

ACCELERATOR

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Putting your ideas in motion

MnDOT, LRRB SELECT NEW RESEARCH PROJECTS FOR FUNDING



LED display to indicate lateral position error (1-ft resolution)

MnDOT plow truck operators will test a lane boundary guidance system for whiteout conditions, which was awarded funding for further development. The system was made possible by a past research effort that mapped roadway edge lines using a vehicle-mounted lidar scanner. Watch a demonstration of the lane boundary system at youtube.com/mndotresearch.

In a continuing effort to support the most effective and efficient use of Minnesota's transportation assets, MnDOT's Transportation Research and Innovation Group (TRIG) and the Local Road Research Board (LRRB) have selected new university research projects for funding in Fiscal Year 2020.

The research includes 14 projects funded by MnDOT, nine by LRRB and three co-funded by both. (For a list of all the funded proposals, which were primarily in response to need statements from local and state transportation practitioners, visit mndot.gov/research/awards.html.)

Some of the funded projects continue current research, such as geotextile and geogrid usage in roadway construction,

anchor bolt tightening procedures for support structures and counting of nonmotorized travel in rural tribal communities.

New initiatives include:

- Deterring imperiled bats from roosting under Minnesota bridges during maintenance or construction activity
- Harnessing the sun's energy through noise barriers and structural snow fences
- Evaluating environmental effects of potassium acetate as a road salt alternative
- Maximizing maintenance of wet ponds for phosphorus retention
- Evaluating deicing treatments for difficult roadway areas

- Developing public education tools for the design of nontraditional traffic treatments, particularly RCUTs and J-turns
- Analyzing the influence of transitways on traffic patterns of parallel and adjacent roads
- Reusing natural waste in sustainably designed soils
- Evaluating curing effects on cold in-place recycled asphalt
- Developing Minnesota-specific Superpave 5 asphalt mix designs to improve pavement life
- Analyzing proprietary base stabilizers for more accurate pavement design
- Investigating alternative methodology for adaptive signal timing control
- Analyzing different pavement marking specifications on driver behavior
- Rightsizing bridge repairs by developing guidance tables for assessing rebar section loss



**MnDOT
Research
Implementation
Ideas Due
Feb. 8**

MnDOT is looking for innovative pilot and demonstration projects to fund for its next research implementation funding cycle. MnDOT staff should submit a brief summary of their idea by Feb. 8 at mndot-lrrb.ideascale.com.

New Model Quantifies the Benefits of Geogrid for Pavement Designers

MATERIALS & CONSTRUCTION – Geogrid has been used to stiffen and stabilize aggregate bases in soft subgrades like the peaty soils in northern Minnesota. The polymer webbing holds gravel in place and creates stronger, more resilient roadway foundations. Despite evidence that geogrid works well, how it affects road design isn't known precisely—or wasn't, until John Siekmeier in the Office of Materials and Road Research upgraded MnDOT's pavement design software.

"We were asked to quantify the benefit of geogrid," Siekmeier explained. So he created a new model to use with MnPAVE Flexible, Minnesota's pavement design software that predicts base performance based on geogrid shapes and dimensions and on aggregate thickness, properties and moisture content.

Geogrid-enhanced bases offer 1.5 to 2.5 times the resiliency of no-geogrid aggregate bases, according to models. While keeping aggregate layers thick for strength and good drainage remains a priority, Siekmeier noted that it's useful to understand how much geogrid helps. "It's important to know that we are getting extra years of life with geogrid-reinforced aggregate base," he said.

Siekmeier is finishing a new geogrid design input for MnPAVE Flexible that helps users determine how much service life is gained with geogrid or how thick an all-aggregate base would need to be to perform as well as a thinner base that includes geogrid.

TECHNICAL SUMMARY 2018-30



Geogrid is placed over an aggregate base layer and then covered with more aggregate to improve base stiffness and resiliency.



One operator can investigate soil conditions with a sophisticated testing vehicle even in difficult conditions.

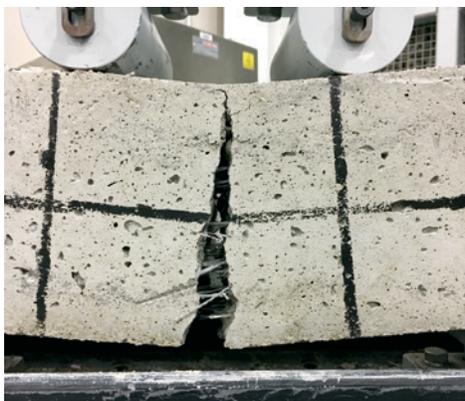
New Guide Uses Cone Penetration Testing in Geotechnical Design

MATERIALS & CONSTRUCTION – Designing foundations for bridges and pavements requires understanding the soil conditions and properties at the site. One of the best methods for calculating site conditions is the cone penetration test (CPT), in which a rod with a cone-shaped tip outfitted with sensors is driven into the soil. Engineers attach more rods to the first as the device is gradually driven to depths of 30 to 150 feet.

