECT OVERVIEW		
	MDOT Project Manager: N. Annelin	Report Number: RC-1576	
	Principal Investigator & Vendor: B. Dye, Dye Management Group	Contract Number: 2011-0052	
	Publication Year (Fiscal Year): 2012	Study Costs: \$249,925	
	Description: The researchers collected and analyzed local agency inventory, cost and condition assessment information in order to provide the Michigan Transportation Asset Management Council with a) the costs expended to maintain its roadway system on a per-mile basis and b) the projected dollars per lane mile that need to be spent in order to bring 100 percent of its system into fair-to-good condition and to maintain it at that level over the next 20 years.		
IMPLEMENTATION STATUS			
<u>Implementation Goals</u> N/A <u>Implementation Work Plan</u> N/A <u>2012 Activity</u> Research implementation is complete.	Implementation Recommended?	Yes	
	2012 Status	Completed	

Appendix B

TRB Action Item Details by Focus Area

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BRIDGES & STRUCTURES	ACTION ITEM: ABCs of Accelerated Bridge Construction Policy Development		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 561	TRB Attendee: Bob Ranck, Matt Chynoweth Action Contacts: Bob Ranck, Matt Chynoweth	
	Description: This session included presentations from Utah and Iowa DOTs about their experiences with ABC policy development.		
	Utah DOT: Construction manager/general contractor (CMGC) project using precast deck panels (see UDOT Web site) The presentation included many Accelerated Bridge Construction pictures. <ul style="list-style-type: none"> UDOT built a bridge farm, then transported precast elements to construction sites and moved them into place on weekends. Utah used precast deck panels on another project (slide-in with approach slabs). The agency does major public outreach, with continued conversations with industry. UDOT frequently uses simulations with the public. This adds value to public perception. UDOT also invites legislators to construction sites to see bridge moves. 93 percent of the public knows what ABC is. People camp out in lawn chairs to watch the action. In a recent public survey, 91 percent of respondents said they would pay extra for ABC methods. 		
	Iowa DOT: ABC deployment strategy Highlights of the presentation on ABC policy included: <ul style="list-style-type: none"> IDOT hosted an ABC Policy Forum. IDOT keeps an ABC score for every bridge. Factors include items such as annual average daily traffic, distance (miles) and user cost. <ul style="list-style-type: none"> Repetition: There is a direct link to the number of spans. Use a 0 to 3 scale; weight of four factors. Total weighted scores range from 0 to 100. IDOT can't afford ABC on all bridges and this process allows them to prioritize candidates. 		
ACTION STATUS			
<u>2013 Activity</u> Bob Ranck planned to discuss Utah's public outreach strategies with executive leadership and the Office of Communications. Matt Chynoweth will share the policy information from Iowa and Utah with the Bridge Committee.	2013 Status	Open	

BRIDGES & STRUCTURES	ACTION ITEM: Characterizing Performance of Bridge Deck Systems		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 335		TRB Attendee: Michael Townley Action Contacts: Steve Kahl
	Description: Several good papers on possible new technologies in this area.		
	ACTION STATUS		
	2013 Activity Several new technologies that Mike Townley will convey to Steve Kahl, Bridge Research, including: <ul style="list-style-type: none"> • Using deck cracking prediction software to avoid designs that might result in early deck cracking. Contact Ahmed Abdel-Mohti of Ohio Northern University if follow-up information is desired. • Using X-ray fluorescence (XRF). X-ray fluorescence provides a practical method for positively identifying corrosion-resistant rebar for inspection acceptance. This device provides not only a list of the percentage of elements detected but also the alloy type. 		2013 Status
			Open

BRIDGES & STRUCTURES	ACTION ITEM: Accelerated Bridge Construction		
	OVERVIEW		
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 170, 775		TRB Attendees: Dave Juntunen, Paul Ajegba Action Contacts: Dave Juntunen, Paul Ajegba
	Description: Several staff attended multiple sessions on this topic. Information included accelerated reconstruction techniques for full and partial bridge replacement and accelerated bridge deck/expansion joint repair methods. Additional information can be found at: http://amonline.trb.org/211qmr/1 http://93fast14.dot.state.ma.us/		
	ACTION STATUS		
	2012 Activity This information was forwarded on to Bridge Design (Dave Juntunen). In addition, Paul Ajegba, University Region Engineer, initiated meetings to explore these concepts for use on a future project at the I-96/US-23 interchange in Livingston County. An accelerated bridge construction workshop was held at the region office to discuss options with consultants that have experience in this area. 2013 Activity The University Region has programmed an ABC project to replace all of the structures at the I-96/US-23 interchange near Brighton. The project is scheduled for letting in 2014 with 2015 construction. Bridge Design is spearheading several efforts to incorporate ABC techniques into the MDOT bridge design program. These include: <ul style="list-style-type: none"> • Working with Western Michigan University on a research project to develop a decision-making framework for ABC. • Updating the bridge scoping and design manuals to provide direction for ABC designs. • Meeting with the Every Day Counts team that is involved in national efforts regarding ABC to share best practices. • Adding information/direction to the annual Call for Projects regarding the consideration of ABC in the scoping/programming phases of project development. Note that 60 percent of the programmed 2013 projects will utilize some aspect of ABC design techniques. 		2012 Status
2013 Status			Closed

BRIDGES & STRUCTURES	ACTION ITEM: Carbon Fiber Repair for Bridge Foundation Piles		
	OVERVIEW		
	TRB Year: 2012	TRB Attendee: Dave Juntunen	
	Lectern, Committee, Poster or Session Number: 320	Action Contact: Dave Juntunen	
	Description: A pile repair technique called Mediwrap was presented at TRB. The technique involves creating a shell around the outside of a damaged pile by wrapping carbon fiber around the perimeter, filling the void between the fiber wrap and damaged pile with either grout for concrete piles or resin for timber piles. The repair surface is painted with epoxy to ensure adhesion and to form a cylindrical shape. The repair can also be accomplished in water with water curing resin. Divers are not needed because the wrap can be formed above the water line and lowered into place.		
	ACTION STATUS		
<p><u>2012 Activity</u> An MDOT research project was planned for Fiscal Year 2013 that will explore bridge repair techniques using fiber-reinforced polymer (FRP). The Mediwrap pile repair technique will be further explored as part of this research project.</p> <p><u>2013 Activity</u> A research project concerning FRP techniques and applications will begin in Fiscal Year 2013. The project, titled "Design and Construction Guidelines for Strengthening Bridges Using Fiber-Reinforced Polymers," will be led by Wayne State University.</p>	2012 Status	Open	
	2013 Status	Closed	

ACTION ITEM: Long-Span, Spliced and Continuous Prestressed Girder Bridges**OVERVIEW****TRB Year:** 2012**Lectern, Committee, Poster or Session Number:** 219**TRB Attendee:** Dave Juntunen**Action Contact:** Dave Juntunen**Description:**

Information presented about long-span, spliced and continuous prestressed girder bridges included:

- Washington State DOT has WF100G section for spans exceeding 240 feet.
- The span-to-depth ratio controls for very long spans.
- Longest span: 213 feet (Calgary 37th Street, Washington state).
- They don't do debonding, they use harped/draped strands. NCHRP report addresses end zone cracking. Welded wire reinforcement can replace rebar. They do transporting/handling calculations.
- Allow alternate splice locations—competitive shipping cost.
- 20-inch-wide girder, bearing pad, girder safe. Use 15 percent lighter elastic modulus than AASHTO Load and Resistance Factor Design (LRFD).
- Skew on prestressed beams.
- With hairpin bars at joints, daily and seasonal changes occur. Thermal gradient stresses can be significant load.
- AASHTO: If beams are aged 90 days, positive moments develop.
- Another way to lengthen spans is to splice them on the ground, then lift the beams into place (use Cazaly hanger system).
- Options for splicing: 1) fully prestress connection 2) fully reinforce connection 3) partially prestress.

ACTION STATUS**2012 Activity**

Dave Juntunen planned to share this information with the MDOT Bridge Committee.

2012 Status

Open

2013 Activity

Information has been shared with the bridge committee. Spliced prestressed beams are being considered for use on the I-96/US-23 interchange project.

2013 Status

Closed

BRIDGES & STRUCTURES	ACTION ITEM: Epoxy Overlay Testing		
	OVERVIEW		
	TRB Year: 2012	TRB Attendee: Dave Juntunen	
	Lectern, Committee, Poster or Session Number: 365	Action Contact: Dave Juntunen	
	Description:		
	Information presented about epoxy overlay testing included:		
	<ul style="list-style-type: none"> Can test texture depth, surface friction, bond strength and chloride context. Can also test bond strength, but with strange failure modes. FP2000: Sensor in bridge deck monitors chemical temperature, liquid temperature and ambient temperature; it determines when freezing is imminent. 		
ACTION STATUS			
<u>2012 Activity</u>	2012 Status	Open	
Dave Juntunen planned to share this information with Bridge Field Services.			
<u>2013 Activity</u>	2013 Status	Closed	
This information has been shared with Bridge Field Services.			

