

# ACCELERATOR

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## AFTER STUDY FINDINGS CONFIRM 'A LINE' ABRT A SUCCESS



The study also provided recommendations for future ABRT line design considerations.

“Researchers confirmed the findings of our original study conducted before we introduced the service,” explained Carl Jensen, MnDOT Traffic Advantages Engineer. “The arterial BRT stopping in a lane of traffic does not adversely affect traffic flows or signal operations.”

In addition to video analysis of traffic at key intersections, researchers surveyed riders, residents and business owners along the A Line service

area and others. “The arterial BRT has a more favorable perception than local bus service,” Jensen said. “Stations are cleaner, more attractive, riding is easy, and payment options are convenient.”

More information about this study is available at [bit.ly/Alinestudy](http://bit.ly/Alinestudy).

**TECHNICAL SUMMARY 2018-35**

In 2016, the A Line began service on Snelling Avenue, introducing Minneapolis-St. Paul to arterial bus rapid transit (ABRT). The A Line gained popularity almost immediately, offering transit customers a quicker, more reliable bus service that complements light rail and commuter rail service.

Unlike bus rapid transit (BRT), which requires a dedicated lane in a roadway corridor, ABRT operates within existing traffic lanes. Both forms of rapid transit use off-board payment at kiosks or online.

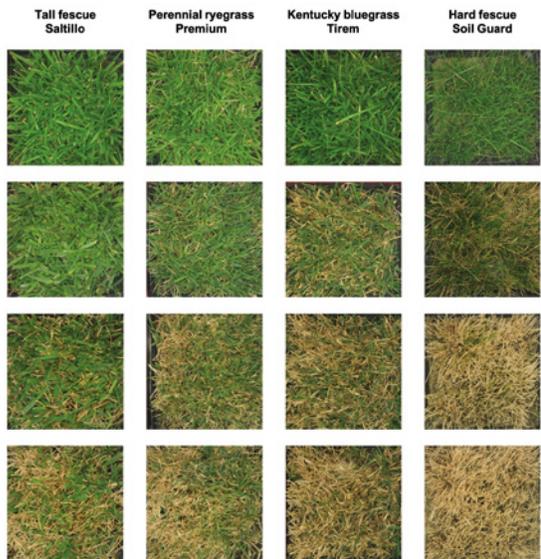
Recent MnDOT-sponsored research evaluated the A Line’s impact on traffic and riders’ perceptions of the service.

## 7 research implementation projects funded

The state transportation research program’s governing board has funded seven research implementation projects that will advance new technologies or knowledge at MnDOT in the coming year. Included is seed money for a mobile work zone barrier, user testing of an all-in-one slurry system for snow and ice removal, and an e-ticketing pilot for asphalt truck material weight.

A complete list of funded projects is available at [mndot.gov/research/implementation.html](http://mndot.gov/research/implementation.html).

# Research Points to Turfgrass Blends Suitable for Minnesota



Researchers measured green cover with digital imagery to evaluate the response of grass species to deicing salt, heat and ice stress. Results are shown over a 12-week period.

**ENVIRONMENTAL** – Vegetation alongside highways keeps sightlines clear for drivers, reduces erosion, and prevents road and vehicle contaminants from reaching waterways. But turfgrasses are subjected to environmental stressors, including heat, ice and deicing salt.

A study of Minnesota turfgrasses showed that tall fescue and perennial ryegrass tolerated salt, and certain bluegrasses and fescues performed adequately under heat stress. But researchers could not identify an ice-resistant cultivar. Investigators established a mixture of six species that could potentially manage these stresses. As part of a second phase of this research, which began last year, mixtures have been planted in different combinations alongside highways for further study.

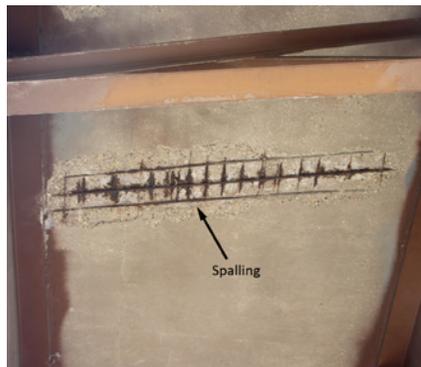
**TECHNICAL SUMMARY 2019-01**



## Research Ideas Due May 3

MnDOT is soliciting new research ideas for CY2020 funding, with co-funding consideration by the Minnesota Local Road Research Board. Submit your idea by May 3 at [mndot-lrrb.ideascale.com](http://mndot-lrrb.ideascale.com) to be considered.

# Performance Data Shows Less Damage With Epoxy-Coated Rebar Bridge Decks



Damage on the underside of bridge decks is less likely with epoxy-coated rebar.

**BRIDGES & STRUCTURES** – From 1973 to 1990, MnDOT built more than 600 bridges using epoxy-coated rebar in at least the upper layer of reinforcing matting in bridge decks. The bottom

layer contained standard black rebar, although in recent decades MnDOT has been using epoxy-coated matting in both layers. The coated rebar was expected to reduce steel corrosion and concrete damage.

To learn how epoxy-coated rebar has performed in bridge decks, researchers studied bridge inspection data from 528 bridges, 57 of which used epoxy-coated bars in both layers. Next, they conducted site evaluations at 111 of these bridges to confirm inspection reports.

