

MnROAD

**National Research
And
Technology Center**



**Providing Research Insight
for a Safe, Efficient,
and
Cost-Effective
Transportation System**

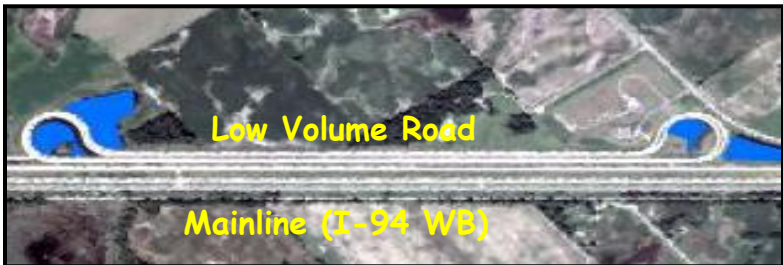
January 2010

Serving the Nation

MnROAD, located near Albertville, Minnesota (40 miles northwest of the Twin Cities) is a cold region testing laboratory that is unique to the world. MnROAD was originally constructed in 1994 at a cost of \$25 million of state and federal funding. A partnership between Minnesota Department of Transportation (Mn/DOT) and the Minnesota Local Road Research Board (LRRB) have provided the majority of the operations funding for the first ten years. Over the years researchers from around the nation and the world have utilized the MnROAD facility and data.

MnROAD consists of two road segments that are divided into 55 test cells, which represent varying combinations of road-building materials and designs.

- Mainline 3.5-mile Interstate-94 roadway.
- Low Volume Road 2.5-mile roadway that uses a controlled 5-axle semi tractor-trailer.



These MnROAD cells enables researchers to:

- Evaluate pavement performance under real conditions (traffic, environment, materials).
- Examine the way factors such as moisture, frost, traffic loading, construction, and materials interact through its extensive instrumentation and database.
- Design customized experiments for both interstate and low volume roads with experienced MnROAD staff and equipment to support unique researcher needs.
- Provide a safe work zone for testing due to its unique ability to remove traffic without disruption to the driving public.
- Validation of models with 14 years of performance data from the initial experiment.

Successes and Benefits

Research results from the first generation of work at MnROAD have made a positive impact. Six recent studies are estimated to save Minnesota \$33 million and potentially \$749 million nationally annually. These include:

Minnesota Implemented Study	Savings
Updated - Spring Load Restriction Policy	\$14 million
Updated - Winter Load Increase Policy	\$7 million
Low Temperature Cracking Reduction	\$5.7 million
ME Flexible Design Method - Binders	\$4 million
ME Concrete Design Method	\$1.2 million
Sealing Pavement/Shoulder Joints	\$1.2 million

Nationally MnROAD has played a key role in:

- As test facility and data source for several NCHRP studies, including development of the next generation pavement design guide.
- Field validation and development of intelligent transportation systems (ITS)



The results of these efforts are already providing tangible benefits to the entire nation.

Serving Minnesota

LRRB has financially supported and made it possible for MnROAD to conduct LVR studies. Projects are tailored to Minnesota's Cities and Counties local needs. Some of these projects include.

- Preventive Maintenance Techniques*
- Pavement Rehabilitation Selection*
- Use of Recycled Materials*
- Calibration/Implementation of Mechanistic Designs*
- Evaluation of new technology / tools (DCP - GPR)*
- Local City and County Test Section Tracking*
- Best Practices Manuals*
- Seasonal Loading*

Transportation Engineering & Road Research Alliance

TERRA Members

Aggregate and Ready Mix Association of Minnesota
American Concrete Pavement Association
Associated General Contractors of Minnesota
Caterpillar Global Paving
Concrete Paving Association of Minnesota
Iowa State University
Michigan Department of Transportation
Michigan Technological University
Minnesota Asphalt Pavement Association
Minnesota Department of Transportation
Minnesota Local Road Research Board
New York State Department of Transportation
Norwegian Public Roads Administration
RMC Research and Education Foundation
Road Science
United States Federal Highway Administration
University of Minnesota
Wisconsin Department of Transportation

TERRA is a new road research governance structure that partners private industry and academia with national, state, and local road authorities. TERRA was created after a task force of government, industry, and academic representatives investigated road research governing structures and evaluated ways to broaden the use of the unique MnROAD research facility.

TERRA's Mission Statement

"To develop, sustain and communicate a comprehensive program of research on pavement, materials, and related transportation engineering challenges including issues related to cold climates"

While the primary focus will be to expand pavement research opportunities, other compatible research such as vehicle technologies and driver communications will be pursued in order to diversify funding.

TERRA exists to:

- Expand Productive Research Partnerships
- Provide Effective Transportation Engineering and Road Research
- Communicate Transportation Engineering and Road Research Activities, Benefits/Results
- Expand entrepreneurial use of the MnROAD facility by pursuing opportunities to serve a broader research community

Phase-II Core Research Areas

Transportation research is needed now more than ever to help provide the safe, efficient and cost-effective movement of people, goods, and services that is the backbone of our economy. Small increases in performance and pavement life result in a reduction in costs for maintenance, repairs, user delays, and congestion. These pavement research activities improve our national productivity and quality of life. Priority research and implementation activities include:

- **Innovative Construction** – Team with industry and academia to implement new technology, materials, and construction methods to maximize productivity and reduce user delays.
- **Green Roads** – Reduce our footprint and dependence on virgin materials throughout the pavement structure by reusing various waste products and more efficiently design pavement based on today’s technology. This includes taconite aggregates, fly ash, shingles, and other materials.
- **Preservation and Rapid Renewal** – Develop and improve techniques to maintain and rehabilitate our current pavement investments, reduce life cycle cost, and maximize investments for long term performance.
- **Surface Characteristics** – Establish new techniques with our research partners for smooth, quiet, durable, and safe skid-resistant pavements.
- **Non-Pavement Research** – Continue supporting traffic, environmental, industrial, and intelligent transportation systems through the use of MnROAD’s unique facility.

