



## RESEARCH SERVICES SECTION

# TECHNICAL SUMMARY

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### Principal Investigators:

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## IMPLEMENTATION PROJECT COST:

\$26,923



A geogrid can be used within an aggregate layer for reinforcement. The training described appropriate materials and techniques for each geosynthetic application.



# Putting Research into Practice: Training Module for Designing and Constructing with Geosynthetics

## What Was the Need?

The use of geosynthetics typically involves laying down synthetic materials such as textiles or plastic meshes on a section of earth to provide a stable foundation for a roadway. The improved uniformity and strength that this layer provides can allow the use of a thinner pavement layer, which amounts to a substantial cost savings. Moreover, this is only one of the uses of geosynthetics; the technology is being increasingly used throughout Minnesota for applications such as reinforcing or separating roadway layers, controlling erosion, stabilizing earth walls and slopes, and lining containment ponds.

This abundance of potential uses can create confusion. There are many geosynthetic products available, and vendors tend to introduce this technology to transportation engineers with an eye toward promoting their own products. An impartial resource was needed to give a high-level view of the various transportation-related geosynthetic uses throughout the state along with guidance for each type of use regarding appropriate technologies and design, installation and inspection best practices.

## What Was Our Goal?

The objective of this implementation effort was to maximize the investments made in geosynthetic research by Mn/DOT and the Local Road Research Board over the last 25 years by drawing on this body of work along with other sources to design a one-day workshop that the Minnesota Local Technical Assistance Program could present to transportation officials across the state.

## What Did We Implement?

This workshop leveraged a great deal of completed research, including:

- The presentation [“Applications of Geotextiles, Geogrids, and Geocells in Northern Minnesota.”](#) prepared for the 2001 Geosynthetics Conference. This presented four varied road reconstruction projects, compared three types of geosynthetics and provided rules of thumb to determine when and where to use geotextiles.
- Report 2001-15: [“The Use of Geosynthetics to Reinforce Low Volume Roads.”](#) This study used numerical simulations to investigate the benefits of reinforcing with geotextiles and geogrids.
- Report 1999-04: [“Fabric for Reinforcement and Separation in Unpaved Roads.”](#) This study evaluated various woven geotextiles’ effects on laboratory pavement samples.
- The 1999 CD-ROM [“Geosynthetics: Use in Streets and Highways”](#) (updated in 2000).
- Seven other LRRB-produced projects dating back to 1984.

The course also drew on a design manual and workshop created by the Federal Highway Administration, as well as the presenter’s professional experience as a member of national geosynthetic task forces.

## How Did We Do It?

The presenter conducted a literature search and interviews with Minnesota geosynthetic experts to ensure that the training would take all of the most recent relevant research into account. In conjunction with a technical advisory panel, he used these sources to

*“There are so many ways to use geosynthetics. We wanted to provide a resource to explain where and how it has been used to help city and county engineers determine the proper materials and installation techniques for their particular need.”*

—Lou Tasa,  
Mn/DOT District State Aid  
Engineer

*“People’s use of geosynthetics was more often based on their own experience and not on any formal training. This course provided scientific backing for what they were doing and why they were doing it.”*

—Steve Gale,  
Principal Engineer,  
Gale-Tec Engineering Inc.

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Among the geosynthetics uses described was a geotextile laid over a clay subgrade. This allows moisture to drain through but keeps the clay from migrating up into the roadway base and affecting pavement performance.

determine key subject areas and an outline for the workshop. He then produced a presentation with more than 200 slides, along with a 50-page participant’s manual and other supporting documents. A pilot workshop was held for the technical advisory panel.

The resulting presentation covers a broad range of geosynthetics applications in roadway projects, retaining walls and other applications. It describes the available material types and provides procedures and standards for design, materials handling, installation and inspection for each type of geosynthetics application. It presents Minnesota projects as case studies and directs users to additional resources for more information.

### What Was the Impact?

The course was accepted by Minnesota LTAP, advertised at the 2007 pavement conference, and presented at four locations around the state to Mn/DOT, county and local staff representing municipal, engineering and public works areas as well as consultants. The feedback received was largely positive, with most participants saying they were confident that they could apply course content in their respective areas. Some of the geosynthetics uses discussed were new to most participants; the workshop has enabled serious consideration of novel applications such as reinforcement over swamps.

### What’s Next?

Recognizing the ongoing rise in geosynthetics use around the state, Minnesota LTAP has accepted this course as part of its core curriculum. The course is currently scheduled to be given biannually at multiple venues around the state as new professionals enter the field and more counties and cities expand their use of geosynthetics to additional applications. This will require regular course updates to ensure current information.

An early proposal within this training project was the revision of the 2000 LRRB Geosynthetics Design Guide. This may still be undertaken to further leverage this research to facilitate the appropriate use of geosynthetics during pavement design and construction and its expansion to other uses that reduce costs and may benefit the environment.

*This Technical Summary pertains to the implementation product PP07GEO, “Training Module for Designing and Constructing with Geosynthetics,” published January 2007. The full presentation can be accessed at <http://www.lrrb.org/PDF/PP07GEO.pdf>. The LTAP listing for the course can be viewed at <http://www.mnltap.umn.edu/Events/DrainageErosionControl/Geosynthetics.html>.*

*The research being implemented via this project can be found in several sources as described above, including the presentation “Applications of Geotextiles, Geogrids, and Geocells in Northern Minnesota” and the LRRB-produced Reports 2001-15, “The Use of Geosynthetics to Reinforce Low Volume Roads,” and 1999-04, “Fabric for Reinforcement and Separation in Unpaved Roads.” These sources can be accessed, respectively, at <http://www.mrr.dot.state.mn.us/research/pdf/2001MRRDOC003.pdf>, <http://www.lrrb.org/PDF/200115.pdf> and <http://www.lrrb.org/PDF/199904.pdf>.*