

SOLUTIONS

PROJECT HIGHLIGHTS

Relative Operational Performance of Geosynthetics Used as Subgrade Stabilization

<http://www.mdt.mt.gov/research/projects/geotech/subgrade.shtml>

State departments of transportation (DOTs) routinely use geogrids and geotextiles for subgrade stabilization applications. This construction practice involves placing a geosynthetic on top of a weak subgrade to help stabilize the ground in order to construct the remaining gravel platform. The geosynthetic generally provides stabilization of the subgrade by increasing the load-carrying capacity of the system and maintaining separation between the soft subgrade and subbase materials.

The objectives of this research were accomplished through a comprehensive program that included constructing, monitoring and analyzing full-scale field test sections as well as extensive laboratory tests on geosynthetics. Seventeen test sections were constructed, trafficked and monitored during summer 2012 at the TRANSCEND test facility in Lewistown, Montana to evaluate geosynthetics when used as subgrade stabilization.

The results of this study indicated that strength and stiffness of the junctions and tensile members contribute to the performance of geosynthetics when used as subgrade stabilization, and the relative contribution of these material properties depends on the thickness of the base course aggregate layer and the anticipated rut depth. Practitioners who wish to use geosynthetics as subgrade stabilization should consider specifying minimum values for material properties that correlated with good performance of the test sections.

Additional information can be found on the [research project website](#). If you have questions, please contact Craig Abernathy (cabernathy@mt.gov or 406.444.6269).



Filling lined trench with subgrade



RESEARCH PROGRAMS

Summer 2014

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NEW RESEARCH AND EXPERIMENTAL PROJECT REPORTS

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A Peer-to-Peer Traffic Safety Campaign Program

Motor vehicle crashes are the leading cause of death for teenagers in the United States and in Montana. Per mile driven, teen drivers ages 16 to 19 are three times more likely than drivers aged 20 and older to be in a fatal crash (Centers for Disease Control and Prevention, 2010). The purpose of this project was to implement a peer-to-peer driver’s safety program designed for high school students. This project was modeled after an effective peer-to-peer outreach effort in Texas entitled [Teens in the Driver Seat \(TDS\)](#), the nation’s first peer-to-peer driving safety program run by teens for teens. The Teens in the Driver Seat program conducted in public schools encourages students to educate their peers on safe-driving habits by using social norms theory to increase student awareness of the major risk factors and how to avoid them. Since the message is coming from their peers and not an authority figure, the message will likely have a stronger impact on the students who receive it. The goal was to develop a culture encouraging safe driving, created by students and intended for students.

The peer-to-peer traffic safety campaign program empowers high school students to create methods of outreach to their peers. The implementation of MDT’s project followed that of the TDS high school program

developed by the Texas Transportation Institute. The research used a case–control experimental design across four Montana high schools that included one case and one control school in an urban setting (Bozeman and Helena) and another case and control school from a rural setting (Manhattan and Big Timber).

Results did show some early success in improving teens’ awareness of the most dangerous risk factors for teen drivers. Moreover, the program was found to be effective in reaching even those teens in the schools that were not affiliated with the program. These results were more prominent in the rural group than the urban group. However, self-reported driving behaviors did not reflect this change (except for an increase in seatbelt usage). Urban teens reported being influenced most by their peers, closely followed by a parent, whereas rural teens reported being nearly equally influenced by their peers and a parent. Another key finding was that the effectiveness of certain types of peer-to-peer media, such as posters, differed by school size.

In conclusion, rural teens appear to have an overall increased awareness about driving dangers after the implementation of the program. Rural teens are especially aware of the dangers associated with fatigued/night driving and speeding. The effectiveness of visual announcements (school news) was apparent in the urban school, while assemblies were more effective in the rural school.

A final component of this research project was the development of a program guidebook for schools that may want to implement a peer-to-peer traffic safety program.