Researchers developed a new manual to show geotechnical engineers how to conduct the CPT and use the data it gathers. The guide walks engineers through the process of CPT-based foundation design for sand and clay soils in deep and shallow foundations, helping engineers put the best technology to use.

TECHNICAL SUMMARY 2018-32

Fibers in Thin Concrete Overlays Improve Pavement Performance



Laboratory testing shows how synthetic fibers in concrete can keep cracks from widening.

MATERIALS & CONSTRUCTION – In thick concrete pavements, road builders often set steel dowel bars at the joints

of concrete slabs. These dowel bars help transfer loads from heavy vehicles from one slab to the next without damaging the pavement. In thinner concrete overlays, dowel bars take up too much space and lead to premature cracking.

Researchers determined that synthetic fibers, when mixed properly into concrete, can keep cracks from widening and can transfer loads in overlays with some of the success that dowel bars have in thick pavement. The research produced recommendations for fiber size and material that MnDOT will take to manufacturers to develop a list of approved fibers for Minnesota concrete mixes.

TECHNICAL SUMMARY 2018-29

Recycling Asphalt Pavement Offers Strong Alternative to New Aggregate Base



A tanker with new asphalt material connects to a reclaimer that grinds pavement and mixes it with old aggregate and the new asphalt at the site.

MATERIALS & CONSTRUCTION – With stabilized full-depth reclamation (SFDR), crews pulverize old asphalt pavement, mix it with the base aggregate and blend in new asphalt material, reusing the old pavement as a new, partially bound base for a new pavement. MnDOT not only recycles the original pavement but avoids hauling in new, expensive aggregate or hauling away old pavement.

Researchers developed SFDR design parameters for Minnesota and documented that SFDR tends to create roads that avoid reflective cracking, while providing a stronger pavement than unstabilized aggregate. When road crews grind 4 inches of asphalt pavement with 4 inches of base aggregate and use the right emulsion or additive, the new 8-inch base offers the strength of 12 inches of new aggregate.

TECHNICAL SUMMARY 2018-33

Travel Time Reliability System, Put to Super Bowl Test, Reduces Traffic Delay

TRAFFIC & SAFETY – Every 30 seconds, traffic data from the Twin Cities metropolitan freeway system is transmitted to the Regional Transportation Management Center (RTMC) and used in congestion and delay reports. To use this invaluable information to better manage congestion and travel times, however, requires time-consuming work correlating the data with weather, accident and work zone data.

TRANSPORTATION RESEARCH SYNTHESSES

A *Transportation Research Synthesis (TRS)* summarizes transportation research activity and practices among state departments of transportation (DOTs). To view these reports or request a TRS from the MnDOT Office of Research and Innovation, visit mndot.gov/research/TRS.html.

Involving People With Visual Impairment in Facility Design



POLICY & PLANNING – People with visual impairment have unique perspectives on crosswalks, transit stations, traffic intersections and other transportation facilities. MnDOT's Office of Transportation System Management researched best practices for communicating facility designs to this community.

Researchers surveyed eight transportation agencies and 19 service organizations for insights on involving individuals with visual impairment in planning and designing transportation facilities.

Face-to-face meetings are critical, and can be aided by tactile maps, scale models, large print presentation materials and braille documents. Other recommended tools include surveys, screen reading services and tools for simulating blindness in demonstrations.

TRS 1808

In a recent MnDOT project, researchers developed a system that automates the data integration process. As a result, RTMC engineers now use nearly up-to-the-minute travel time reliability data to more effectively manage traffic flow with

Assessing the Use of Continuous Green T-Intersections

POLICY & PLANNING – Traffic signals are supposed to provide safety at intersections, but 30 percent of fatal crashes occur at signalized intersections. Some highway designers have replaced conventional intersections with low-cost alternatives that improve traffic flow and safety, including converting fully signalized T-intersections to a Continuous Green T-Intersection (CGT), where the main line of traffic passes through the intersection without stopping (the top of the “T”).

A 2016 FHWA study showed that the safety of CGTs compares favorably with that of conventional T-intersections. To learn more about this strategy, MnDOT surveyed state DOTs about their experience with CGTs. Seven DOTs currently using these intersections provided guidance and explained their criteria for using CGTs.

TRS 1809



electronic signage and other tools. The new system was tested in the weeks before, during and after the February 2018 Super Bowl, and kept traffic moving steadily and with great success.

TECHNICAL SUMMARY 2018-28



OFFICE OF RESEARCH & INNOVATION

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Calendar

- 1/30-2/1** City Engineers of Minnesota Annual Conference
- 3/11** Local Road Research Board (LRRB) Research Implementation Committee spring meeting
- 3/13-14** Minnesota Transportation Conference
- 3/20** LRRB spring meeting
- 3/26** MnDOT Transportation Research and Innovation Group (TRIG) meeting

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FY2018 At-A-Glance

- › Annual Report Now Available at mndot.gov/research.