BRIDGES & STRUCTURES	ACTION ITEM: Long-Term Bridge Performance Program							
	OVERVIEW							
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 804		TRB Attendee: Dave Juntunen Action Contact: Dave Juntunen					
	<p>Description: Tom Everett, FHWA Bridge Engineer in Washington, D.C., gave a presentation about FHWA's Long-Term Bridge Performance (LTBP) program. Highlights included:</p> <ul style="list-style-type: none"> • FHWA is looking for states to partner with. FHWA will conduct all testing, but states provide traffic control. <ul style="list-style-type: none"> ○ Update: Dave Juntunen and Beckie Curtis are on Technical Advisory Panels for the LTBP program. • Changes are planned in regulations on inspection frequency, update to Bridge Inspector's Reference Manual (BIRM), Virtual Bridge Exercises. Field exercises subject to weather. • FHWA is looking to develop a BIRM app for mobile devices. • The new BIRM references elements and better defines critical findings. • FHWA is planning to update the National Bridge Inventory (NBI) Coding Guide. Wade Casey is the lead person. • FHWA is developing training on bridge management and performance measures. The agency will use element data for National Highway System (NHS) bridges. • FHWA has developed a Bridge Preservation Toolbox and an updated National Highway Institute (NHI) bridge maintenance course (4½ days). 							
	ACTION STATUS							
	<p><u>2012 Activity</u> Dave Juntunen planned to share information with the MDOT Bridge Committee.</p> <p><u>2013 Activity</u> This information is shared with the bridge committee on an ongoing basis. As state coordinator of the LTBP program, Dave Juntunen recently participated in an LTBP meeting.</p>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">2012 Status</td> <td style="background-color: yellow; text-align: center;">Open</td> </tr> <tr> <td style="text-align: center;">2013 Status</td> <td style="background-color: #90EE90; text-align: center;">Closed</td> </tr> <tr> <td colspan="2" style="height: 20px;"></td> </tr> </table>	2012 Status	Open	2013 Status	Closed	
2012 Status	Open							
2013 Status	Closed							

ACTION ITEM: AASHTOWare Bridge Management Software (Formerly Pontis) Update**OVERVIEW****TRB Year:** 2012**TRB Attendee:** Dave Juntunen**Lectern, Committee, Poster or Session Number:** 776**Action Contact:** Dave Juntunen**Description:** Jeremy Shaffer of Bentley Systems provided an update on AASHTOWare Bridge Management software, or BrM (formerly Pontis). Highlights included:

- Data from PDI to XML, speed enhancement, core elements are read-only.
- Sybase no longer supported (Oracle and Microsoft SQL). Reports in Crystal Reports, data in XML for support for importing and migration. Unable to use NBI translator. Simple flex action type.
- Parent-child relationship; add multiple pictures; use compressed XML. PDIs still supported, and NBI files. Integrated Guide Manuals.
- Color-coded Core Elements. All old tables retained; new tables added. 65-bit: Officially no, unofficially yes.
- Documents—significant.
- New Web site: <http://aashtowarebridge.com/>

ACTION STATUS**2012 Activity**

Dave Juntunen planned to share this information with the Michigan Bridge Inspection System (MBIS)/Michigan Bridge Reporting System (MBRS) development team.

2012 Status

Open

2013 Status

Closed

2013 Activity

- The developer for BrM was recently invited to Michigan to give a presentation on BrM development and bridge 3-D modeling.
- MDOT is participating in the BrM 5.2 development project (national pooled fund study). MDOT's Beckie Curtis is on the national oversight team.
- An update on BrM development has been shared with the bridge authorities for Michigan's long-span bridges (Mackinac Bridge, Blue Water Bridge, International Bridge). MDOT and the bridge authorities developed a research problem statement regarding long-span bridge needs for bridge management. A pooled fund study led by MDOT may develop, or an individual stand-alone research project will be initiated.

INNOVATIVE CONTRACTING	ACTION ITEM: Successes in Accelerated Project Delivery		
	OVERVIEW		
	TRB Year: 2013	TRB Attendee: Tony Kratofil	
	Lectern, Committee, Poster or Session Number: 165	Action Contact: Chris Youngs	
	Description: FHWA (headquarters) perspective on MAP-21 (along with Every Day Counts) is to encourage more use of the contract manager/general contractor (CMGC) project delivery method. <ul style="list-style-type: none"> • Section 1303. The intent is to allow for CMGC approval by division offices; no SEP-14 is required. A draft regulation for FHWA to implement is in place. • Section 1304. Promotes innovative project delivery with the incentive of increasing the federal share by 5 percent. Open to and want to see more innovation. CMGC has only been done in 17 states, and only a few have significant experience. FHWA would like to see a lot more. Alternative Technical Concepts (ATCs), also part of Every Day Counts, can be used in both design-build and design-bid-build and is starting to be tried in more areas. Bidders can propose an alternative that meets or exceeds the functional scope of the intended design.		
	ACTION STATUS		
2013 Activity Tony Kratofil will talk with Chris Youngs, Innovative Contracting, about the expanded use of CMGC. Tony Kratofil talked with Chris Youngs about piloting design-bid-build ATCs in lieu of post-award Value Engineering Change Proposals. This would allow MDOT to realize the entire value of the improved solution. See the FHWA Web site, and look to Maryland, which has reportedly used this approach extensively with success. EOC approved this approach on several projects at the February 2013 meeting.	<table border="1"> <tr> <td style="background-color: #cccccc;">2013 Status</td> <td style="background-color: #ffff00;">Open</td> </tr> </table>	2013 Status	Open
2013 Status	Open		

INNOVATIVE CONTRACTING	ACTION ITEM: Best Value Contracting			
	OVERVIEW			
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: N/A		TRB Attendee: Steve Bower Action Contact: Chris Youngs	
	Description: Best Value selections, including technical proposal scores, are an effective means for ensuring a quality project, especially when handling very unique situations. Other agencies have had challenges with evaluation criteria; lessons can be learned. Transparent documentation is a must.			
	ACTION STATUS			
	<u>2012 Activity</u> Information was shared with the Innovative Contracting Section (Chris Youngs). <u>2013 Activity</u> Best Value and Quality-Based Selection have been used on design-bid-build, design-build, and construction manager/general contractor projects in recent years. The need for transparency and clear selection criteria has been discussed with MDOT project managers. It can be difficult to remove some of the subjective criteria in these selections, but efforts have been made to reduce this as much as possible and provide detailed explanations to the teams that submit proposals on these projects.		2012 Status	Open
			2013 Status	Closed

ACTION ITEM: All You Wanted to Know about Roundabouts

OVERVIEW

TRB Year: 2013

Lectern, Committee, Poster or Session Number: 542

TRB Attendee: Bob Ranck

Action Contacts: Imad Gedaoun

Description:

Paper #13-3316

- This project studied the capacity of roundabouts and the number of seconds for people to enter the traffic gaps in a roundabout. Purdue University researchers studied a location with a high density of roundabouts (where people know how to drive them) in Carmel, Indiana. Capacity is often determined by projecting ahead 20 years based on initial usage. The best approach is to use the capacity after the roundabout has been in place for three years. This study looked at roundabouts that are more unbalanced.

- The bottom line:
 - Balanced legs of roundabouts are the most efficient.
 - In unbalanced situations, the number of gap seconds goes down after three years, when people are used to driving them.

The unscientific opinion expressed after the research is that capacity projections are conservative and that need projections are 10 to 20 percent too conservative. This will make a difference in a one-lane or two-lane roundabout.

ACTION STATUS

2013 Activity

Bob Ranck will pass this information on to Imad Gedaoun, Lansing Geometrics.

2013 Status

Open

TRANSPORTATION SAFETY	ACTION ITEM: Pedestrian Planning, Policy and Demand Analysis		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 340	TRB Attendee: Michael Townley Action Contacts: Deirdre Thompson	
	Description: This poster session covered the effects of various countermeasures on vehicle yield rates for pedestrians.		
	ACTION STATUS		
	<u>2013 Activity</u> Mike Townley will speak with Deirdre Thompson, Traffic & Safety, regarding: <ul style="list-style-type: none"> • Parking limitations and advance yield pavement markings should be considered to limit pedestrian exposure to multiple vehicle threats. • To improve pedestrian safety, yielding rates in communities with yield laws can be improved with education and enforcement. • MDOT could follow a plan similar to the effective Gainesville education and enforcement program outlined in the presentation. 	2013 Status	Open

TRANSPORTATION SAFETY	ACTION ITEM: Performance-Based Tools to Access Geometric Design Decisions		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 679		TRB Attendee: Bill Wahl Action Contact: Mark Bott
	Description: <u>Decision Tool to Define and Quantify Interchange Complexity (Paper #13-5219)</u> This research developed an easy-to-use tool to quantify and compare complexity for various intersections. The methodology is based on geometric conditions of the interchanges, including issues such as left-hand exits, the number of levels for the interchange, exit ramp spacing, and numerous others. Each of the parameters is given a weighted score to develop a final complexity score. Takeaway: This tool is complete and ready to utilize. There may be value in validating the weight provided for each parameter, but even in its current form the tool provides a method to compare the complexity of interchanges so that extra effort can be placed on signing, pavement markings, etc., at the most complex locations. During design, the tool could be used as a way to compare various design options and balance the cost of each option vs. its complexity.		
	ACTION STATUS		
	2013 Activity Bill Wahl will forward this information on to Mark Bott, Traffic & Safety, for further investigation.		2013 Status Open

ACTION ITEM: Innovations Worth Deploying Now: High-Value Research Results

OVERVIEW

TRB Year: 2013 Lectern, Committee, Poster or Session Number: 744	TRB Attendee: Steve Bower Action Contact: Angie Kremer
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Description:

Presentation: Automated Flagger Assistance Devices (AFADs): Saving Lives (Paper #13-5653)
(Wade Odell, TxDOT)

Flagger operation is typically used for two-lane, two-way work zones. One-third of all pedestrian worker crashes or injuries are a result of flagging operations. AFADs are remotely operated devices. The flagger is still present but not in traffic. Some are designed with rotating stop/slow signs. Others are designed more like a signal with red/flashing yellow.

There are several concerns associated with the use of AFADs:

- Motorists may not understand AFADs, so they might stop but then proceed.
- There might be confusion about the signal type or color recognition deficiencies.
- There are concerns about compliance without a person right there at the flag. Research conducted over two years looked at compliance based on field studies and driver understanding based on motorist surveys.

Survey results: One Type A Sign AFAD configuration was better. The sign showed drivers what to do for each sign and included a gate arm when stopping was required. The study also found that a gate arm was critical for the signal-type AFAD.

Field study results: The violation rate was higher for AFADs than human flaggers. Adding a gate arm helped. The rate of AFAD violation was lower than rate of motorists running a red light in a non-work zone situation. As a result, TxDOT adopted its use, with clearly defined standards (e.g., must have a gate arm) and work zone setups. AFADs cost about \$25,000 per pair. Trailer-mounted units cost more. There is no measurement to date on the number of flagger injury incidents or the number of AFAD hits. Anecdotally, when drivers get hit, it is the gate arm, and it is usually easily to repair.

