

New National Pact Tackles Road Owners' Toughest Issues

NRRA Reaches Out to Nation's DOTs and Industry Representatives as It Guides Experiments at MnROAD

By Paul Fournier



A section of MnDOT's MnROAD test track is microsurfaced as new National Road Research Alliance addresses troublesome paving issues to help DOTs nationwide.

A unique national alliance has been established to help solve some of the most pressing problems facing road owners. Using the resources of Minnesota's internationally recognized MnROAD testing facility, the National Road Research Alliance (NRRA) is addressing such knotty issues as freeze-thaw damage, pavement cracking, inconsistent construction practices and faulty construction materials, to name a few.

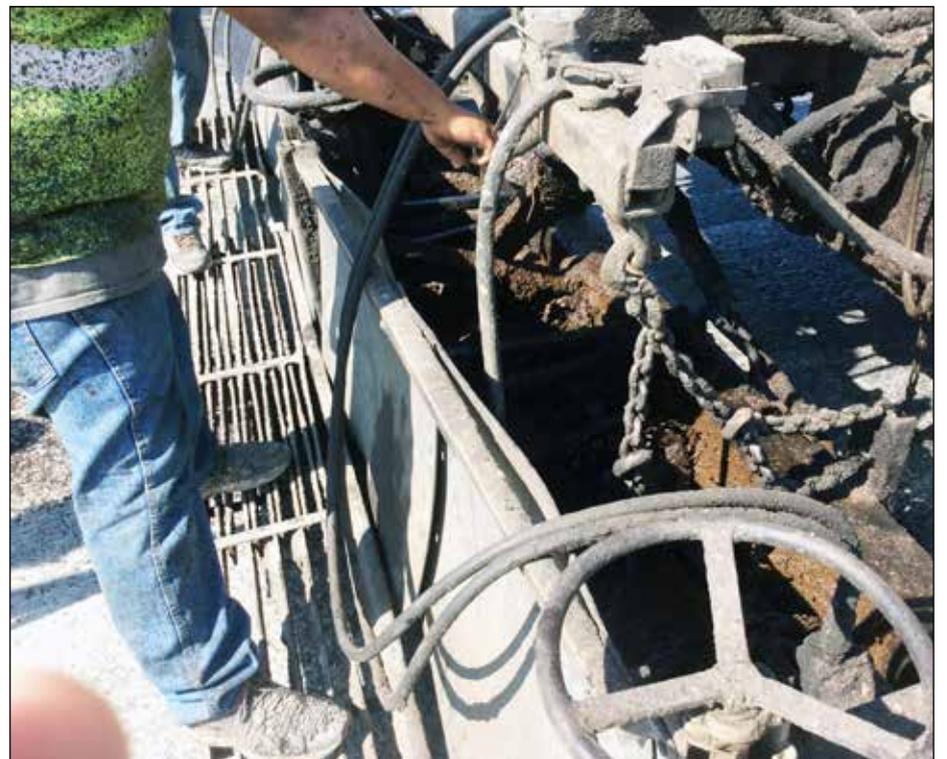
NRRA is a pool-funded group based in Minnesota that was created to oversee the latest research program of MnROAD, one of the world's two largest full-scale accelerated pavement testing facilities (the other being NCAT, the National Center for Asphalt Technology based in Alabama).

Test Cells Carry Interstate Traffic

Built in 1994, the MnROAD track is located about 40 miles northwest of Minneapolis and is owned and oper-

ated by the Minnesota Department of Transportation (MnDOT). The facility encompasses a 3.5-mile section of mainline I-94 carrying about 29,000 vehicles per day, a 3.5-mile bypass for diverting interstate traffic when desired, and a controlled-access 2.5-mile closed-loop, low-volume roadway that simulates rural roads.

MnROAD works in conjunction with MnDOT's Office of Materials and Road Research to find ways of building roads that last longer, perform better and cost less to build and maintain, while minimizing environmental impact. The testing facility has 50 test cells each about 500 feet long, with research sections sponsored by state DOTs, the Minnesota Local Road Research Board, the Federal Highway Administration, and private industry. Professional staff use high-tech equipment plus thousands of road-embedded sensors to run experiments on many types of pavements and collect detailed performance data.