Visit the [research project website](#) for more information. If you have questions, please contact Kris Christensen (krchristensen@mt.gov or 406.444.6125)



Reference

Centers for Disease Control and Prevention. (2010). 10 Leading Causes of Death by Age Group Highlighting Unintentional Injury Deaths, United States 2010. Retrieved from http://www.cdc.gov/injury/wisqars/pdf/10LCID_Unintentional_Deaths_2010-a.pdf



2014 New Research Projects

During the May [Research Review Committee \(RRC\)](#) meeting, thirteen new research topics were approved to move forward to technical panels for further development. The technical panel for each project will determine the need for research based on the literature and other information. If the need for research is confirmed, the technical panel will develop a scope of work and will follow their project through the conduct of research and implementation. This solicitation cycle resulted in a record number of projects submitted and moved forward. They include the following:

Aeronautics

[Montana Airport Economic Impact Update](#)

This proposed research would be an update of the 2007/2008 study. The research would provide MDT and local governments the information to assist in Capital Improvement, Master, and Airport Layout Planning to meet the future needs of community airports. The updated statewide completed study would help to quantify and support the value of aviation to the State of Montana.

Communications and Information Technology

[An In-Depth Assessment of Montana Road Weather Information System](#)

The Montana Department of Transportation (MDT) currently has 72 Road Weather Information System (RWIS) stations throughout the state. All these RWIS stations are fixed and other entities (e.g., National Weather Service) currently rely on these stations for information. The number and location of these environmental sensor stations were largely determined over time by the pressing needs of the maintenance and snow removal operations, without much consideration to other applications that are in need of accurate and timely road weather data. Therefore, a comprehensive review and assessment of the state road weather data collection program is needed to ensure the efficient use of weather data in various

transportation applications and the optimum use of MDT resources.

[Development of Strategic Enterprise Architecture Design for MDT](#)

The purpose of this proposed project is to develop a strategic enterprise architecture plan customized for MDT. The objective of the enterprise architecture (EA) project and plan is to inform and guide technology decisions for the enterprise and to ensure that technology decisions align with MDT business objectives. A critical element of the research will be development of an implementation plan and time line. The plan must be executable such that MDT can implement the intent of the plan through a series of follow-up projects.

[Statewide Land Mobile Radio \(LMR\) Propagation Analysis and Modeling along Major Highway Network](#)

As of January 2013, all LMR had to be narrowband; this conversion from wide band to narrow band has created gaps in the LMR coverage. Wireless communications between LMR devices and LMR sites, and among the LMR sites currently suffer from link breakage, low data rates, and low reliability. There is an urgent need to understand the gap location and size so as to establish reliable, scalable, and economical solutions to the challenges of LMR communications in Montana. The proposed research will enable the MDT to fully understand the deficiencies in the current LMR communication system, and use study findings and the recommended guidelines for future LMR system improvements.

Construction

[Advanced Methodology to Determine Highway Construction Cost Index](#)

This proposed research will develop an advanced methodology to determine Highway Construction Cost Index (HCCI) and a methodology to forecast it. HCCI is a quick indicator of highway construction cost



changes over time and is typically used for conceptual cost estimation for project budgeting purposes. A quick and reliable conceptual cost estimation is very important for maximum utilization of available budget.

[*Advanced Method to Detect Unbalanced Bidding Patterns Using Historical Bid Data and Daily Work Report \(DWR\) Data*](#)

This proposed study will analyze the historical bid and DWR data together to locate patterns to allow MDT to detect unbalanced bidding in future bids. Statistical pattern recognition techniques will be used to find the patterns hidden in those two sets of data. A model to detect unbalance bids will be developed based on the pattern analysis.

[*Top-down Construction Cost Estimating Model/ Guide Using a Neural Network within an Off-the-Shelf Spreadsheet and Database Programs*](#)

This proposed research will leverage the work completed in NCHRP 15-51: [*Guide for Estimating Preconstruction Services Costs*](#), by extending the parametric models developed for preliminary engineering, right of way, etc. to the estimating of construction project cost at the earliest stages of project planning development. It will deliver a top-down cost estimating model that can be run without the need to purchase special software or hardware.

Environment

[*Assessing Noise Levels and Impacts from Pile Driving on Bull Trout during MDT Project Construction*](#)

New requirements from the U.S. Fish and Wildlife Service (USFWS) based on noise produced impacts to bull trout are expected to add additional workloads and may potentially cause delays to MDT projects. Therefore, this proposed research will investigate noise levels created from pile driving operations and the potential effects on bull trout during MDT projects in western Montana in an effort to reduce the impact of these new requirements.