ACTION STATUS

2013 Activity Steve Bower will forward to Angie Kremer, Operations, for further investigation for rural road applications.	2013 Status	Open

TRANSPORTATION SAFETY	ACTION ITEM: Retroreflectivity and Wet Night Visibility of Pavement Markings		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 774	TRB Attendee: Steve Bower Action Contact: Mark Bott	
	Description: Session takeaway regarded new mobile equipment that Florida DOT has developed to more efficiently measure reflectivity. This new equipment will allow FDOT to measure reflectivity on a network basis. The presentation was titled "Repeatability and Reproducibility of Mobile Reflectivity Units for Measurement of Pavement Markings" (Paper #13-3812).		
	ACTION STATUS		
	2013 Activity Steve Bower will forward to Mark Bott, Pavement Marking Technical Agenda Team Leader, for further investigation.	2013 Status	Open

TRANSPORTATION SAFETY	ACTION ITEM: Pavement Marking Management: Best Practices and Safety Benefits		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 107	TRB Attendee: Steve Bower Action Contact: Mark Bott	
	Description: The session included a presentation by Jerry Britt, a representative from Ennis Paint Company, that touched on snowplowable raised pavement markings. There were also discussions on studies conducted in Oregon and Iowa on grooving depths and material, as well as wet/night visibility. Georgia has minimum wet retroreflectivity requirements.		
	ACTION STATUS		
	2013 Activity Steve Bower will forward on to Mark Bott, Pavement Marking Technical Agenda Team Leader, for further investigation.	2013 Status	Open

ACTION ITEM: Systemic Safety Program Improvement Location Prioritization

OVERVIEW

TRB Year: 2013

TRB Attendee: Dean Kanitz

Lectern, Committee, Poster or Session Number: 113

Action Contact: Dean Kanitz

Description: The Highway Safety Improvement Program (HSIP) is only supported through the identification of problems that are then prioritized and addressed with the appropriate countermeasures. Under MAP-21, there is a new definition for High-Risk Rural Roads that requires the state to consider areas of “significant safety need.” MAP-21 also has put more emphasis on the systemic application of safety through the understanding of crash potential on a systemwide basis. See <http://safety.fhwa.dot.gov/systemic/>.

Scott Davis, Thurston County, WA (davissa@co.thurston.wa.us)

The county is a mix of suburban and rural roadways. Went through the process of developing a systemic approach through the following six steps: 1) stakeholder meeting; 2) identification of crash types critical to the system, with locations and respective attributes; 3) identification of risk factors; 4) risk factor data acquisition—mobile database, field data collection, photolog and GE data collection; 5) risk factor analysis; and 6) risk factor prioritization. This process was approximately a five-month investment with three to four people at 60 percent time.

Andy Kaplan and Eric Gonzales, Rutgers University (andy.kaplan@rutgers.edu; eric.gonzales@rutgers.edu)

Rutgers University researchers performed analysis on roadways to provide an understanding of roadside safety. They used a binary process to determine what passed standards and what did not. This was used to develop a cost-benefit spreadsheet illustrating which projects should be accomplished first.

Doug Harwood, MRI

Analysis of pilot of United States Roadway Assessment Program (usRAP) by Genesee County Road Commission (Flint, Michigan). There was a need to collect 535 miles of roadway data using the usRAP interface. Once users are proficient, collection takes approximately 20 minutes per mile.

Kentucky

Utilized cameras with built-in GPS for roads that are not on Google Street View, such as gravel roads.

ACTION STATUS

2013 Activity

Dean Kanitz will work with other safety staff to investigate the following:

Local Systemic Safety Process:

- Examine the processes developed by Thurston County, WA, and Rutgers University and summarize their systemic safety.
- Evaluate Roadsoft for potential use in defining systemic safety applications.
- Evaluate Local Agency Safety Program for potential application changes for systemic safety project submittals.
- Develop processes to address systemic applications of safety for statewide, regional, TSC and local levels.

Local Data Collection Processes:

- Look at what data can be gathered from existing data and images.
- Consider commitment for usRAP or potential modification to Roadsoft.
- Determine local training needs (self-paced).
- Shift Local Safety Initiative to support agency data collection efforts, use of student help to enhance collection.

2013 Status

Open

TRANSPORTATION SAFETY	ACTION ITEM: Pedestrian Safety		
	OVERVIEW		
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 260	TRB Attendee: Steve Bower Action Contact: Deirdre Thompson	
	Description: Pedestrian safety is becoming a bigger and bigger issue with the advent of context-sensitive designs and complete streets policies. Several TRB sessions covered this issue. One item of interest was “zigzag” pavement markings in advance of a crossing, which have been shown to cause drivers to slow down approaching the crossing. Another approach is a Danish Offset, which provides a refuge area in the middle of the roadway; this requires a median island. This treatment is used for wider arterials where crossing the entire arterial at once may be hazardous.		
	ACTION STATUS		
	<p><u>2012 Activity</u> This information was forwarded to Traffic & Safety staff (Deirdre Thompson) who specialize in this area.</p> <p><u>2013 Activity</u> The Danish Offset has already been implemented in Michigan; it is in MDOT’s design toolbox for addressing pedestrian safety at mid-block locations.</p> <p>Zigzag pavement markings are not currently approved by the Michigan Manual on Uniform Traffic Control Devices. MDOT or a local agency would need FHWA approval to install such markings. The initial study on the zigzag markings was performed at only two locations in Virginia. Before MDOT moves forward with implementing zigzag markings, Traffic & Safety recommends waiting for additional research on this topic.</p>	2012 Status	Open
	2013 Status	Closed	

TRANSPORTATION SAFETY	ACTION ITEM: Toward Zero Deaths	
	OVERVIEW	
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: N/A	TRB Attendee: Gregg Brunner Action Contact: Gregg Brunner
	Description: Much good information on Toward Zero Deaths (TZD).	
	ACTION STATUS	
	<p><u>2012 Activity</u> Gregg Brunner incorporated this information into PowerPoint presentations used at regional Rural Elected Officials/Transportation Summit meetings. The information shared seems to make a good impact on the need for traffic safety. Brunner planned to share the PowerPoint with his counterparts in other regions for their use.</p> <p><u>2013 Activity</u> The presentation has been shared with Lansing Traffic & Safety staff. Brunner also met with other MDOT staff to develop a Toward Zero Deaths message for possible inclusion in the upcoming Strategic Highway Safety Plan. The TZD presentation has also been given to the Saginaw Valley Traffic Safety Committee.</p>	2012 Status Open
		2013 Status Closed

ACTION ITEM: Roadway Illumination Systems: Meeting Drivers' Visual Needs

OVERVIEW

TRB Year: 2013 Lectern, Committee, Poster or Session Number: 371	TRB Attendee: Steve Bower Action Contact: Steve Urda
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Description:

Field and Software Evaluation of Luminance from LED Luminaires for Roadway Applications (Paper #13-3398)
(University of Illinois at Urbana-Champaign)

- Phase I compared high-pressure sodium (HPS) lights with three different LED technologies.
- Phase II just started. Will also be looking at induction and performing LCCA for the various technologies based on observed field performance.
- See <http://ict.illinois.edu> for details.

Evaluation of the Impact of Spectral Power Distributions on Driver Performance (Paper #13-3803)
(Ron Gibbons, Virginia Polytechnic Institute)

- Human-perceived light color and intensity affect the ability to see objects.
- Pedestrian visibility evaluated using different lighting technologies (colors and intensities).
- Red color provided the furthest detection.
- Blue provided the furthest without color determination.
- Phase II is just beginning.

Development of a Guide for Replacement of Roadway Lighting with New Lighting Technologies (Paper #13-2308)
(John Bullough, Rensselaer Polytechnic Institute)

- New York lighting study.
- Developed guidelines for NYSDOT to replace old lighting technologies with new lights on both existing poles and new installations.
- Looked at spacing versus light power.
- Evaluated and characterized each lighting technology based on the perception of the human eye, not just lumens.
- Looked at HPS versus LED and induction.
- See NYSDOT Web site for standards.

ACTION STATUS

2013 Activity Steve Bower will speak with Steve Urda and Terry Frake, Design Services, regarding further action.	2013 Status	Open

SURVEYS & AUTOMATED DESIGN	ACTION ITEM: Best Practices and Lessons Learned Involving Virtual Design and Construction		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 693		TRB Attendee: Dan Belcher Action Contact: Dan Belcher
	Description: <ul style="list-style-type: none"> With 3-D modeling you must define the level of detail needed for each project. Must set or adopt standards; Penn State and UK have BIM specifications. Use the 3-D models as a communication tool with designers and Construction. 4-D (adding time) works great for maintenance of traffic. Taking 3-D models to game engines allows stakeholders to drive the project before it is built. Wisconsin DOT—60 percent of problems during construction can be fixed in design if using 3-D models. 		
	ACTION STATUS		
<u>2013 Activity</u> Dan Belcher, Design Surveys, will investigate the Penn State standard to see if it is applicable to MDOT. MDOT needs to begin developing standards for this new design technology.		2013 Status	Open

SURVEYS & AUTOMATED DESIGN	ACTION ITEM: Digital Design Technology			
	OVERVIEW			
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 318		TRB Attendee: Steve Bower Action Contact: Dan Belcher	
	Description: MDOT should be placing a higher priority on further implementation of digital design technology. These technologies include LiDAR (light detection and ranging) design surveys, 3-D model design methods and automated machine guidance (AMG) in construction. Great efficiencies in plan development and construction are possible.			
	ACTION STATUS			
	<u>2012 Activity</u> Information from other states was shared with the Design Services Section (Dan Belcher). <u>2013 Activity</u> <u>LiDAR</u> Design Surveys has two static LiDAR scanners. The scanners have been used for bridge and intersection mapping. The equipment is available for regional office use with Survey Support Unit assistance provided. Mobile LiDAR, through consultant contracts, continues to expand. The Survey Support Unit has the capability to process the LiDAR data into the topographic mapping and digital terrain models (DTMs) required by designers. <u>3-D Models</u> GEOPAK Roadway Designer training is currently being provided to MDOT design staff. This is the first step in creating 3-D models for construction. Reference Information Documents (RID) have been added to eProposal to provide contractors with as much electronic information as possible on projects. The number of projects with RID will continue to expand as it goes from pilot to standard practice. 3-D model availability on MDOT-letted projects will continue to increase as projects are completed using Roadway Designer. <u>Automated Machine Guidance</u> With Roadway Designer now in place, MDOT is able to produce the information necessary for AMG. The Engineering Support and Survey Support Units are now working with Construction staff to develop methods for stakeout and inspection on AMG jobs. We are providing training with GPS equipment and finding ways to use existing software for inspection activities. The first pilot project, the I-96/Latson Road Interchange, will incorporate all three technologies and will start later this year. This project will enable MDOT and the construction industry to learn more about how these new technologies can mesh together to create even greater efficiencies in project design and construction.		2012 Status	Open
			2013 Status	Closed

