



ACCELERATOR

Putting your ideas in motion

MnROAD Celebrates 20th Anniversary, Prepares for Next Research Phase



MnROAD's facility includes a test section of I-94 carrying live traffic, a low-volume roadway that simulates rural road conditions, and thousands of sensors that record load response and environmental data.

Researchers from around the world rely on Minnesota's pavement testing center, MnROAD.

This year, the one-of-a-kind research facility celebrates 20 years of finding ways to make roads last longer, perform better and cost less. No other cold-weather facility offers such an array of pavement types with thousands of electronic sensors recording both environmental changes and dynamic truck testing.

Established in 1994, MnROAD partners with the Federal Highway Administration, industry and dozens of other states and countries to conduct research on two live test tracks in rural Albertville, Minnesota.

"If not for MnROAD, many of our projects wouldn't be nearly as successful," said Larry Wisner, FHWA highway research engineer.

Minnesota saves an estimated \$33 million each year, thanks to MnROAD's initial research on pavement life and performance (from 1994 to 2006), which reduced maintenance costs, repairs and motorist delay. The annual nationwide savings is thought to be even larger: \$749 million.

In the second phase of research, MnROAD reconstructed almost 40 test cells for more than 20 different studies.

Peer Exchange Reviews Pooled Research



Pavement researchers from around North America gathered June 10-12 for a MnDOT-hosted research peer exchange. They shared how they have implemented the findings of MnROAD's Phase II pooled fund studies and developed ideas for the next phase of research, which begins in 2016.

"We're excited for the third phase of research, which will be mainly focused on maintenance and rehabilitation," said Ben Worel, MnROAD operations engineer. "We've seen the benefits of our past research and expect the same in the future."

MnROAD is hosting an open house on Aug. 6. Visitors are invited to stop by from 10 a.m. to 2 p.m. to tour the site and talk with researchers.

Thanks to MnROAD

Annual MnDOT savings: \$33 million
Annual national savings: \$749 million

Research Highlights



In Beltrami County, researchers facilitated focus groups and round-table dialogue regarding competing alternatives for revitalizing the county's road system. *Photo by Guillermo Narvaez*

“The biggest benefit for local agencies will be improving local engineers’ ability to engage the public through the communications tool the researchers developed, the focused consultations they did and the training they provided.”

—Bruce Hasbargen, Beltrami County Engineer

Getting the Public Involved in Local Transportation Decisions

Policy & Planning — The general public and elected officials often don't understand the issues faced by local road systems. Many roads and bridges are very old and desperately in need of repair or replacement. More and more drivers are using a system built for far fewer vehicles. And the gap between revenues and needed expenditures continues to grow. To assist county engineers in improving communication of these realities, researchers looked at outreach strategies currently used in three Minnesota counties: Beltrami, Dakota and Jackson. The research team talked with county road managers to identify key issues and concerns, and surveyed 91 residents who had participated in the public engagement efforts.

This project revealed widespread confusion about local road system issues. For example, many participants erroneously believed that the gas tax covers (or was enacted to cover) the cost of maintaining local roads. Researchers produced a set of recommendations and tools for county engineers to use in designing effective public engagement processes that overcome confusion and lack of information. A newly approved follow-up project will test the tools in three or four other Minnesota counties and cities. [Technical Summary 2014-17](#)

Understanding Moisture Effects on Subgrade Testing

Materials & Construction — During roadway construction, pavement engineers test the subgrade layers of roads—consisting of gravel, sand and other materials—to make sure they will adequately support the pavement layer. However, results of these field tests vary depending on the amount of moisture in the subgrade materials as well as on the size distribution of the sand and gravel particles. MnDOT needed to better understand these effects to determine target values for the tests that will assure strong road foundations.

Researchers developed a three-dimensional computer model simulating how individual subgrade particles behave during field tests and how this behavior is affected by moisture. The model will help engineers more accurately interpret test results, leading to smoother roads that last longer and require fewer costly repairs. [Technical Summary 2014-13](#)

Can Variable Speed Limits Reduce Crashes in the I-94 Commons?

Traffic & Safety — The 1.4 miles of I-94 westbound between 11th Avenue and Lowry Hill Tunnel in Minneapolis experience the highest crash rate in the state: roughly one crash every other day. To address this issue, researchers tested the use of variable speed limit signs advising drivers to slow down before reaching congested areas. The signs were automated, displaying reduced speed limits upstream when congestion worsens downstream.

This system yielded little change in driver behavior during 2012-2013 testing; drivers didn't understand what the advisory speed signs meant, and the I-94 commons area presents challenges that the system was not designed to handle. However, researchers are not giving up. A new project is starting this year to develop a queue warning system designed for this location. Read more about it at mntransportationresearch.org. [Technical Summary 2014-19](#)

Driving Bridge Piles Just Far Enough

Bridges & Structures — Most of Minnesota's highway bridges are supported by driven piles made of steel, timber or concrete. Piles that aren't driven deeply enough won't support the bridge properly, but driving them in further than needed wastes resources and adds unnecessary cost. The FHWA requires use of Load and Resistance Factor Design methods to calculate required pile depth, and MnDOT needed to optimize the LRFD method for Minnesota practices and conditions.