Results were clear: Concrete decks with all epoxy-coated rebar matting showed less damage above deck and below.

**TECHNICAL SUMMARY 2019-09**

“These findings may help us shift some priorities for repairing or replacing mixed rebar bridges.”

—Nick Haltvick, North Region Bridge Construction Engineer, MnDOT Bridge Office

# Chemical Adhesives Safely Anchor Epoxy-Coated Rebar in Hardened Concrete

**BRIDGES & STRUCTURES** – Bridge repairs often require replacing concrete slabs on deck barriers, crash barriers around piers and other non-hanging concrete applications. In these repairs, crews install new reinforcement bars in hardened concrete, using adhesives to hold the bars in place and allow load transfer between concrete slabs.

Adhesive manufacturers specify the expected strength of regular steel rebar in these installations, but not for corrosion-resistant epoxy-coated rebar. MnDOT suspended the use of epoxy-coated rebar in post-installed applications until adhesives could be evaluated.

In a recent study, researchers determined that epoxy-coated rebar is almost as secure as uncoated rebar and is safe for use. The findings from this



Laboratory pullout tests showed that epoxy-coated rebar sets nearly as well with adhesives as uncoated steel.

research are helping the MnDOT Bridge Office determine what steps must be taken to resume using epoxy-coated rebar in these applications.

**TECHNICAL SUMMARY 2019-07**

# Modeling Tool Optimizes Truck Station Siting

**MAINTENANCE OPERATIONS** – MnDOT operates 137 truck stations, 18 head-quarter sites for maintenance operations and over 50 areas for materials delivery. The effective life span of a truck station is about 50 years. In the next 20 years, 80 of MnDOT's truck stations will need to be replaced. MnDOT has considered optimizing truck station locations, possibly reducing the size of some, increasing others or combining facilities.

A geographic information system-based computer model and data from multiple sources allowed researchers to determine the most effective locations for future truck stations statewide, which could potentially save time, effort and millions of dollars.

**TECHNICAL SUMMARY 2019-10**

# Inductive Loops Could Improve Safety, Save Time and Money



A camera and an inductive loop data box at a test site.

**POLICY & PLANNING** – Leveraging existing equipment for new uses is a win for MnDOT and for taxpayers. Inductive loops below the pavement surface register electronic signatures from vehicles as they pass. Traffic operations centers use the information to manage congestion.

Researchers explored a method of using inductive loops to survey traffic for management, planning and federal funding purposes. Typically, traffic surveys count and categorize vehicles once every two years at 1,200 sites around the state by stretching rubber pneumatic tubes across roadways for 48 hours.

Swapping circuit cards in inductive loop data collectors allowed researchers to identify the electronic signature of every individual passing vehicle, categorize its vehicle type and calculate its speed. If refined, the system could provide continuous information and eliminate the need, cost and safety challenge of biannual traffic counts.

**TECHNICAL SUMMARY 2018-31**

# Drivers Respond When Rest Areas Advertise Amenities



Rest area signs listing amenities, like this sign on I-94 near the St. Croix River, encourage drivers to stop and take a break.

**TRAFFIC & SAFETY** – In the summer of 2015, MnDOT tried a new strategy for reducing roadway accidents: encouraging more drivers to take a break by posting signs that advertised rest area amenities, such as play areas, security cameras and shelters, in advance of highway rest areas.

To gauge the effectiveness of the rest area amenity signs, surveys were posted at 21 rest areas that were included in the

pilot study along Interstate 35 (I-35), I-94 and State Highway 371. More than 900 visitors accessed the survey using a QR code. Of these respondents, 33 percent saw the signs, and 29 percent were not sure if they saw the signs. Of these two groups, 27 percent indicated the signs impacted their decision to stop.

**IMPLEMENTATION SUMMARY 2019-15**

# Testing the Crack Resistance of Asphalt Mixes

**MATERIALS & CONSTRUCTION** – MnDOT and the National Center for Asphalt Technology lead a five-state pooled fund study on performance testing asphalt for cracking potential. This group installed eight pavement sections at the MnROAD pavement test facility in 2016 to evaluate low-temperature, top-down and fatigue cracking in mixtures and pavements.

Researchers conducted additional tests on duplicates of the eight MnROAD mixtures. The three mix tests and one asphalt binder test proved viable for materials selection, quality control and forensic examinations of asphalt. Tests are at least as easy to run as existing alternatives, and the novel binder test is also simple to conduct. MnDOT is sharing results with its pooled fund partners as it works to improve asphalt testing procedures.

**TECHNICAL SUMMARY 2019-03**



MnDOT examined new methods like this semi-circular bend test to evaluate asphalt pavement performance.



OFFICE OF RESEARCH & INNOVATION

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## Calendar

- 4/23 MnDOT Environmental Stewardship Conference
- 5/1 NCHRP panel nominations due
- 5/3 MnDOT research ideas due
- 5/8-10 APWA Minnesota Chapter 2019 Spring Conference
- 5/16 Minnesota Roadway Maintenance Training and Demo Day
- 5/21 TRIG Summer Meeting
- 5/22-23 2019 National Road Research Alliance Pavement Workshop
- 6/19-20 LRRB/RIC summer meeting

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