ACTION ITEM: Disadvantaged Business Enterprise Committee

OVERVIEW

TRB Year: 2013

TRB Attendee: Greg Johnson

Lectern, Committee, Poster or Session Number: AFH80

Action Contacts: Greg Johnson

Description: This committee addressed a number of topics, including:

- Using supportive services dollars for the small business initiative is a controversial question as it may take away resources from the Disadvantaged Business Enterprise (DBE) program. How do you keep the small business initiative from usurping the DBE program?
- Using DBEs on alternate delivery methods is an issue that will require close attention and action by DOTs. Do we capture the number of DBEs participating in highway work versus the number of firms certified?
- Using DBE utilization plans for DBE involvement in alternative delivery or in service Request for Proposal (RFP) selections. A good plan will contain a monitoring element.
- Is there a need to split WBE participation from MBE participation based on an overutilization by women-owned firms?
- Future synthesis topics: prequalification as a barrier to DBEs, interface and distinguish the programs that exist.
- Possible research problem statements: DBE participation in alternate delivery methods, the most effective organizational structure for the civil rights/DBE function.

ACTION STATUS

2013 Activity

Greg Johnson will convey this information to Pat Collins, DBE Office, for further investigation.

2013 Status

Open

CONSTRUCTION	ACTION ITEM: Post-Installation Inspection of Buried Pipe		
	OVERVIEW		
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 100		TRB Attendee: Michael Townley Action Contact: Michael Townley
	Description: Several states, including DOT representatives from Kentucky, Virginia, Florida and North Carolina, presented information about their pipe laser profiler inspection specifications.		
	ACTION STATUS		
	<p><u>2012 Activity</u> As a result of these discussions, current MDOT research planned to investigate and make recommendations on the following:</p> <ol style="list-style-type: none"> 1. MDOT's current standard of deflection (greater than 5 percent deflection requires removal, replacement or reinstallation). 2. A laser inspection form for acceptance, allowing engineers to make better field decisions. 3. Using nominal or manufacturer's diameter. 4. Developing guidelines on how deflection is measured (one frame, average, ovality or other deflection measurement). 5. Timing of inspection. 6. A joint opening standard. 7. Installation training and inspector training. <p><u>2013 Activity</u> An MDOT research project made pipe inspection recommendations on the following topics because of our increased awareness of critical issues from TRB:</p> <ol style="list-style-type: none"> 1. MDOT's current standard of deflection. 2. A laser inspection form for acceptance, allowing engineers to make better field decisions. 3. How to measure deflection. 4. Timing of inspection. 5. A joint opening standard. 6. Installation training and inspector training. <p>Recommendations will be presented to the Engineering Operations Committee for consideration.</p>		2012 Status Open
			2013 Status Open

CONSTRUCTION	ACTION ITEM: Project Management on Complex Projects					
	OVERVIEW					
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 118		TRB Attendee: Steve Bower Action Contacts: Terry Stepanski, Mohammed Alghurabi			
	<p>Description: SHRP 2 (Project R10) is funding work for managing work on complex projects. New management techniques are recommended to address all of the considerations on complex projects. A concept called Project Complexity Pentium is used to aid project managers and the project management team as a whole in improving the way a project is managed.</p> <p>A traditional project management model uses a linear approach that only considers technical issues, project cost and project schedule. Project Complexity Pentium enables a nonlinear approach that is more flexible and addresses many other considerations, including financing options and context issues such as public concerns, environmental impact, major utility coordination issues and political concerns.</p>					
	ACTION STATUS					
	<p><u>2012 Activity</u> Information was forwarded to MDOT senior project managers (Terry Stepanski, Mohammed Alghurabi) for their consideration and follow-up.</p> <p><u>2013 Activity</u> A workshop occurred in the Fall of 2012 at the Metro Region office. The workshop was scheduled because of MDOT's interest in this project management concept. The SHRP 2 team for project R10 is providing the workshop because they are interested in applying the concepts of five-dimensional project management (Project Complexity Pentium) to some of MDOT's large projects such as the I-75 and I-94 megaprojects in the Detroit area. These projects will ultimately be used as case studies for further national research. MDOT was also awarded SHRP 2 Implementation funding for R10.</p>		<table border="1"> <tr> <td style="background-color: #d3d3d3;">2012 Status</td> <td style="background-color: #ffff00;">Open</td> </tr> <tr> <td style="background-color: #d3d3d3;">2013 Status</td> <td style="background-color: #90ee90;">Closed</td> </tr> </table>	2012 Status	Open	2013 Status
2012 Status	Open					
2013 Status	Closed					

GEOTECHNICAL & FOUNDATION	ACTION ITEM: Non-Nuclear Methods for Compaction Control		
	OVERVIEW		
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 510		TRB Attendee: Steve Bower Action Contacts: Dave Gauthier
	Description: MDOT has been interested in alternatives to the nuclear density gauge to reduce the amount of compliance costs and regulatory requirements that exist when nuclear gauges are used. The Army Corps of Engineers has completed a comparison study (see http://docs.trb.org/prp/12-3516.pdf) of non-nuclear density gauges recommending the best alternative gauges on the market.		
	ACTION STATUS		
	2012 Activity Planned to share information with Dick Endres, first from this summary report and again when the full report from the Army Corps is published (publication expected in summer 2012). MDOT had proposed using SPR II funds to conduct this research; however, reviewing this national research will save us from duplicating this effort. If Dick Endres finds this study useful, perhaps an alternative to the nuclear gauge may be used on MDOT projects, saving regulatory compliance costs.		2012 Status
2013 Activity A 2013 National Cooperative Highway Research Program (NCHRP) synthesis project topic submitted by MDOT was selected for funding. The project, "NCHRP Synthesis 20-05/Topic 44-10: Non-Nuclear Methods for Compaction Control," is starting, and MDOT's Dave Gauthier is on the national project oversight panel.		2013 Status	Closed

INTELLIGENT TRANSPORTATION SYSTEMS	ACTION ITEM: Challenges and Opportunities for Road Vehicle Automation					
	OVERVIEW					
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 834		TRB Attendee: Tony Kratofil Action Contact: Matt Smith			
	Description: <u>U.S. Experience</u> (Bob Ferlis, FHWA) Just released Broad Agency Announcement looking for research projects to fund. <ul style="list-style-type: none"> Topic 1A: High-performance vehicle streams; looking at cooperative adaptive cruise control. \$1.5 million. Topic 1B: New approaches for testing connected highway and vehicle systems; more about tools for adaptive cruise control for passenger vehicles. Topic 1C: Innovative applications for emerging real-time data: how we capture and utilize it; does it have value; data that cars will be generating in this environment. Topic 1D: Partial automation for truck platooning; CACC system applications. \$2 million. 					
	ACTION STATUS					
	<u>2013 Activity</u> Tony Kratofil will speak with Matt Smith, ITS Section, about using I-69 as a test bed for some of these technologies.		<table border="1"> <tr> <td style="background-color: #D3D3D3;">2013 Status</td> <td style="background-color: #FFFF00;">Open</td> </tr> <tr> <td colspan="2" style="height: 150px;"></td> </tr> </table>	2013 Status	Open	
2013 Status	Open					

INTELLIGENT TRANSPORTATION SYSTEMS	ACTION ITEM: Work Zone Intelligent Transportation Systems: Where Are They Now?				
	OVERVIEW				
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 573	TRB Attendee: Colin Castle Action Contact: Angie Kremer			
	<p>Description: Multiple speakers presented on a number of topics related to work zone ITS. The use of ITS to address work zone safety and mobility concerns has progressed significantly over the past 10 to 15 years. In this session, presenters provided a snapshot of the current state of the practice regarding work zone ITS, describing specific implementations from around the world. This included the following:</p> <p><u>Use of Portable Traffic Management Systems in Oregon</u> (Scott McCanna, Oregon DOT)</p> <p>Scott discussed the use of such work zone ITS systems as Slow/Stopped Traffic Queue Warning Systems, Travel Time Estimations, Dynamic Detour/Alternate Routing, etc. He stated that the Slow/Stopped Traffic Queue Warning Systems have had the most positive impact up to this point. He mentioned a simple formula that he uses as he looks at work zone ITS and ITS in general:</p> <p>Crash/Congestion Reduction = Efficient Equipment Movement = Increased Production = Shorter Project Duration.</p>				
	ACTION STATUS				
	<p>2013 Activity MDOT needs to learn more about utilizing ITS technologies to increase safety and efficiency in work zones. Colin Castle will discuss further with Angie Kremer, Operations.</p>	<table border="1"> <tr> <td style="background-color: #d3d3d3;">2013 Status</td> <td style="background-color: #ffff00;">Open</td> </tr> <tr> <td colspan="2" style="height: 150px;"></td> </tr> </table>	2013 Status	Open	
2013 Status	Open				

