



# ACCELERATOR

*Putting your ideas in motion*

## MnDOT Funding Awards Put Research into Practice

MnDOT's Transportation Research Innovation Group recently selected 15 research implementation projects for funding in Fiscal Year 2015. Descriptions of all projects are available on our Crossroads blog, [mntransportationresearch.org](http://mntransportationresearch.org).

Each winter, MnDOT solicits proposals from staff who want to put local or national research into practice in their day-to-day work.

"Certain departments have problems they've been working on for a long time, and they've spun their wheels or not had the staff resources to get something done," said MnDOT Research Services & Library project advisor Bruce Holdhusen, who helps employees develop their proposal plans.

MnDOT provides the funding needed for equipment, consultant services or researcher assistance. Supervisors also must agree to make time for employees to implement the practice.

"Implementation means it's changing the way some practitioner does his job," Holdhusen said. "It's not just trying something new; it's got to stick."

TRIG is the governing board for the MnDOT State Research Program. It awards funding twice a year, selecting primarily research-focused projects in December and implementation-related proposals in the spring.

Some of this year's implementation projects will:

- Install GPS units on MnDOT mowers to alert highway maintenance crews to areas of noxious weeds, a technology anticipated to cut herbicide use in half.



**One implementation project will complete testing and demonstration of portable traffic control devices (auto-flaggers) to increase their use by highway maintenance crews.**

- Purchase 3-D sonar equipment to inspect bridges underwater, which is currently performed by engineer-divers.
- Select an alternative, European-branded centerline rumble strip (sinusoidal) that produces less stray highway noise.
- Implement an innovative asphalt-quality test, developed by MnDOT's Office of Materials and Road Research, to assess the cold temperature-cracking properties of asphalt mixes proposed by contractors.
- Advertise state rest area amenities on highway notification signs. The pilot project will target 13 rest stops.

## Library Director Honored for ROI Work



MnDOT Library Director Sheila Hatchell recently received the Innovation Award from the Transportation Division of the Special Libraries Association for her groundbreaking research on library return on investment.

Hatchell's publication, "2013 MnDOT Library Valuation/Return on Investment (ROI) Study Findings," documents the tangible and intangible savings realized from MnDOT's library. The study is available at [mndot.gov/library/Library-ROI-Study.html](http://mndot.gov/library/Library-ROI-Study.html).

Read more at our Crossroads blog, [mntransportationresearch.org](http://mntransportationresearch.org).

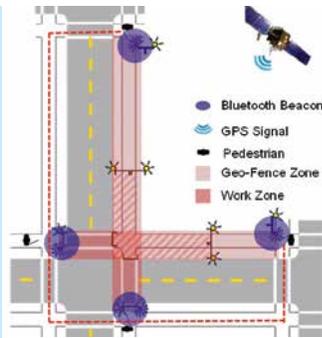
### New Smartphone App Helps the Visually Impaired Navigate Work Zones

**Traffic & Safety** — The Federal Highway Administration requires that pedestrian walkways through work zones have audible navigation information for visually impaired pedestrians. Information is typically provided by beeping devices that produce an audible message when a pedestrian presses a button. However, this strategy can be ineffective if the message requires the pedestrian to backtrack to find a safe path or if instructions are too lengthy to be easily remembered.

Researchers developed a smartphone app that automatically gives navigational information as the pedestrian approaches and travels through a work zone. Inexpensive, low-power Bluetooth beacons mounted on work zone infrastructure send messages to the app, which first alerts users by vibrating the phone before using a text-to-speech interface to provide a safe route through the work zone. Users can repeat the message as needed with a single tap of the screen. Interviews with visually impaired pedestrians provided information about effective work zone messaging, which has been incorporated into MnDOT's [temporary pedestrian audible message guidelines](#). The system was profiled in an [ABC news story](#); read more at [mntransportationresearch.org](#). [Technical Summary 2014-12](#)

*“We need to accommodate pedestrians of all abilities in our work zones. This system vibrates a smartphone to let visually impaired pedestrians know they are approaching a work zone and provides audible messages to tell them where they need to go.”*

—Ken Johnson, State Work Zone, Pavement Marking and Traffic Devices Engineer, MnDOT Office of Traffic, Safety and Technology



This sample work zone diagram shows where Bluetooth beacons (in purple) provide route-finding information.

### Reducing Collisions at Rural Intersections

**Traffic & Safety** — In the past 10 years, more than 40 percent of fatal intersection-related crashes occurred at through/stop intersections, where the only control device was a stop sign on the minor approach. Most of these crashes were caused by drivers on the minor approach trying to determine a safe gap in cross traffic. This problem is often worsened at rural intersections where vegetation or hills limit visibility. Researchers previously developed the Advanced LED Warning System for Rural Intersections (ALERT) system, which used wireless vehicle detection technology to trigger flashing LEDs on warning signs to indicate oncoming cross traffic ([Technical Summary 2011-04](#)). The project's current phase improved the system reliability with better batteries, increased safety by improving access to the system's electronics, and added flashing LEDs to stop signs to reduce the percentage of drivers who disregard the signs when there was no conflicting cross traffic. [A MnDOT Research Services & Library video](#) demonstrates ALERT in action. Our videos are listed at [mndot.gov/research/videos.html](#). [Technical Summary 2014-10](#)

