

# RESEARCH UPDATE

OCTOBER 2016

## MDOT Research Receives National Recognition

To maintain a high-quality transportation system for Michigan’s traveling public, MDOT makes a sustained commitment to excellence in transportation research. That commitment includes both developing solutions to meet Michigan’s transportation needs and sharing the results nationally so that other states can learn from efforts in which MDOT has taken the lead.

MDOT won national recognition for its research in 2016, earning its third “Sweet Sixteen” award in five years from the American Association of State Highway

and Transportation Officials (AASHTO). AASHTO’s Research Advisory Committee members — state DOT research directors — annually cast their votes among more than a hundred submissions to honor 16 standout research projects.

This year’s award-winning project evaluated the safety impacts and cost-effectiveness of engineering improvements designed to reduce crashes among elderly drivers. Researchers compared crash data before and after MDOT began implementing changes in 2004.

By using a more readable Clearview font on guide signs and a more visible fluorescent yellow sheeting for warning signs, MDOT reduced crashes by 24 percent on freeways, 30 percent on urban non-freeways, and 33 percent on rural non-freeways.

The combined benefit-cost ratio for these measures ranged from \$1,090 to \$7,456 for every dollar spent. Arrow-per-lane signing also proved effective, reducing crashes among drivers 65 and older by 68 percent with \$1,440 in benefits for every dollar invested. Other cost-effective improvements included pedestrian countdown signals at intersections, which significantly reduced crashes involving pedestrians.

MDOT also received a Sweet Sixteen award in 2012 for a [related study](#) that developed strategies to keep older travelers safe and mobile, and in 2013 for a [project](#) that investigated best practices for improving the safety of bicycle and pedestrian facilities. As part of its ongoing



MDOT received a 2016 “Sweet Sixteen” award for establishing the benefits of measures taken to increase safety among elderly travelers. One improvement, adding countdowns to crosswalk signs, both improved the safety of elderly pedestrians and reduced the risk of intersection crashes for elderly drivers.

commitment to improving the safety and mobility of the Michigan public, MDOT will continue to pursue research efforts worthy of similar national recognition.

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### Find More Online

Final reports for the studies featured in this newsletter are available on the MDOT Research Administration website at [www.michigan.gov/mdotresearch](http://www.michigan.gov/mdotresearch).

## Profiles in National Engagement: Participating in National Transportation Efforts Brings Rewards to MDOT

MDOT remains highly engaged nationally in the latest developments in transportation research. Across the agency, 92 staff members serve on 144 committees and project panels of the National Cooperative Highway Research Program (NCHRP), the Transportation Research Board (TRB) and the American Association of State Highway and Transportation Officials (AASHTO). By participating in these groups, MDOT staff helps to determine the general direction of national research and to shepherd particular research projects through their life cycles—from scoping to implementable results.

The profiles that follow show how MDOT has benefited from its involvement in these research efforts as both a participant and a leader. By making themselves part of a larger, national network of professionals and expertise, MDOT staff members can remain up to date on the state of the practice nationally and help use this knowledge to benefit both Michigan and the nation.

### Bringing the Benefits of National Highway Safety Efforts to Michigan Local Agencies

Highway safety is an urgent focus nationwide. MDOT Local Agency Programs Engineer Tracie Leix has been involved in two incredibly important national research efforts in this area: *Toward Zero Deaths* (TZD), the national strategy on eliminating fatalities in U.S. highway crashes, and the *Highway Safety Manual* (HSM), a resource that provides transportation engineers with the tools for quantifying and evaluating road safety.

Currently members of NCHRP Project 17-64 are developing guidelines that will help states implement TZD. The guidelines will include self-assessment tools and recommendations for setting goals and targets. Phase II will focus on implementation, including peer exchanges to share knowledge with other states.

As chair of the project, Leix ensures that there is a focus on a broader safety



MDOT has been a champion in supporting TZD and the safety culture in Michigan.

perspective than engineering alone by encouraging engagement with other agencies, such as law enforcement. Her involvement also will give MDOT a chance to implement results earlier than it would have otherwise. “The potential for what I can bring back to Michigan is huge,” Leix says. “We expect to learn how other states are implementing TZD and working with local agencies and other partners in the safety realm.”