INTELLIGENT TRANSPORTATION SYSTEMS	ACTION ITEM: Active Traffic Management					
	OVERVIEW					
	TRB Year: 2012		TRB Attendee: Steve Bower			
	Lectern, Committee, Poster or Session Number: 206		Action Contact: Matt Smith			
	<p>Description: Several states are implementing or considering active traffic management (ATM) systems to address freeway congestion caused by heavy peak hour traffic congestion and traffic backups caused by unforeseen roadway incidents. Washington State DOT and Minnesota DOT have operating systems that seem to be providing significant benefits. Virginia DOT is also studying two locations for ATM use, including urban for traffic congestion and rural for weather-related accident concerns. Additional information on these systems can be found at:</p> <p>Washington State DOT http://www.wsdot.wa.gov/Congestion/technology.htm http://www.wsdot.wa.gov/NR/rdonlyres/73AC9A17-6178-4271-B3A9-91911BD1C8C6/0/FinalATMConceptofOperations.pdf</p> <p>Minnesota DOT http://www.dot.state.oh.us/groups/tft/Appendix%20B/Public%20Investment%20Articles/MN%20Active%20Traffic%20Management.pdf http://www.dot.state.mn.us/smartlanes/</p> <p>Virginia DOT http://www.virginiadot.org/projects/resources/NorthernVirginia/I-66_ATM_Fact_Sheet.pdf http://www.virginiadot.org/projects/northernvirginia/i-66_atms.asp</p>					
	ACTION STATUS					
<p>2012 Activity This information was forwarded on to the ITS group (Matt Smith) for consideration.</p> <p>2013 Activity The ITS Section is working with the Metro Region to explore the potential for Michigan’s first ATM application on I-96 in Oakland County. The consultant has been selected for the study work, and was scheduled to begin work in Fiscal Year 2013.</p>		<table border="1"> <tr> <td style="background-color: #d3d3d3;">2012 Status</td> <td style="background-color: #ffff00;">Open</td> </tr> <tr> <td style="background-color: #d3d3d3;">2013 Status</td> <td style="background-color: #ffff00;">Open</td> </tr> </table>	2012 Status	Open	2013 Status	Open
2012 Status	Open					
2013 Status	Open					

FLEET/FACILITY MANAGEMENT & OPERATIONS	ACTION ITEM: Critical Issues in Maintaining the Equipment Fleet		
	OVERVIEW		
	TRB Year: 2013	TRB Attendee: Bill Wahl	
	Lectern, Committee, Poster or Session Number: 770	Action Contact: Sonja Scheurer	
	Description:		
	<p><u>Equipment Replacement Decision Making: Challenges and Opportunities—University of Texas (Paper #13-0326)</u> The University of Texas developed a software tool to assist in managing its fleet and determining when to keep or replace various pieces of equipment. The university is able to do fleet modeling with a 20-year horizon, looking at fleet across the department as a whole or at an individual region level. The program appears to be extremely effective in supporting a wide variety of features and vehicle characteristics and various funding scenarios.</p>		
ACTION STATUS			
<u>2013 Activity</u> Bill Wahl will communicate this information to Sonja Scheurer, OAS fleet services, for review and consideration.	2013 Status	Open	

MAINTENANCE	ACTION ITEM: Anti-icing Chemical Performance		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 204		TRB Attendee: Bill Wahl Action Contact: Gary Mayes
	<p>Description: This session focused on the science behind the performance of various deicing chemicals and testing equipment. The first two presentations focused on the theoretical chemical interaction of deicing chemicals with snow and ice. The testing done was under ideal lab conditions and therefore had limited direct applicability to actual field activities. The third presenter was from Cargill and explained a new testing process the company has developed to determine the longevity performance of various anti-icing chemicals. The tests conducted were static tests modified from airplane deicer testing and did not account for dynamic traffic impacts. The laboratory tests showed that combinations of salt and additives delayed the formation of ice longer than pure salt and that a salt + polymer additive combination will be more effective as an anti-icing agent than straight brine. However, additional testing is needed with conditions that more accurately depict roadway conditions.</p> <p>The key takeaway is that if the department looks at expanding its use of anti-icing chemicals in the future, it should look for methods to test various chemicals and determine both the longevity of each chemical and its comparative cost.</p>		
	ACTION STATUS		
	<p>2013 Activity Bill Wahl will forward this information to Gary Mayes, Roadway Maintenance, for further investigation.</p>		<p>2013 Status Open</p>

MAINTENANCE	ACTION ITEM: Benefits of Winter Maintenance and Road Condition Information		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 351		TRB Attendee: Bill Wahl Action Contact: Matt Smith
	Description: There were two presentations in this session that were of value.		
	<p><u>Effect of Weather and Road Surface Conditions on Traffic Speed of Rural Roads</u> (University of Waterloo)</p> <p>This Aurora pooled fund study looked at the impact of different weather conditions on traffic speed for rural non-freeway roadways and whether traffic speed could be utilized as a performance factor in maintenance contracts. The study investigators felt that speed was an accurate indicator of condition and are developing a model to infer conditions from speed data and road weather information system (RWIS) data. This could be of great value as we develop PBOS processes and look to improve our usage of RWIS.</p> <p><u>Remote Sensing of Weather and Road Surface Conditions</u> (Western Transportation Institute)</p> <p>The researchers looked at the accuracy of noninvasive pavement sensors for evaluating surface conditions. This paper could be valuable for our ITS staff to review as we look at new options for our RWIS and ITS infrastructure.</p>		
	ACTION STATUS		
2013 Activity Bill Wahl will forward this information on to Matt Smith, ITS Section, for further investigation.		2013 Status Open	

MAINTENANCE	ACTION ITEM: Maintenance Management Systems and Contracting			
	OVERVIEW			
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: N/A		TRB Attendee: Gregg Brunner Action Contact: Gregg Brunner	
	Description: Gained valuable insight as to the benefits of maintenance management systems, both in terms of prioritizing work needs and potential uses to meet a legislative or public desired level of service. Also gathered much useful information regarding outsourcing of maintenance activities.			
	ACTION STATUS			
	<u>2012 Activity</u> Gregg Brunner planned to share this information with his counterparts at statewide meetings. <u>2013 Activity</u> Brunner is part of a team working to implement an Enterprise Asset Management System at MDOT. Utilizing the knowledge gained in both the Maintenance Contracting and Maintenance Management System sessions, the team is in the beginning stages of developing a Request for Proposal (RFP) for the purchase of software. This software will allow MDOT to better manage its assets and will create a work order-type process to track and report maintenance activities completed by direct forces, contract counties and maintenance contractors.		2012 Status	Open
			2013 Status	Closed

MOBILITY, SYSTEMS & SIGNAL OPERATIONS	ACTION ITEM: Simulation-Based Evaluation of Dynamic Queue Warning System Performance		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 339		TRB Attendee: Bill Wahl Action Contacts: Hilary Owen
	Description: Simulation-based model to determine the most effective placement and spacing of traffic devices related to dynamic queue warning systems. If MDOT uses additional systems of this type in the future, this paper could provide valuable lessons about how to most effectively utilize these systems.		
	ACTION STATUS		
	2013 Activity Bill Wahl will convey this information to Hilary Owen, Traffic Operations, for further investigation.		2013 Status

PAVEMENTS & MATERIALS	ACTION ITEM: Developments in In-Place Stabilization		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 740	TRB Attendee: Bill Wahl Action Contact: Curtis Bleech	
	Description: <u>Design and Constructability of Emulsion-Stabilized Bases for Full-Depth Reclamation—UTEP (Paper #13-2256)</u> This session focused on evaluating the Texas specifications for emulsion-stabilized bases for full-depth reclamation. The researchers developed a process to predict the strength of the stabilized bases with laboratory tests. The presentation provided good recommendations for this type of construction that should be evaluated by MDOT's HMA pavement staff.		
	ACTION STATUS		
	2013 Activity Bill Wahl will communicate this information to Curtis Bleech, Pavement Operations, for further investigation.	2013 Status	Open

PAVEMENTS & MATERIALS	ACTION ITEM: Daring to Unpave		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 739	TRB Attendee: Ron Vibbert Action Contact: Ron Vibbert	
	Description: This session was about treatments for constructing roads for low-volume conditions where non-hard surfaces are considered viable construction techniques. One of the presenters talked at the Asset Management Council last year in Livonia. The presenters talked about construction materials, use of various binders to construct a roadway that can handle traffic without paving, and use of chemicals to create the type of surface/structure that is desired. It doesn't appear that specifications for this have been written. Unpaved roads are just a different engineering problem.		
	ACTION STATUS		
	2013 Activity Ron Vibbert will talk with Tim Colling at Michigan LTAP about incorporating this information into future training sessions for local agencies and the Transportation Asset Management Council.	2013 Status	Open

PAVEMENTS & MATERIALS	ACTION ITEM: Don't Break It, Test It: Nondestructive Asphalt Testing		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 207	TRB Attendee: Steve Bower Action Contact: Curtis Bleech	
	Description: <u>Haul Time Effects on Foam Additives (Paper #13-3093)</u> (Isaac Howard, Mississippi State University) <ul style="list-style-type: none"> • Discussed effect of haul times on warm-mix asphalt performance. Mississippi DOT uses 64-22 binder. • Field trials with three mix designs: standard HMA, WMA foam and WMA chemical additive. • WMA mix temperature: 160 degrees F. • Real-life conditions, varying weather types. • Low binder temps were stable up to eight-hour haul time. • Paving operations due to Katrina disaster. 		
	ACTION STATUS		
	2013 Activity Steve Bower will discuss with Curtis Bleech, Pavement Operations, to determine further action.	2013 Status	Open

PAVEMENTS & MATERIALS	ACTION ITEM: Pavement Condition Evaluation: What's Below the Surface?		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 260	TRB Attendee: Steve Bower Action Contact: Curtis Bleech	
	Description: <u>Development and Initial Testing of a Total Pavement Acceptance Device (Paper #13-5040)</u> (Ken Stokie, University of Texas, Austin) <p>Rolling Dynamic Deflectometer:</p> <ul style="list-style-type: none"> • Data collection capabilities include profile (transverse/longitudinal), faulting, GPR, digital images (vertical/perspective), and deflection testing. Operating speed is 3 to 5 mph. Single operator. Much automation. • TxDOT wants the device used this year to assist in program development. • Several districts will use the device. • Has network- and project-level capabilities. • Cost is \$400,000 to \$500,000 per unit. 		
	ACTION STATUS		
	2013 Activity Steve Bower will speak with Curtis Bleech, Pavement Operations, to determine further action.	2013 Status	Open