## Transportation Research Syntheses

*These short-turnaround research projects provide summaries of research activity and/or practice among state DOTs. If you need answers, [request a TRS from MnDOT Research Services & Library today](#).*



### Why are Joma Blades Wearing Prematurely?

**Maintenance Operations & Security** — Joma snowplow blades, which consist of carbide inserts brazed into steel segments that are encased in rubber, are widely used in Minnesota because they typically have longer life spans than other types of plow blades, better snow-removal performance and other benefits. Recently, MnDOT has noticed that newer Joma blades wear prematurely compared to Joma blades purchased a few years ago. To investigate possible causes for this trend, MnDOT conducted a literature review and surveyed winter maintenance professionals in Minnesota and nationwide. Respondents reported that improper blade installation, drier-than-typical snowfalls, poor blade quality, newly constructed concrete road surfaces and the use of Joma blades on underbodies all contribute to premature wear. [Transportation Research Synthesis 1403](#)

### Pavement Design in Design-Build Projects

**Materials & Construction** — Design-build practices can lead to faster and less expensive highway construction and encourage innovation by giving contractors responsibility for some elements of a project's design. MnDOT has been using design-build since 1996 and plans to continue its use in the coming year. The agency commissioned this TRS to identify other state practices for extending, in design-build projects, the elements of pavement design for which bidders would be responsible, including the thickness and material of the subbase and base, drainage treatments, and pavement type and mix. [Transportation Research Synthesis 1402](#)

## Other Research Highlights

### New Software Sharpens Analysis of Twin Cities Area Congestion

**Traffic & Safety** — Newly developed software has drastically reduced the amount of time and effort required by MnDOT's **Regional Transportation Management Center** to analyze congestion in the Twin Cities metropolitan area. Developing MnDOT's annual **Metropolitan Freeway System Congestion Report** used to be a manual process that could be applied to only a portion of the large quantity of data generated by in-pavement sensors. The new Highway Automated Reporting Tool now automatically imports and cleans data to produce a report about the percentage of network miles congested during peak periods as well as three new reports on other performance measures. The tool will help MnDOT engineers and planners better develop congestion reduction strategies and determine the most cost-effective investments in the network.

[Technical Summary 2014-05](#)



*“Before HART, it took months to analyze freeway performance using traffic data from only the month of October. Now engineers can quickly analyze data from any time period, significantly improving traffic planning.”*

—Jesse Larson, Assistant Freeway Operations Engineer,  
MnDOT Metro District Regional Transportation Management Center

### Acoustic Monitoring System Gives Advance Warning of Bridge Distress

**Bridges & Structures** — While not inherently unsafe, MnDOT's fracture-critical bridges—those having critical, nonredundant components—require regular inspection. To help track the health of these bridges, MnDOT has developed a bridge health monitoring system that gives advance warning of potential failure by detecting early signs of structural distress. The system detects acoustic emissions—stress waves caused when cracks form and propagate in the steel components of a bridge. Researchers deployed and tested the system on the Cedar Avenue Bridge in Burnsville, Minnesota, enabling

them to develop procedures for automatically collecting and processing data. The test deployment also led to guidelines for monitoring other fracture-critical bridges. The system will help MnDOT prevent bridge failure and keep the traveling public safe.

[Technical Summary 2014-15](#)



### Ground Scrap Shingles Firm Up Gravel Roads, Reduce Dust

**Materials & Construction** — Most of the 200,000 tons of waste roofing shingles generated in Minnesota each year are landfilled. These waste shingles contain high-quality fine aggregate, however, which prompted MnDOT to investigate their use in gravel road surfacing. Results from two test sections suggest that ground waste shingles can be used as a binder in gravel roads to make them smoother and reduce the amount of dust roads generate. In Jackson County, Minnesota, a section of gravel road that had previously experienced severe wash boarding performed much better and required less re-shaping or blading after construction with a mix of 40 percent shingles and 60 percent Class 5 natural gravel by volume. A 40 percent shingle and 60 percent Class 6 limestone section built in Goodhue County produced 34 percent less dust than a control section after 298 days.

[Technical Summary 2014-06](#)



**Carried on a trailer, a falling weight deflectometer measures pavement response to loads.**

### Improved Tool Enhances Evaluation of Pavement Structural Capacity

**Materials & Construction** — MnDOT has made several improvements to its FWD Viewer Tool, a spreadsheet with various methods for analyzing falling weight deflectometer data to determine a pavement's maximum allowable axle load. The updated tool integrates TONN2010, a recent improvement in the accuracy of MnDOT's TONN FWD analysis method. It also displays multiple data sets at one time and includes a new module for predicting the load ratings of pavements after a structural overlay is added. Researchers developed training materials for the tool and delivered trainings to engineers throughout Minnesota. The updated tool will help MnDOT and local agencies make more cost-effective use of their resources to design safer and stronger roads. [Technical Summary 2014RIC14](#) and [Technical Summary 2014RIC16](#)



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## Calendar

- 5/7–9 Minnesota Public Works Association Spring Conference
- 5/15 Minnesota Roadway Maintenance Training and Demo Day
- 5/21–22 CTS Transportation Research Conference
- 5/30 New FY16 research project ideas due
- 6/18–19 LRRB and Research Implementation Committee meetings
- 6/24–27 2014 World Symposium on Transport and Land Use Research
- 7/20–24 National LTAP Conference
- 7/28–30 Mid America Association of State Transportation Officials Annual Meeting

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