Leix was also a panel member for NCHRP Project 17-50, which provided technical assistance to several lead states implementing the *HSM*. These early adopters served as models for implementation in other states. “Participating in 17-50 let us tap into the knowledge of national leaders when it came to highway safety and aggressively apply what we learned in Michigan,” Leix says. “MDOT was one of the first states to utilize many of the tools available in the *HSM*.” MDOT in turn participated in several peer exchanges to share the results of its implementation with other states. It also worked with local agencies within Michigan to adapt *HSM* tools to their needs.

“In Michigan, our vision is to operate a roadway system free of fatalities,” Leix says. “MDOT’s leadership in helping other states implement TZD will help bring us closer to our own goal.”

### SHRP2: A Major National Research Effort with MDOT Leadership

The second Strategic Highway Research Program (SHRP2) is a national research effort tackling more than 100 research projects in areas important to both state and local agencies, such as aging infrastructure, congestion and safety.

State Transportation Director Kirk Steudle has been involved extensively in SHRP2. He currently serves on TRB’s Safety Data Oversight Committee (FAO14), which curates safety data from SHRP2’s Naturalistic Driving Study. This study analyzed the causes of highway crashes and congestion by monitoring the driving behavior of 3,100 drivers in six states using



SHRP2’s *Naturalistic Driving Study* equipped participants’ vehicles with data-collecting devices that monitor driver behavior. Researchers in Michigan and elsewhere are using the data from this study to develop strategies that will increase public safety dramatically.

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in-vehicle video cameras, radar and other state-of-the-art technologies.

“This was the largest data collection effort of naturalistic driving ever done,” Steudle says. “It will be used for the next decade by researchers in Michigan, whether in our Traffic and Safety department or by universities.”

Previously Steudle chaired all SHRP2 research, which covered a range of areas important to MDOT. His involvement helped MDOT prioritize its research interests and implement national research results. “One of the primary outcomes of MDOT’s participation in SHRP2 was our implementation of emergency responder training to better manage incidents along roadway,” he says. “We did extensive training across the state.”

Staying involved in national research efforts is vital to addressing transportation challenges efficiently, Steudle says. “We live in a large country with many different agencies trying to solve the same problems,” he says. “We get the best bang for our buck by taking the nation’s experts and having them collaborate on solutions for problems shared across states.”

### At the Forefront of Innovative Structures, But Still Learning

MDOT has been a pioneer in the use of carbon fiber reinforced polymer (CFRP) in bridge structures. This technology eliminates the corrosion that occurs in steel reinforcements, leading to lower bridge life-cycle and maintenance costs and to increased safety.

“We’re seen as a leader in this area,” says Matt Chynoweth, deputy Metro Region engineer. Chynoweth is also a panel member for NCHRP Project 12-97, which is developing a guide specification for prestressing and post-tensioning concrete bridge girders with CFRP. “Through our national involvement, we’ve both been able to help other states with implementation and we’ve continued to acquire the knowledge that will help us remain a leader.”

Chynoweth is part of a related **AASHTO Innovation Initiative** led by MDOT that is educating other states and developing proposals for increasing the use of CFRP nationwide. He is also on



As part of an AASHTO Innovation Initiative, MDOT replaced the Plum Creek Bridge in Detroit with a CFRP-prestressed structure, a measure expected to reduce maintenance dramatically.

Technical Committee T-6 (Fiber Reinforced Polymer Composites) of AASHTO’s Subcommittee on Bridges and Structures.

“It’s important to stay connected to national initiatives,” Chynoweth says. “I learn something new every day, and my relationships with other states have benefited MDOT.”

### Improving Mobility with Lessons Learned by Other States

MDOT Metro Region Director Tony Kratofil credits the national connections he has made for providing critical guidance in implementing an active traffic management (ATM) system on US-23. ATM helps improve traffic flow on highways using

lane-specific variable message signs and other strategies.

Kratofil is currently a member of the Standing Committee on Regional Transportation Systems Management and Operations (AHB10). Committee efforts aim to maximize transportation system performance in metropolitan areas by mitigating congestion, improving emergency response and recovery, and making other operational improvements. He also has served on several NCHRP project panels.

Because of Kratofil’s national engagement, the Federal Highway Administration and several states, including Minnesota, Washington, Florida and Virginia, shared their expertise with Michigan to help to deploy ATM. “In the few years they’ve been using active traffic management, MnDOT has learned a lot—not just about deployment strategies but [ATM] maintenance implications and how much infrastructure is actually required to use it effectively,” Kratofil says. “MDOT can leverage these lessons moving forward.”