PAVEMENTS & MATERIALS	ACTION ITEM: Precast Concrete Pavement Patches		
	OVERVIEW		
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 726		TRB Attendee: Steve Bower Action Contact: John Staton
	Description: SHRP 2 (Project R05) is investigating various materials and methods that can be used to repair concrete pavements in very short time windows to minimize or eliminate traffic disruption during peak-hour traffic periods. There has been considerable success on pilot projects on I-295 and I-66 in Virginia. Repairs were made within a six- to eight-hour work window.		
	ACTION STATUS		
	<p><u>2012 Activity</u> This information was forwarded on to the Materials area (John Staton) in Construction Field Services (CFS).</p> <p><u>2013 Activity</u> MDOT was involved with demonstration of precast concrete pavement repairs in SHRP 2. The Materials Section in CFS and the Design Division developed design details and specifications for two precast concrete repair demonstration projects in Michigan. This information was included in the SHRP 2 Study R05. The Materials Section will be reviewing the SHRP Project R05 report when it is released to determine what course of action is appropriate.</p> <p>Materials Section staff are also field-testing new concrete patch mixtures (cast-in-place patches) that provide the possibility of early opening to traffic (four to six hours) without sacrificing patch performance. This work continues, and evaluation will follow.</p>		2012 Status
2013 Status			Open

ACTION ITEM: Pavement Design/Materials

OVERVIEW

TRB Year: 2012

Lectern, Committee, Poster or Session Number: 111, N/A

TRB Attendee: Mike Eacker

Action Contact: Mike Eacker

Description:

- **Mechanistic-Empirical Pavement Design Guide (MEPDG) Implementation:** State DOTs are preparing for MEPDG implementation by concluding research projects and preparing data for future MEPDG designs. Some DOTs are creating materials databases with material properties to be used in the future MEPDG designs. Twenty-seven states are licensing AASHTO’s new pavement design software, DARWin-ME.
- There was an emphasis on greening pavements; this includes pavement life-cycle analysis, reducing CO₂ emissions, reducing rolling resistance, etc. Approximately 70 percent of Virginia DOT’s asphalt tonnage last year was warm-mix.

ACTION STATUS

2012 Activity

Information was passed on to materials and pavement staff (Mike Eacker) in Construction Field Services (CFS). In addition, MDOT is moving forward with research to identify proper mechanistic data inputs for Michigan climatic conditions.

2012 Status

Open

2013 Status

Open

2013 Activity

- A new research project has been initiated to further develop data inputs needed to fully implement the mechanistic pavement design procedure. The project, titled “Adequacy of Michigan Climatic Files for Mechanistic Pavement Design,” has been approved for the Fiscal Year 2014-2015 research program and is expected to begin in October 2013.
- MDOT sent out a nationwide questionnaire to gather information on other states’ experiences with implementation of MEPDG. Results have been received and documented.
- MDOT has joined the pooled fund effort “Traffic and Data Preparation for AASHTO DARWin-ME Analysis and Design.” A recent meeting of the pooled fund members was held in Romulus.
- Mechanistic-empirical pavement design training for MDOT employees is being planned using Web-based methods, which is an idea suggested at a TRB workshop.

WORKER/FACILITY SAFETY & SECURITY/EMERGENCY MANAGEMENT	ACTION ITEM: Superstorm Sandy: Transportation Challenges and Research Opportunities in the Aftermath of a Disaster		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: N/A	TRB Attendee: Hilary Owen Action Contacts: Hilary Owen, Eileen Phifer	
	<p>Description: The presentation stressed the need to develop and maintain disaster plans. There are four distinct stages in dealing with a disaster:</p> <ol style="list-style-type: none"> 1. Planning: Before you even know a storm is coming, you need to have completed planning and partnering as to what you will do when it does. 2. Pre-storm action: Initiate action to minimize damage. 3. Ongoing action: Dealing with the disaster as it hits. 4. Post-storm action: Aftermath cleanup. <p>With Superstorm Sandy, agencies had the ability to compare what happens with and without early planning. When Hurricane Irene hit, they did not have a strong plan in place, and primarily reacted to the weather event. However, lessons learned from Irene were used to create a plan for future events, which were in place for Sandy. It was very evident that the work they put into the planning had a dramatic effect on the success of their ability to respond to Sandy.</p>		
	ACTION STATUS		
<p>2013 Activity Hilary Owen is working with Eileen Phifer, Safety & Security, to initiate a review of MDOT emergency planning Standard Operating Procedures (SOP) for the Statewide Transportation Operations Center (STOC). The statewide advanced traffic management system (ATMS) network includes functionality to control ITS devices from another traffic operations center (TOC) in case of an emergency. MDOT has used that capability in the past when power failures have occurred at one of the TOCs.</p> <p>Owen also is initiating simulation workshops for TOC operators to train for various incidents.</p>	<table border="1"> <tr> <td>2013 Status</td> <td>Open</td> </tr> </table>	2013 Status	Open
2013 Status	Open		

AVIATION	ACTION ITEM: Airports and Their Communities: Communicating Benefits beyond Economic Contributions		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 314	TRB Attendee: Mike Trout Action Contact: Mike Trout	
	Description: Presenters included representatives of an association, an airport and a state DOT. Very informative discussion on a new airport mapping application developed by the state of Washington. Airport presentations focused on developing business plans with an emphasis on marketing strategies and management objectives. They also discussed careers in aviation and ways to attract people to the airport who are not flying.		
	ACTION STATUS		
2013 Activity Actions: Mike Trout will discuss this mapping technology with staff and initiate contact with the state of Washington. Follow up: Aeronautics staff are currently working with staff in Washington state, as they are willing to share their application. Safety and education activities are supported by aeronautics in a variety of ways, including encouraging airports to use their facilities for community events, meetings and other activities.		2013 Status	Open

AVIATION	ACTION ITEM: Commercial Space Transportation Past & Present: Money Wasted or Opportunities Galore—Where Will the Future of Space Exploration Lead Us?		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 523	TRB Attendee: Mike Trout Action Contact: Mike Trout	
	Description: A very informative session with presentations from a commercial space company (SPACEX), the FAA, academia, and the Center for Advancement of Science in Space. A multi-billion dollar industry is now moving toward private companies rather than government being involved in space. Legal issues regarding liability, statutory standards and practical considerations. Horizontal takeoff and landing will require significant runways and facilities around the United States.		
	ACTION STATUS		
2013 Activity MDOT Aeronautics is working with an advanced aerial systems consortium and should identify whether opportunities for spaceports in the state exist. Given the various military facilities in the state, both active and civilian airbases should be studied for this potential. Mike Trout will direct Aeronautics staff to review the possibility of conducting an asset review for potential spaceports in the state, perhaps as part of a statewide system plan update.		2013 Status	Open

AVIATION	ACTION ITEM: What's Happening to General & Business Aviation: Understanding the Implication of Recent Trends		
	OVERVIEW		
	TRB Year: 2013		TRB Attendee: Mike Trout
	Lectern, Committee, Poster or Session Number: 786		Action Contact: Mike Trout
	Description: A very informative session with four papers presented. <ol style="list-style-type: none"> 1. Economic Regional and State Drivers Influencing GA Aircraft Sales. Presented by the General Aviation Manufacturers Association, indicating a significant decrease in aircraft sales. 2. Private Pilots – Next Endangered Species. Due to an aging pilot population interest in aviation is explored. 3. Regional GA Demand Forecast for Southern California. No relevance to Michigan. 4. Business Aviation Environment – Business Aviation Leads the Way Out of the Great Recession of 2008. A study that shows that those Fortune 500 companies who use business aircraft have recovered and that those that do not use aircraft have not. The study validates the efficiency of business aircraft to businesses. 		
ACTION STATUS			
<u>2013 Activity</u> MDOT Aeronautics continues to support business aviation as a significant part of the aviation system in Michigan and making investment in facilities to attract and retain businesses in communities. Mike Trout will discuss these items with staff, especially the Business Aviation Environment presentation, to look for additional uses at MDOT.		2013 Status	Open

ACTION ITEM: Planning and Programming Reforms: Freight Planning

OVERVIEW

TRB Year: 2013

TRB Attendee: Aarne Frobom

Lectern, Committee, Poster or Session Number: 720

Action Contact: Lina Chapman

Description: Several presenters spoke of challenges and opportunities when developing agency freight plans.

Comments received from states

(Sandy Kohrs, Colorado DOT)

Data collected should be useful for decision-making, not just reporting. The differing needs of auto and freight create a “people vs. pallets” tension in coastal cities especially, coupled with the fear that private carriage will be subsidized, or trucks favored over rail. How can we reconcile demands for performance-based planning with increased funds and authority for local units and small projects? Likewise, enhanced NHS routes that are non-state highways.

MPO perspective

(Charles E. Howard, Puget Sound Regional Council)

“MAP-21 is set up so that we have to work together.” This promises better collaboration among FHWA, states and MPOs. A 27,000-mile strategic freight network of lines on a map is not how the economy works; flows are everywhere, and often local. National policy goals are poorly matched with performance measures. “If we persist in having a jurisdictionally based system, we will not be serving the economy.”

Non-motorized perspective

(Margo Pedroso, Safe Routes to School Partnership)

Competition for alternative funds generates a battle for pedestrian interests in every state. Guidance is not yet available for handling of unobligated funds. Low-income communities, where the safety need is frequently great, may need more help to compete for alternative funds. Small projects need help getting through the delivery process. Biking and walking projects ought to be funded through HSIP; “crash potential” language may allow this, given good rules and guidance. Safety goals should be by mode, reflecting the greater danger associated with biking and walking.

Freight perspective

(George Schoener, I-95 Corridor Coalition)

The National Freight Network helped get people (Congressional staff) interested in freight movement (perhaps similar to Commercial Corridors). “Freight knows no boundaries,” but a state and metropolitan focus ignores multistate regions. “Freight planning should become part of transportation planning;” it’s not separate. Long-range plans should include all modes with a coordinated strategy.

Transit perspective

(Andrea Burnside, WMATA)

“Things go wrong.” You have to be able to turn numbers into information that will help management and workers improve. “Millions of numbers” can be a burden, not a help. Best-to-worst rankings are of no help. Benchmarking only works if the measures are exactly the same, and there are no unsuspected definitional differences. Targets do not guarantee continuous improvement; they may cause a focus on indicators, not results.

(Emil Frankel)

We should have focused on intelligent investment of scarce resources in broad strategies and progress toward national goals, not financing single projects. But it’s projects that drive the decision-making, and the politics.