[*Evaluation of Jump-out Designs in a Controlled Setting and Along US Highway 93 N*](#)

This proposed research involves testing different jump-out heights and other design parameters for white-tailed deer using both field tests and conducting tests in a controlled environment. This study will determine the optimal height and other design parameters for jump-outs targeted at white-tailed deer.

[*MDT Wildlife Crossing Guidelines*](#)

Wildlife crossings and associated features are proven mitigation measures to increase public safety, and maintain or create habitat connectivity. Currently there is not a documented justification process in place to determine the appropriateness of including crossings on highway projects. Through this proposed research, the development of MDT Wildlife Crossings Guidelines based on current research and design practices will assist MDT personnel and consultants in determining the appropriateness of including wildlife crossings and/or exclusionary devices on proposed MDT projects based on standardized criteria.

Materials

[*Development of a New Specification for ¾-in. Crushed Base Course, Type A*](#)

Crushed base courses are typically a cost effective component to pavements that reduce the amount of asphalt pavement needed for a road. For some projects, however, obtaining the material that meets the current specifications for 5A or 6A crushed base course is not economical, especially in eastern Montana. If adequate performance can be met with a ¾-in. crushed base course, as will be demonstrated with this proposed research, then including a specification for this new base course will ensure Montana's transportation system continues to be cost effective.



[Feasibility of Non-Proprietary Ultra-High Performance Concrete \(UHPC\) for Use in Highway Bridges in Montana](#)

The objective of the proposed project is to design and test non-proprietary UHPC mixes to determine whether UHPC is a viable option for Montana bridge decks.

[Large-Scale Laboratory Testing of Geosynthetics in Roadway Applications](#)

The objective of the proposed project is to establish a laboratory testing program for geosynthetics in roadway applications to better characterize their behavior and performance characteristics within the state of Montana. Testing will consist of constructing full-scale models of geosynthetic reinforced/stabilized roadway sections in a laboratory setting to be trafficked using an automated loading facility.

Additional Research Projects Initiated Include:

[Disparity/Availability](#)

This project involves a determination of whether a disparity exists within the State of Montana

between the availability of minority and female and/or disadvantaged firms and their utilization in the highway construction industry. The study will also provide MDT with guidance for implementing changes to MDT's DBE program.

[Rockfall Hazard Classification and Mitigation System](#)

In the initial study for this project, MDT sought to develop and implement a comprehensive rockfall management system for use on the Department's state-maintained roadways. MDT is now looking to update the study. This will include refining the rating criteria to make it more specific to Montana and MDT's needs. It will take into account maintenance and roadway user costs- not just mitigation costs - with hopes of determining benefit/cost ratios related to mitigation. The system can also be used as a component of MDT's asset management efforts.

Information on these project as they progress can be found on each project's web page or MDT's Research Programs [What's New web page](#).

LIBRARY CORNER

Overcoming Library Anxiety

Oddly to some but completely understandable to others, libraries can be intimidating places. Many people would rather dodge bullets than walk in and use the library. As more resources become available online, some may seek to further avoid them. But why? Are libraries really dreadful, torture chambers? Are librarians all crotchety old ladies with buns, obsessively shushing whoever passes?

To answer these questions quickly, no. In fact, one of the top reasons why more people don't use libraries is their own anxiety and feelings of inadequacy. Constance Mellon, professor of library science, began a study in 1986 to find out exactly why

people avoid libraries. After surveying six thousand students, Mellon published her theory of "library anxiety" (Yes, it's a thing). She found that as many as 85% of the students thought that libraries were "scary, overpowering" and experienced feelings of "helplessness" and fear.

Library anxiety is still a common problem for a variety of people, not just students. Being able to walk into a new setting that you may not completely understand and admit you need help can be a challenge. If you find yourself embarrassed that you don't know how to use the library, find librarians unapproachable, and/or avoid the library, you probably are



experiencing library anxiety. Stay calm! Washington State University and University of Arkansas offer these following suggestions to help ease your mind:

- Take deep breaths! Not only does it help stress, deep breathing can help stimulate brain growth.
- Recognize that what you are feeling is common. You are not the only one that may be feeling overwhelmed.
- You don't have to be an expert to use the library, only willing to learn.
- There are no "dumb" questions, only unasked ones. Save time by asking questions early.
- Ask a librarian for help!
- Practice improves performance (you don't have to be perfect).