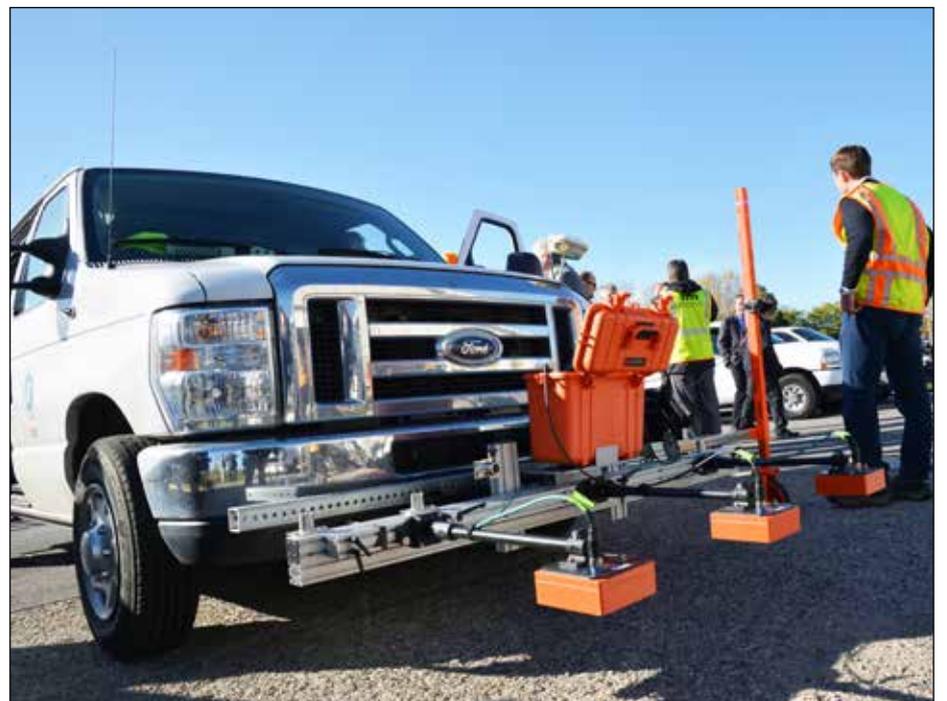
A sample of material is taken from microsurfacing machine for analysis by MnDOT lab.



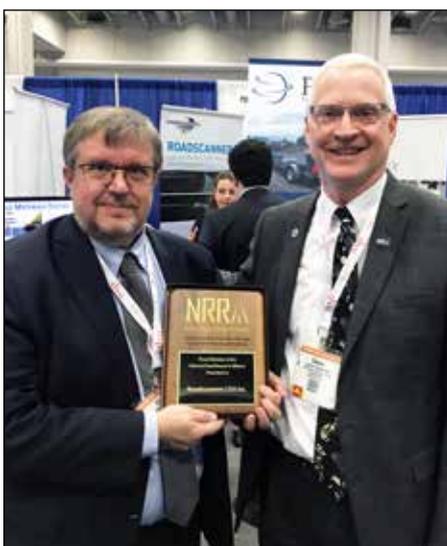
Excavation of new test cell takes place, with clay surface to be subsequently watered to produce mud, then covered by large stone base to see if it will support pavement structure.

NRRA Executive Committee Agency Members

- Dave Ahlvers, Missouri Department of Transportation
- Curtis Bleech, Michigan Department of Transportation
- Steve Bower, Michigan Department of Transportation
- John Donahue, Missouri Department of Transportation
- Glenn Engstrom (Chair), Minnesota Department of Transportation
- Joe Holland, Caltrans – California Department of Transportation
- Steve Krebs, Wisconsin Department of Transportation
- Kuo-Wei Lee, Caltrans – California Department of Transportation
- Paul Oehme, Minnesota Local Road Research Board - Chanhassen
- Bob Orthmeyer, Federal Highway Administration
- Greg Ous, Minnesota Department of Transportation
- Barry Paye, Wisconsin Department of Transportation
- Brian Pfeifer, Illinois Department of Transportation
- Lyndon Robjert, Minnesota Local Road Research Board – Carver County
- Charles Wienrank, Illinois Department of Transportation



A rolling density meter (RDM) is a new non-destructive GPR technology being used in conjunction with statistical analysis model developed by MnROAD's Materials office.



NRRA Chair Glenn Engstrom, right, is seen with associate member Timo Saarenketo of Roadscanners USA., which develops such non-destructive tests as ground penetrating radar.

NRRA Teams Boost Research

MnDOT has provided \$3.1 million in construction funding to support the current round of test sections as part of the facility's Phase III Research Program. The newly established NRRA, led by an Executive Committee comprised of members of various state DOTs, is guiding selection of MnROAD research projects and will disseminate test results and assist state transportation agencies who wish to apply the results to solve some of their own unique pavement problems.

In 2017, the fledgling alliance's first full year of existence, NRRA implemented and constructed 35 new experimental pavement sections. In his welcoming address to NRRA's 2018 Pavement Workshop attendees, Executive Committee Chairman Glenn

Engstrom said "the testing facility hasn't seen this volume of research construction for more than a decade." Engstrom, who is Director of MnDOT's Office of Materials and Road Research, pointed out the experimental sections were conceived and designed by NRRA project teams to address high-priority research topics.

Six project teams spearhead NRRA research, each chaired by a state DOT agency member and comprised of people expert in each team's particular sphere of interest.

The teams are as follows:

- Flexible: New and rehab asphalt roads
- Rigid: New and rehab portland cement concrete roads
- Geotechnical: Grading and base, full depth reclamation, cold-in-place recycling
- Preventive Maintenance: For both asphalt and concrete roads
- Technology Transfer: Maintain newsletters, webinars, training sessions, workshops
- Intelligent Construction Technologies: Focuses on current and emerging ICT



MnDOT Materials Office's Eddie Johnson uses nuclear density meter to check compaction of test cell base material before pavement overlay is placed.



