



## RESEARCH SERVICES

OFFICE OF POLICY ANALYSIS,  
RESEARCH & INNOVATION

## TECHNICAL SUMMARY

### Technical Liaison:

Mitch Bartelt, MnDOT  
Mitch.Bartelt@state.mn.us

### Project Coordinator:

Alan Rindels, MnDOT  
Alan.Rindels@state.mn.us

### Principal Investigator:

Neal Hawkins, Iowa State University

### PROJECT COST:

\$39,991



Studies have shown that pavement markings on rough surfaces exhibit less retroreflectivity than other markings.

# Improving Pavement Marking Performance on Challenging Pavement Surfaces

## What Was the Need?

High-quality pavement markings at the center and edges of roadways are critical to public safety, helping to prevent accidents by delineating traffic lanes more clearly and providing information to drivers about lane changing and passing.

However, these markings do not perform well on roadways with rougher surfaces such as those with seal coat and micro-surface treatments, which are used to extend the service lives of pavements by covering an existing surface with asphalt emulsion and aggregate. It is hard to apply markings at the right thickness to these “challenging surfaces,” and they tend initially to lose pieces of aggregate and attached markings to traffic, especially from the abrasion of snowplows. The service life of such a pavement marking can be up to 50 percent shorter than a comparable marking on a smooth surface, and its retroreflectivity—how well it reflects vehicle headlights—will be lower and degrade more quickly.

MnDOT’s current pavement marking policies were developed for smooth pavements and do not apply well to challenging surfaces. Initial markings after a seal coat, for example, may need to be quickly replaced, in which case it may be advisable to use less expensive latex paint rather than the epoxy material called for by current policies. Local Minnesota agencies are currently using ad hoc strategies for addressing the rapid degradation of these markings, and research was needed to establish better guidance.

## What Was Our Goal?

The objective of this project was to develop recommendations for improving the application of pavement markings on challenging surfaces by documenting the practices of MnDOT districts and other state departments of transportation.

## What Did We Do?

Researchers began by conducting a literature review of published and unpublished sources along with a survey of other state DOTs concerning their pavement marking practices on challenging surfaces. Then they reviewed MnDOT technical guidance on this issue, surveyed agencies by email and phone about their experiences installing and maintaining markings, and performed a field visit in 2010 to observe the placement of pavement markings along I-94 in MnDOT District 3B. The field visit also included a review of existing pavement markings on other challenging surfaces within the district, including Highways 25, 47 and 71. At each site visited, researchers photographed surfaces and took retroreflectivity readings.

Researchers used this data to identify key problems and potential solutions, and outlined a future field trial to evaluate marking performance and installation practices for different combinations of pavement marking materials on various challenging surfaces.

*Improving the performance and durability of pavement markings on seal coat and micro-surfaced roadways will reduce construction and maintenance costs for Minnesota agencies and increase traveler safety by improving marking visibility.*

*“This project will allow MnDOT to improve its pavement marking policy to better serve its districts by providing more thorough guidance with respect to challenging surfaces.”*

—Mitch Bartelt,  
Pavement Marking  
Engineer, MnDOT Office  
of Traffic, Safety &  
Technology