Research compared a new driving formula for steel piles, MPF12, to other formulas that use the results of field tests (pictured below) in which static loads are applied to the piles. MnDOT began using this new formula in 2013 for all bridge projects, and the results have been good: MPF12 is now contributing to improved accuracy, safety and efficiency of driven pile foundations, reducing both material costs and construction time. [Technical Summary 2014-16](#)



Research Highlights

Designing and Draining Temporary Stormwater Ponds on Highway Construction Sites

Environmental—Stormwater flowing over a construction site collects sediments that can seriously damage nearby waterways. The U.S. Environmental Protection Agency consequently requires creation of temporary ponds to hold the polluted stormwater. Researchers prepared guidelines for pond design and maintenance and created computer models to estimate the impact of various commercially available floating head skimmers on water quality. Skimmers prevent pond overflow by draining clean water from the top of the pond while allowing sediments to settle to the bottom. This technology is estimated to remove approximately 80 percent of total suspended solids from stormwater runoff, but a real-world implementation of this approach is needed to confirm this effectiveness and design guidelines. [Technical Summary 2014-18](#)

New Use of GPS Data to Identify Truck Bottlenecks

Multimodal — Freight is essential to our economy, and highways are a critical component of freight movement. Knowing where commercial trucks encounter bottlenecks can point to the need for transportation investments. Researchers integrated commercial data on heavy truck movement in 38 Twin Cities freight corridors into MnDOT's current databases. This enabled them to identify bottlenecks and peak traffic periods and to quantify performance measures like the total hours of truck delay per day, truck travel time reliability, heavy commercial annual average daily traffic volume, truck mobility and corridor target speeds. This information will ultimately aid in the development of a statewide freight system plan. [Technical Summary 2014-14](#)

Access Technical Summaries and research reports at mndot.gov/research/reports-2014.html.

Recent Videos

Why Aren't They Working on My Road?

The Local Road Research Board produced this presentation of factors considered when deciding which roads get worked on when. The presentation also addresses how weather and traffic cause road damage, what can be done to extend a pavement's life and how maintenance and repair activities are prioritized.



Rumble Strips: Noise Difference from Traditional vs. Sinusoidal Designs: A comparison between a traditional rumble strip vs. a new sinusoidal type.

DCT (Disk-Shaped Compact Tension) Test Sample Preparation: A test that measures the fracture energy of asphalt-aggregate mixtures to predict how well a pavement built with a given mix design will stand up to low-temperature cracking.

Minnesota—Where Every Step Counts: A research effort to develop automated counting methods for nonmotorized traffic and how it is being implemented throughout Minnesota. See also [Technical Summary 2013-24](#).

Find all of Research Services & Library's videos at mndot.gov/research/videos.html.

Transportation Research Syntheses

Transportation Research Syntheses are short-turnaround research projects that summarize research activity and practices among state departments of transportation. To view any of these documents or request a TRS from MnDOT Research Services & Library to answer your questions about a transportation topic, visit mndot.gov/research/transportation-research-syntheses.html.



When is a Turn Lane Warranted on a Local Road?

Traffic & Safety — Minnesota city and county engineers perceived a lack of guidance on when to install right- or left-turn lanes on local roads. This literature review was conducted to gather turn lane guidance being used by various agencies. Researchers reviewed 17 documents, focusing on areas of interest such as corridor design, the extent to which lanes are warranted by new develop-

ment, bicycle and pedestrian considerations, access management, operations and maintenance, and safety. [Transportation Research Synthesis 1406](#)

Other recent TRSs include:

[TRS1404 Transportation Agency Practices Currently Employed for Bridge Maintenance Painting Operations: Findings from a National Survey](#)

[TRS1407 Gravel Road Management Tools](#)

[TRS1408 Software Programs and Processes for Tracking Capital Program Funds](#)

[TRS1410 State of Practice for Defining, Demonstrating and Documenting Transportation Efficiencies](#)



RESEARCH SERVICES & LIBRARY

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Calendar

- 7/20–24 National LTAP Conference
- 7/28–30 Mid America Association of State Transportation Officials Annual Meeting
- 8/21–22 Mid-Continent Transportation Research Symposium
- 8/24–27 National Rural Intelligent Transportation Systems Conference
- 9/7–11 2014 Intelligent Transportation Systems World Congress
- 9/10–12 Minnesota Surveyors and Engineers Society Fall Conference
- 9/21–24 Rail~volution 2014
- 9/29–10/1 European Transport Conference

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