NRRA's Glenn Engstrom poses with new associate member George Chang of Transtec Group, which recently opened an Intelligent Construction Technical Support Center.

Non-Destructive Technologies

As NRRA's newest team, ICT focuses on non-destructive testing technologies, for example, ground penetrating radar (GPR), acoustics and ultrasonics, plus such cutting edge technologies as infrared imaging, LiDAR surveying (measuring distance by illuminating a target with laser light), unmanned drones, intelligent compaction, and artificial intelligence.

In line with the team's efforts to study non-destructive technologies, they are focusing on one of the engineering advancements tested by MnDOT Materials

researchers – the use of rolling density meters (RDM). As described in an article by Shongtao Dai and Kyle Hoegh that appeared in a NRRA newsletter, RDM is based on high-frequency air-coupled GPR antennas that can determine relative hot-mixed-asphalt compaction levels nondestructively. MnDOT's Office of Materials subsequently developed a statistical analysis method modeled on RDM field test results that can be used to accurately assess compaction quality.

Research Benefits All

Engstrom sees the alliance as a collaborative partnership supported by numerous agency and industry representatives who pool their expertise and resources to produce practical solutions to real-world pavement issues. He said that one of NRRA's most important tasks is to inform departments of transportation nationwide, as well as industry professionals and academics, of the benefits to be gained by taking part in the pooled fund.

"We welcome agencies and other stakeholders nationwide to take advantage of MnDOT's \$3.1 million track construction investment and the opportunity to help shape important future road research," he said.

Through NRRA involvement, DOT agencies can learn about innovative, cost-saving technologies that preserve and improve the performance of pavements. What's more, by participating in

experimental pavement design and construction, they can evaluate pavement performance, construction materials, and designs. Under real world conditions, aided by MnROAD staff using high-tech instruments, they get to see how such factors as moisture, frost, traffic, construction practices, and materials interact. This knowledge enables them to develop tools and methods based on actual live traffic performance data to improve the design, construction, and maintenance of pavements for their own locales. Participants also benefit from the fact that since MnROAD personnel can divert traffic, test cells are built and can be examined in a safe work zone.

Research efforts by state DOT sponsors are benefitted by the participation of associate members from industry and academic sectors who lend their expertise throughout the MnROAD research cycle. These members provide input on long-term technology trends, identify innovative solutions to research problems, and determine the viability of research results. Associates also have an opportunity to supply or obtain testing materials and propose design approaches based on field experience.

NRRA Membership Expands

As of June 2018, NRRA's state DOT agency members include Minnesota, Wisconsin, Illinois, Michigan, Missouri and California (see accompanying side-

NRRA Associate Members

- Roadscanners USA
- MAPA
- Diamond Surface Inc.
- Midstate Reclamation
- University of New Hampshire
- Concrete Paving Association of Minnesota
- Michigan Tech Transportation Institute
- Aggregate & Ready Mix Association of MN
- Braun Intertec Corporation
- Flint Hills Resources, LP
- University of Minnesota – Duluth
- University of Minnesota - Twin Cities
- Minnesota State University Mankato - Center for Transportation Research and Implementation
- Asphalt Pavement Alliance (APA)
- Mathy Construction Co.
- National Concrete Pavement Technology Center, Iowa State University
- International Grooving and Grinding Association
- National Center for Asphalt Technology (NCAT)
- Ingios Geotechnics, Inc.
- WSB & Associates, Inc
- BASF Corp.
- Cargill Industrial Specialties
- Infrasense, Inc.
- Collaborative Aggregates LLC
- University of Pittsburgh
- American Engineering Testing, Inc.
- Center for Transportation Infrastructure Systems
- Asphalt Recycling & Reclaiming Assoc.(ARRA)
- GSE Environmental
- First State Tire Recycling
- First State Tire Recycling Amendment
- ASTEC/CEI Enterprises
- Upper Great Plains Transportation Institute
- 3M Transportation Safety Division
- Helix
- Iowa State University, Asphalt Materials & Paving Program
- University of California Pavement Research Center
- BASF Corporation – NEW
- Pavia Systems Inc
- All States Materials Group
- Payne and Dolan, Inc
- Caterpillar Paving Products, Inc.
- The Dow Chemical Company
- Husky Energy, Inc.
- Uretex USA
- Transtec Group
- Testquip LLC
- Hardrives, Inc.

bars) while some 50 representatives of private industry and academia have joined as associate members – and the list is growing.

Readers wishing to learn more about NRRA membership should contact Executive Chair Glenn Engstrom at 651-366-5531, or e-mail glenn.engstrom@state.mn.us. Additional information is available at dot.state.mn.us/mnroad/nrra/index.html or by calling the general MnDOT number, 800-657-3774.