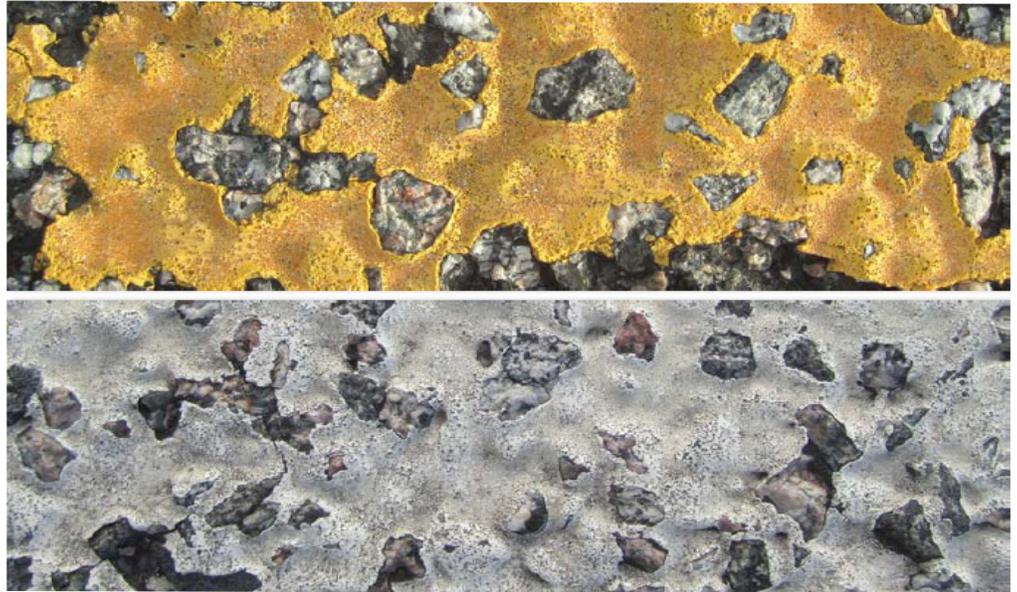
*“Field trials will help us provide control in the evaluation of these markings on both seal coat and micro-surface roadways.”*

—Neal Hawkins,  
Director, Iowa State  
University Center for  
Transportation Research  
and Education

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**Produced by CTC & Associates for:**

Minnesota Department  
of Transportation Research Services  
MS 330, First Floor  
395 John Ireland Blvd.  
St. Paul, MN 55155-1899  
(651) 366-3780  
[www.research.dot.state.mn.us](http://www.research.dot.state.mn.us)



Seal coat and micro-surface treatments experience a certain amount of rock loss after application, which also removes pavement marking material. And because the surfaces are coarse, it is difficult to apply markings at the right thickness.

### What Did We Learn?

The literature search showed that pavement markings on challenging surfaces have an overall reduced service life of up to one year, worse uniformity and retroreflectivity, faster degradation of retroreflectivity and higher differences in directional retroreflectivity of yellow centerline markings. They require greater marking thickness, and marking performance is sensitive to both material thickness and aggregate size.

Phone interviews with Midwestern DOTs and field visits to MnDOT districts allowed researchers to document their maintenance treatment and pavement marking practices, and confirmed the problematic nature of using pavement markings on challenging surfaces.

MnDOT district email and phone surveys showed that districts are experimenting with a variety of marking materials, with little success in the first year. There is a desire to standardize methods and materials. Current strategies typically involve:

- Just after maintenance, using latex paint to stripe the centerline (for seal coating) or all lines (for micro surfacing).
- After two weeks, using all-weather paint to stripe all lines.
- After one to two years, using epoxy to restripe all lines.

### What's Next?

Researchers recommend that MnDOT improve its guidance for pavement markings on challenging materials with a pavement marking strategy that matches the roadway life cycle. To do so, in 2012 they will conduct a comprehensive field evaluation of different pavement marking materials and installation practices on challenging surfaces. The trial will be conducted for up to three years on 500-foot test segments on four-lane divided and two-lane roadways with both micro-surface and seal coat treatments as well as both yellow and white pavement markings. Materials being considered for testing include latex, high build, VisiLock, thermo (sprayed and extruded), epoxy, MMA and polyurea. Researchers will consider the benefits of placing a primer coating before striping as well as different glass bead delivery systems for improving retroreflectivity and directionality. In each case they will measure both retroreflectivity and failure mechanisms such as loss of bond between paint and surface or loss of rock.

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*This Technical Summary pertains to Report 2011-24, “Pavement Marking Compatibility with Chip Seal and Micro Surfacing,” published October 2011. The full report can be accessed at <http://www.lrrb.org/PDF/201124.pdf>.*