MDOT also is learning from other states and metropolitan areas as it begins to implement Integrated Corridor Management, a set of strategies for directing travelers toward underutilized parts of the transportation system. Particularly important has been the experience of the City of San Diego Transportation Planning department, a leader in this area.

“It’s important to stay connected to the broader research community,” Kratofil says. “That allows us to stay aware of the state of the practice and bring it back to Michigan.”



Lessons learned from Minnesota’s use of ATM are informing MDOT’s efforts to install a similar system on US-23. That project, which is expected to be operational in 2018, will improve traffic flow and safety during peak-hour congestion.

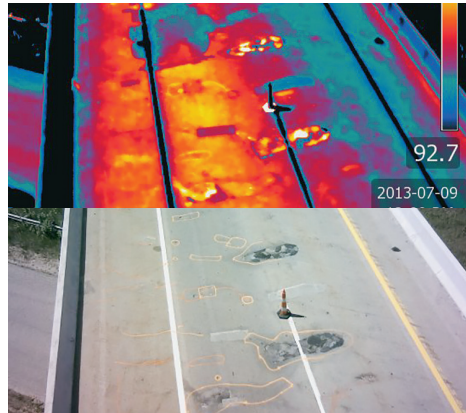
# Innovation Through Research Partnerships

MDOT's participation in multistate research through the national Transportation Pooled Fund (TPF) Program is a small part of the agency's research investment, but it yields significant results. By pooling funds with other states to solve high-priority shared problems, MDOT has improved operational efficiency, saved money on maintenance and replacement, and put customer safety and mobility first.

This year MDOT participated in about 20 pooled fund studies and has been the lead state on three. Almost all of the major research focus areas were represented by these projects, from bridges and structures to mobility and maintenance.

In one ongoing project, **TPF-5(247)**, MDOT is collaborating with other states to test the latest handheld thermographic inspection technologies for early detection of concrete delamination. These tools can detect temperature variations on the surface of the concrete resulting from delamination and display them as thermal images. Field testing during Phase I demonstrated successful applications of the thermographic technologies and led researchers to draft guidelines for the optimal use of these tools in detecting delamination. Phase II involved further field testing to validate the drafted guidelines, identify barriers to implementation and evaluate the reliability of thermographic inspection.

These technologies offer numerous cost and safety benefits. Inspectors can conduct real-time on-site assessments at a distance, which eliminates the need for bridge closures or traffic control. The handheld technologies



*Through thermal imaging (above) that can detect areas of bridge delamination (below), handheld thermographic tools allow for safer, more efficient bridge inspections than traditional methods. TPF-5(247) is providing the field testing, validation and guidelines that MDOT needs to effectively implement this technology.*

also require minimal training and allow inspectors to scan large areas of a bridge fairly rapidly, streamlining the process for prioritizing bridge maintenance and repair schedules.

MDOT has invested \$60,000 in TPF-5(247) through 2015, contributing to the total committed funds by all states of \$760,000. This project is only one example of how MDOT can leverage its investments in transportation research to produce implementable, real-world results for Michigan.

For more pooled fund success stories, see: [http://www.michigan.gov/documents/mdot/PooledFundSuccessStories\\_WEB\\_511630\\_7.pdf](http://www.michigan.gov/documents/mdot/PooledFundSuccessStories_WEB_511630_7.pdf)

## Fall Research Solicitations

This fall, MDOT Research Administration will accept research solicitations for the projects listed at right.

Further information will be available when the solicitations are posted on the MDOT requests for proposals website: [http://www.michigan.gov/mdot/0,1607,7-151-9625\\_32842---,00.html](http://www.michigan.gov/mdot/0,1607,7-151-9625_32842---,00.html).

1. Commercial Production of Nonproprietary Ultra-High Performance Concrete
2. Bridge Scour Technology Transfer
3. Best Practices for Modernizing MDOT Bridge Design Manual, Guides and Policy Documentation
4. Develop and Implement a Freeze-Thaw Model Based Seasonal Load Restriction Decision Support Tool
5. Slope Restoration on Urban Freeways
6. 3-D Highway Design Model Cost-Benefit Analysis

## Research Administration

### MISSION:

*Promoting innovative research for economic benefit and improved quality of life*

### VALUES:

*Quality, teamwork, customer orientation, integrity, pride*

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