Reconstruction Update

MnROAD test cells were designed around studies that were developed through our partners. They include both new construction and rehabilitation along with various asphalt and concrete pavement surfaces. Local, regional, and national interests are represented.

Construction of Phase II test cells began in 2007, continued in 2008, and will be completed in early 2010. A total of 38 test cells were constructed on the Low Volume Road and Mainline representing over 20 different research projects.

Phase-II Active Studies

Several studies are supporting the construction and are funded by TERRA members, Pooled Fund States, Minnesota LRRB, and other participating companies or organizations. These studies are shown below and the following page with the groups that made them possible.

Pooled Fund Research

Visit www.pooledfund.org or the MnROAD web site for more information.

Study TPF-5	Pooled Fund Title (Partners) Lead Contractor
153	<p style="text-align: center;">Optimal Timing of Preventive Maintenance for Addressing Environmental Aging in HMA Pavements (MD, MN, OH, TX, LRRB) Research contractor will be selected in late 2009</p>
132	<p style="text-align: center;">Investigation of Low Temperature Cracking in Asphalt Pavements - Phase II (CT, IA, ID, MN, ND, NY, WI, LRRB) Marasteanu, Buttlar, Bahia, Williams, Zofka</p>
149	<p style="text-align: center;">Design and Construction Guidelines for Thermally Insulated Concrete Pavements (CA, MN, WA, FHWA, LRRB) Khazanovich, Harvey, Mahoney</p> <p style="text-align: center;">2009-2010 SHRP-II Composite Pavement Study Darter, Khazanovich, Harvey</p>
148	<p style="text-align: center;">The Effects of Implements of Husbandry "Farm Equipment" on Pavement Performance (MN, LRRB, IL, IA, PNAAW (Industry Consortium)) Khazanovich, Al Qadi, Ceylan</p>
129	<p style="text-align: center;">Recycled Unbound Pavement Materials (CA, MI, MN, OH, TX, WI) Edil U of WI / Benson, RMRC</p>
134	<p style="text-align: center;">PCC Surface Characteristics – Rehabilitation (MN, TX, IGGA, ACPA, FHWA) Izevbehai - MnDOT</p>
165	<p style="text-align: center;">Whitetopping Design (MS, MN, MO, NY, PA) Vandenbossche</p>

National implementation of the research produces an enormous return on MnROAD investments

Phase-II Active Studies

Non-Pooled Fund Research

Partner funded or Minnesota Single State Research

Research Study Title (Participants)
Use of Taconite Aggregates in Pavement Applications (NRRRI, MnDOT)
Investigation of High Performance Concrete Pavement (MnDOT)
Unbonded Concrete Overlay (CPAM, ACPA, MnDOT)
Permeable (HMA) Pavement Performance in Cold Regions (LRRB, MnDOT)
Pervious Concrete Pavement Study (LRRB, MnDOT)
Full-Depth Reclamation Stabilized with Engineered Emulsion (SemMaterials – MnROAD Research Partnership) (SemMaterials provides Construction)
HMA Surface Characteristics related to Ride, Texture, Friction, Noise, Durability (LRRB, MnDOT, FHWA)
PCC Surface Characteristics – Construction (MnDOT, FHWA)
Recycled Asphalt Pavements (LRRB, MnDOT)
Pervious Concrete “Overlay” Mix Design for Wearing Course Applications (CTRE, MnDOT)
Field Investigation of Polyphosphoric Acid Modified Asphalt (Innophos, Marathon, Paragon, ICL, MTE, WRI, FHWA, MnDOT)
Field Investigation of Highway Base Material Stabilized With High Carbon Fly Ash (Bloom Consultants (DOE Grant), U of WI, MPCA, Innophos, MTE)

MnROAD Participation

Each MnROAD study/test cell has pavement materials and pavement research quality data available for other studies. Pavement data collected includes field performance (rutting, cracking, ride, etc.), static & dynamic sensor responses and initial material laboratory testing. The MnROAD database contains all this information. Please contact us if you are interested in using any materials and/or data for your own research needs.

Additional Partners

AASHTO State Agencies
Arizona State University
Bloom Consultants, LLC (Department of Energy)
Case Western Reserve University
CRREL (Cold Regions Research Environmental Lab)
Finnish Road Administration
Michigan Technological University
Minnesota Department of Natural Resources
Minnesota Pollution Control Agency
National Resources Research Institute (NRRI)
NCAT (National Center Asphalt Technology)
Pavement Research Institute
Penn State University
Sweden National Road Administration
University of California Pavement Research Center
University of Florida
University of Idaho
University of Illinois at Urbana-Champaign
University of New Hampshire
University of New Mexico
University of Pittsburgh
University of Texas at Austin
University of Wisconsin
Transportation Research Board (TRB)
US Environmental Protection Agency



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