Continued on next page

ACTION ITEM: Planning and Programming Reforms: Freight Planning (continued)			
ACTION STATUS			
FREIGHT & LOGISTICS	<p>2013 Activity</p> <p>Action item: Notes from this session have been delivered to Lina Chapman of the Intermodal Policy Division.</p> <p>Follow-up: This information is being used to refine the department's freight plan and set up the freight advisory committee mandated by MAP-21. It may also help in amending the Supply Chain Management Commission Act of 2008 to reflect MAP-21. The experience of other agencies is expected to help integrate the freight plan with other MDOT plans and programs. Information from this session will also be used by the Bureau of Transportation Planning in commenting on FHWA rulemaking under MAP-21, and in complying with future FHWA rules.</p>	<p>2013 Status</p>	<p>Open</p>
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LOCAL TRANSIT	ACTION ITEM: Bus Rapid Transit in Developing Nations		
	OVERVIEW		
	TRB Year: 2013	TRB Attendee: Sharon Edgar	
	Lectern, Committee, Poster or Session Number: 125	Action Contact: Sharon Edgar	
	Description: Much information was presented about the variations in mobility and economic development results depending on the specific conditions in place at the time. The benefits of a dedicated bus lane and dedicated bus road infrastructure are clear. Bus Rapid Transit (BRT) needs to be carefully planned and designed in the Detroit metro area for it to be successful.		
	MDOT has limited influence on the BRT planning process for southeastern Michigan. However, MDOT can convey information to this group based on these findings.		
	ACTION STATUS		
2013 Activity Sharon Edgar is proposing to make a presentation to the Woodward Avenue Steering Committee about this issue. Some key findings to convey in the presentation include:	2013 Status	Open	
<ul style="list-style-type: none"> • BRT is not an end or a goal but a tool in the mobility toolbox. It's about mobility, not about mode. • Single-mode authorities are outdated. • At the system level, an integrated passenger transportation system is harder to communicate. It is harder for a user to figure out how to use an integrated, multimodal system than a single bus route. So where mobility opportunities have increased, helping riders make use of the system to achieve that increased mobility is harder. • For more mature BRT systems, the next challenge is quality of service. The obstacles are political and organizational, not technological. 			

LOCAL TRANSIT	ACTION ITEM: Innovative Approaches and Case Studies in Transit Management and Performance		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 352	TRB Attendee: Sharon Edgar Action Contact: Sharon Edgar	
	Description: Sharon Edgar had a discussion with Todd A. Litman from the Victoria Transport Policy Institute in Canada. He supplied Web site information that advocates for the use of dedicated bus lanes in highly congested urban corridors. MDOT, and in particular the Lansing TSC, will be party to difficult decisions when CATA gets to the point of wanting to put Bus Rapid Transit (BRT) with dedicated lanes on the M-43/Michigan Avenue corridor. The traditional lens of “vehicle throughput” (i.e., cars) needs to be replaced with the concept of “people throughput” (i.e., people in cars and people in buses) to justify dedicating a lane to buses in peak time.		
	ACTION STATUS		
2013 Activity Sharon Edgar will convey this information to Paul Lott, University Region Planner.	2013 Status	Open	

LOCAL TRANSIT	ACTION ITEM: New Approach for Measuring Transit System and Network Performance		
	OVERVIEW		
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 536	TRB Attendee: Andy Brush Action Contact: Andy Brush	
	Description: The researchers focused mostly on individual agency performance such as on-time and delay times. Automatic Vehicle Location (AVL) can be a very useful tool for systems to measure these types of activities.		
	ACTION STATUS		
2013 Activity Andy Brush, Office of Passenger Transportation, will investigate whether this approach can be incorporated into existing MDOT efforts to measure the condition of the transit system in Michigan.	2013 Status	Open	

LOCAL TRANSIT	ACTION ITEM: Travel Behavior and Carsharing					
	OVERVIEW					
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 591		TRB Attendee: Andy Brush Action Contacts: Andy Brush			
	Description: Carsharing is becoming more popular. It's also referred to as Zipcars. In the United Kingdom, it's called car clubs. One presenter asked how many in the audience participated in carsharing, and approximately 90 percent said they do. In the UK, car clubs are funded with public funds. The motivation to join is to reduce household expenses by eliminating car payments, insurance, fuel, maintenance, etc. The cars are used for an average of three hours and usually travel less than 10 miles. The presenter also found that most people who participate in carsharing do more online shopping.					
	ACTION STATUS					
	<u>2013 Activity</u> Andy Brush will investigate whether this activity is eligible for federal funding.		<table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">2013 Status</td> <td style="background-color: yellow; text-align: center;">Open</td> </tr> <tr> <td colspan="2" style="height: 20px;"> </td> </tr> </table>	2013 Status	Open	
2013 Status	Open					

ACTION ITEM: Alignment of Highway Asset Level-of-Service Activities and Targets with Agency Strategic Performance Measures and Goals

OVERVIEW

TRB Year: 2013

TRB Attendee: Tony Kratofil

Lectern, Committee, Poster or Session Number: 362

Action Contact: Tony Kratofil

Description:

Identifying the Optimal Mix of Maintenance Activities Based on Performance Targets or Budget Constraints (Paper #13-2118)

(Charles Pilson, Agile Assets Software)

An approach to performance-based budgeting. Most literature is focused on a single element of the infrastructure. This approach is focused on the mix of infrastructure elements and needs. Referenced NCHRP Synthesis 426, PBHM and Operations Management.

- Lots of measuring.
- A little bit of assessing levels of service and costs.
- Next to no effort toward optimization.

Maintenance planning for assets with long life cycles (pavement, bridges) is best handled by asset-specific systems (pavement management or bridge management systems). Shorter-term life cycle elements should be handled collectively and without too much detail on individual assets (each sign, etc.).

What is the best set of level of service (LOS) numbers to aim for with a certain budget scenario? Researchers developed a model to optimize this. The crux of the issue is LOS vs. cost to provide it consistently. But you can turn the model upside down to find the minimum cost to achieve a stated level of service across all asset elements. Demonstration of the model was very good, logical, etc. It allows for performance-based budgeting, trade-off analysis, and budget and activity justification.

To do this, you need to meet about 10 prerequisites, data sets and processes. See PPT for the list—basically an EAMS and processes to support it.

“Managing by the seat of your pants is OK, but why guess when there are 560,000 possible combinations of alternatives?”

Cross Asset Resource Allocation Framework for Achieving Performance Sustainability (Paper #13-4056)

(Mohammadsaied Dehghanisani, Virginia Tech)

The framework for solving this multivariate problem has four components: resource allocation, treatment selection, performance prediction, and overall performance evaluation. It is an iterative process that aggregates results for individual asset classes.

Measuring Perceived Service Quality in Highway Maintenance (Paper #13-2576)

(Adrian Burde, SAIC)

The trend is moving toward increasing use of customer-based measures in highway maintenance management solutions: from inputs, to outputs, to outcomes, to value; from productivity, to effectiveness, to value added to customers.

For highway maintenance service delivery, it is not the product; it is the people, equipment and communication used in providing the product.

ASSET MANAGEMENT

Continued on next page

ASSET MANAGEMENT	ACTION ITEM: Alignment of Highway Asset Level-of-Service Activities and Targets with Agency Strategic Performance Measures and Goals (continued)				
	OVERVIEW				
	<p>Assumption that highway maintenance service delivery has similar attributes to those provided in other industries. Customer satisfaction is a simple approach but doesn't account for a variety of other variables.</p> <p>The researchers propose a "gap analysis approach" assessing the difference between customer expectation and customer perception. This model has been transformed into a process called SERVQUAL, a multivariate scale built for measuring service quality. There are two measurements taken: one to set service expectations and one to measure service perceptions.</p> <p>There are five dimensions behind the scale: tangible, reliability, assurance, responsiveness and empathy. The last two they did not use, because they required something they didn't understand well enough. They developed attributes that represent the delivery of the service across the three dimensions. The result is a one-page survey, easy to fill out and return. It was piloted as a mail (paper) survey at Virginia DOT with a 44.6 percent response, 750 requested, 344 responses, \$4.85 per response.</p> <p><u>Risk-Based Corridor Asset Management Approach, (Paper #13-3319)</u> (Richard Boadi, Georgia Tech) Another approach to multivariate, multi-objective optimization.</p>				
	ACTION STATUS				
	<p><u>2013 Activity</u> Tony Kratofil will discuss the session contents with MDOT staff involved in performance-based operations. This may assist MDOT in selecting the right targets for performance-based contracting and customer satisfaction WIG efforts.</p>	<table border="1" style="width: 100%;"> <tr> <td style="background-color: #cccccc;">2013 Status</td> <td style="background-color: #ffff00; text-align: center;">Open</td> </tr> <tr> <td colspan="2" style="height: 40px;"></td> </tr> </table>	2013 Status	Open	
2013 Status	Open				

ASSET MANAGEMENT	ACTION ITEM: Data for Decisions and Performance Measures Task Force		
	OVERVIEW		
	TRB Year: 2012	TRB Attendee: Roger Safford	
	Lectern, Committee, Poster or Session Number: Task Force A0030T	Action Contact: Roger Safford	
	Description: Much good information. MDOT should consider getting involved in this task force based on our increasing emphasis on data business planning and reinvented data architecture.		
	ACTION STATUS		
	<u>2012 Activity</u> Roger Safford planned to share this information with the Executive Bureau to determine a final course of action.	2012 Status	Open
2013 Status		Closed	
<u>2013 Activity</u> N/A			

FINANCE	ACTION ITEM: TIGER Grants		
	OVERVIEW		
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: N/A	TRB Attendee: Dave Wresinski Action Contact: Dave Wresinski	
	Description: TRB provided a great opportunity to meet and establish a relationship with the U.S. DOT Transportation Investment Generating Economic Recovery (TIGER) team. Their session for agencies and consultants was not well attended. The relationships established at the meeting have led to several calls regarding applications MDOT has submitted. Time will tell if this has improved the light in which our applications are reviewed.		
	ACTION STATUS		
	2012 Activity Dave Wresinski directed Planning staff to continue to engage the national players in this area. 2013 Activity \$55 million in TIGER grants were awarded for Woodward Avenue light rail and Port Huron bridge.	2012 Status	Open
	2013 Status	Closed	

ACTION ITEM: Application of ITE’s Recommended Practice: Designing Walkable Urban Thoroughfares

OVERVIEW

TRB Year: 2013

TRB Attendee: Josh DeBruyn

Lectern, Committee, Poster or Session Number: 781

Action Contacts: Josh DeBruyn

Description:

Presentation: A Context-Sensitive Approach – Acceptance, Use and Adaptation in Minnesota (Excelsior Blvd. Case Study, St. Louis Park, Minnesota)

Reconstruction that blended and supported both transportation and land use.

- Flexibility and design were key.
- Existing conditions: four-lane arterial carrying 19,000 ADT.
- Approached the project using context as the starting point, and identified compatible features of context zones and thoroughfare types. Utilized the flexibility in the application of design criteria.
- Context zones or gradients of development patterns are used as an organizing system for integrated thoroughfare design and land use development.
- Thoroughfare designs change as context changes. Thoroughfare should contribute to and respond to context and sense of place. Not a one-size-fits-all for roadway design. Thoroughfare type and land use establish design criteria. Number of lanes, target speed, sidewalk width, and accommodating bicyclists and pedestrians all vary with land use and thoroughfare type.
- More comprehensive approach because you have greater variation and options to design than just urban or rural.
- Functional class and design speed are not the starting point. Community objectives and adjacent land use help establish the design approach, criteria and starting point.
- MnDOT plans to take this to the next level with land use and road reconstruction by applying ITE & Smart Transportation Guidance publications. New Jersey and Pennsylvania DOT Smart Transportation Guidance are being used. Helps right-size a design and suggest reexamining multifunctional arterials and land use context. Don’t overbuild; recognize land use, community character and desired outcomes, and quality of life.

ACTION STATUS

2013 Activity

Josh DeBruyn will discuss implementing these concepts at MDOT with Brad Wieferich, Design Division.

2013 Status

Open

NON-MOTORIZED PLANNING & DEVELOPMENT	ACTION ITEM: Cycling Infrastructure and Safety	
	OVERVIEW	
	TRB Year: 2013 Lectern, Committee, Poster or Session Number: 494	TRB Attendee: Josh DeBruyn Action Contact: Josh DeBruyn
	Description: <u>Network Connectivity and Low-Stress Bicycling (Paper #13-0427)</u> A city or regional bicycling network includes all roads and paths on which bicycling is permitted. However, some streets provide such a poor level of safety and comfort for bicycling that the majority of the population considers them unsuitable for bicycling. This research had two primary objectives: 1) Propose and test the practicality of a new way to define the bicycle network (that is, as the set of streets and paths that people consider acceptably safe for bicycling), and 2) Develop metrics for low-stress connectivity, or the ability of a network to connect travelers' origins to their destinations without subjecting them to unacceptably stressful links. To make bicycling safer and more appealing, cities often make bicycle-related improvements to certain streets. However, the improvements do not necessarily represent the network of paths and streets that people deem safe enough to use. This research proposes a new scheme for classifying road segments into one of four levels of traffic stress: 1) Level of traffic stress 1 (LTS 1): the level that most children can tolerate. 2) LTS 2: the level that will be tolerated by the mainstream adult population. 3) LTS 3: the level tolerated by American cyclists who are "enthused and confident" but still prefer having their own dedicated space for riding. 4) LTS 4: a level tolerated only by those characterized as "strong and fearless." The LTS criteria developed and applied can distinguish four levels of a street network's stressfulness, corresponding to identified user profiles, and it offers cities a way to map their bicycling networks according to which populations they serve rather than according to facility types. The research highlights the importance of intersection approaches and street crossings in network connectivity. Researchers also developed several analysis tools for visualizing connectivity, including stress maps, shortest-path networks, and maps highlighting barriers and islands of connectivity.	
	ACTION STATUS	
2013 Activity Josh DeBruyn, Planning, will investigate the effort needed to perform an overall analysis of bicycle networks in various urbanized areas. The effort would identify deficiencies in safety and connectivity on various regional bicycle networks around Michigan. An additional benefit would be to provide improved coordination of planned infrastructure improvements for both non-motorized and motorized needs.	2013 Status Open	

PROGRAM DEVELOPMENT	ACTION ITEM: MDOT MPINS Software Update		
	OVERVIEW		
	TRB Year: 2013	TRB Attendee: Denise Jackson	
	Lectern, Committee, Poster or Session Number: N/A	Action Contact: Denise Jackson	
	Description: MDOT is initiating a major redesign of the MAP Project Information System (MPINS). Discussions occurred at TRB with other states regarding this major upgrade. Pennsylvania DOT was identified as having a software package similar to MPINS with the needed enhancements.		
	ACTION STATUS		
<u>2013 Activity</u> Denise Jackson plans to contact PennDOT to determine whether there are any opportunities for technology transfer.	2013 Status	Open	

ACTION ITEM: Communicating Finance Concepts with John Q. Public—Annual Contest Winners

OVERVIEW

TRB Year: 2013

TRB Attendee: Aarne Frobom

Lectern, Committee, Poster or Session Number: 589

Action Contact: Aarne Frobom

Description: Florida DOT legislative briefing documents are individualized by district, with maps highlighting projects, with statistics on networks, and impacts from changes in revenues. These 160 documents may soon be automated and available online.

The GreenCityStreets Web site aims to test people’s improvement suggestions with a game to test bus improvements.

The Atlanta Regional Commission “Terminus” transportation planning game, aimed at high school students but usable by any group, is based on allocating the proceeds from the (failed) regional sales tax initiative. Players have to satisfy the needs of one of five districts by selling their projects to the region.

“Everybody wins, or nobody wins.”

The Indian Nations (Tulsa) Council of Governments’ “Fast Forward” public-outreach program was a bus converted to a mobile meeting place for transit planning to go where the public is. It attracted media coverage and politicians.

Texas A&M Transportation Institute conducted focus groups on transportation funding issues, including fuel-tax basics and the alternative of mileage-based user fees (MBUF). “We didn’t need a focus group to know that the public hates MBUF.” We needed to make people understand the limitations of the current system before they could discuss MBUF. (A quarter of Texas fuel taxes go to education.) They showed people that they’re paying by the mile now, and showed the amounts per mile and per day. Most people assumed that fuel taxes have been rising and don’t know how little they pay. “Folks tune out the notion of how much they have to pay but love to see electric cars get charged for road use.”

San Francisco MTC Regional Parking Initiative had four videos on the financial implications of parking policies.

Minnesota DOT needs \$12 billion in additional revenue for capital improvements plus preservation, after dropping an extra \$30 billion. MnDOT uses online tools to solicit input from the public on its investment plan. A graph of buying-power needs versus revenues was the most powerful illustration. Layered information suits readers with differing knowledge. Alternatives were always fiscally constrained. “What are you willing to give up to get something else?” We teach them what they can’t get. Online tools deny you the ability to talk with people and hear ideas. See MnSHIP.

“How would you invest San Francisco County’s transportation dollars?” is an interactive gamification online budgeting tool (see <http://sfbudgetczar.com/>). People allocated dots among operations and maintenance, which consumed all of today’s \$64 billion in revenues to keep even. It showed what an additional \$6 billion in fees and taxes would buy you. People liked using it. San Francisco Bay Transportation Commission four-year plan update animated “How Would You Invest” video. People stopped screaming and watched the movie.

Continued on next page

ACTION ITEM: Communicating Finance Concepts with John Q. Public—Annual Contest Winners (continued)

ACTION STATUS

2013 Activity

Aarne Frobom will discuss this information with Polly Kent, Manager, Intermodal Policy Division, about applying some of these approaches to MDOT.

Follow-up: Material from this session has already been used by Polly Kent to help in devising an instructive game-style presentation to explain to the public the difficult choices inherent in budgeting for road preservation. This may be used by the Office of Communication to inform the public debate over road funding.

2013 Status

Open

TRAVEL DEMAND FORECASTING	ACTION ITEM: Data Warehousing and Management		
	OVERVIEW		
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: Committee ABJ30	TRB Attendee: Larry Whiteside Action Contact: Larry Whiteside, Karen Faussett	
	Description: The Urban Transportation Data and Information Systems Committee (ABJ30) discussed data warehousing of household survey data. There is a federal agency that could warehouse the data in secure data centers and allow others access without revealing private information.		
	ACTION STATUS		
	<p><u>2012 Activity</u> This information was passed on to modeling staff (Larry Whiteside) in Planning.</p> <p><u>2013 Activity</u> Information was passed on to MDOT’s travel demand modeling staff (Karen Faussett). Modeling staff has reviewed information about the National Renewable Energy Laboratory (NREL) and its Transportation Secure Data Center (TSDC) program. The transportation data that the NREL stores may be useful for MDOT staff as a future resource. MDOT’s travel survey data is accessible and available for use by contacting MDOT Modeling staff directly.</p> <p>More information about the NREL program is available at http://www.nrel.gov/vehiclesandfuels/secure_transportation_data.html. Contact Jeff Gonder (jeff.gonder@nrel.gov) at NREL regarding the TSDC, to apply for spatial data clearance, or for project information.</p>	2012 Status	Open
	2013 Status	Open	

TRAVEL DEMAND FORECASTING	ACTION ITEM: Travel Demand Forecasting			
	OVERVIEW			
	TRB Year: 2012 Lectern, Committee, Poster or Session Number: 714		TRB Attendee: Steve Bower Action Contact: Matt Smith	
	Description: N/A			
	ACTION STATUS			
	<u>2012 Activity</u> Matt Smith planned to review TRB presentations relating to this issue, especially presentation 12-3968. This paper can be reviewed at http://amonline.trb.org/1socg3/1 . <u>2013 Activity</u> MDOT currently has two initiatives under way that are related to this topic area: 1) Data Use Analysis and Processing (DUAP) and 2) an effort with the Center for Automotive Research involving the structuring and storing of data generated by intelligent transportation systems (ITS). One of the primary intents of both of these efforts is to determine how to store and use connected vehicle and ITS data for all uses (both ITS and non-ITS), which includes providing input into transportation planning models. MDOT also has been providing ITS data for use by transportation planning staff for modeling and planning purposes since 2006.		2012 Status	Open
			2013 Status	Open