Asking for help adds a whole other set of problems for many. Whether the librarian is frothing at the mouth with glowing red eyes or is a sweetly dressed elderly woman that is offering cookies, the task of approaching

the librarian for some is almost unbearable. Since the times of Melville Dewey (creator of the Dewey Decimal system), librarians have suffered under one less than flattering stereotype. The cold, strict, elderly lady, adorned with a bun, constantly shushing gives many the impressions that the librarians are uptight, unsociable, haughty, and disinterested. With characters like Madame Pince from Harry Potter, the scary, phantom librarian in Ghost Busters, and Mary Hatch Bailey from It's a Wonderful Life, Hollywood continues to promote the librarian stereotype.



While we all might still have some nightmares about our childhood librarians, the image of the librarian should not be defined by these negative parameters. Most librarians are more than helpful, friendly, and don't wear a tight bun. They usually don't bark or attack anyone like this [library](#) encourages. Nor, will they [yell](#) at you for not knowing library protocol. They definitely won't [insult](#) your choices in books either!

By becoming comfortable with using the library, you can save both time and money. Librarians can point you to a variety of resources that you may not know exist and help refine your research skills. If you have any questions about the library or need any research assistance, please contact us (mdtlibrary@mt.gov or 406.444.6338).



References

Constance Mellon, "Library Anxiety: A Grounded Theory and It's Development," *College and Research Libraries*, Volume, 47(2) (1986), 160-165, <http://crl.acrl.org/content/47/2/160>.

David DiSalvo, "Breathing and Your Brain: Five Reasons to Grab the Control," *The Daily Brain*, Accessed 3 September, 2014. <http://www.daviddisalvo.org/the-daily-brain/2013/7/4/breathing-and-your-brain-five-reasons-to-grab-the-controls.html>.



“Library Anxiety: How to Beat It,” Washington State University, Accessed 11 July, 2014. <http://libguides.wsulibs.wsu.edu/libraryanxiety>.

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“Surviving Library Anxiety,” University of Arkansas, accessed 11 July, 2014. <http://comp.uark.edu/~neciap/instruction1/anxiety.html>.

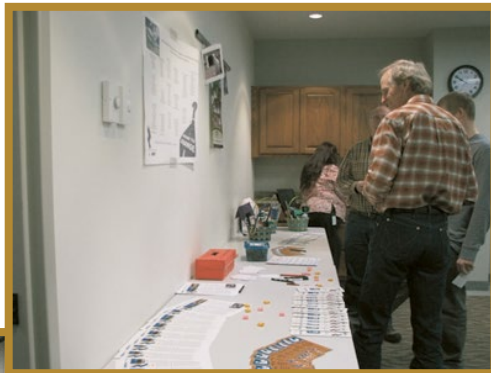
MDT Research and Library Customer Appreciation Day

On April 16th, we held a celebratory open house as way to say thank you to our customers and to share information with staff about the services provided through the Research and Library programs. This event was held in conjunction with the American Library Association’s National Library Week.

research and experimental projects, publications, and library materials. It was a great opportunity to talk more with staff about what we offer. We also distributed brochures, fliers, and our new MDT Library bookmarks.

About 50 MDT staff were able to attend. We had games, door prizes, and snacks, and showcased our

We want to say thank you to those who attended and to all of our customers. We greatly appreciate your support and hope to see you at next year’s event!





DID YOU KNOW?

Research RSS Feed and ListSerts

MDT's research products, including final reports, project summary reports, implementation reports, work plans, construction reports, and more are frequently posted to the web pages for [experimental](#) and [research](#) projects. We now have a new way to allow people to keep up-to-date with newly posted materials, without having to re-visit the site on a regular basis. MDT staff have created a [Research RSS feed](#), which allows users to receive automatic updates whenever something new is posted. It's accessible from [MDT's feed page](#). [These instructions](#) provide additional information on how to add an RSS feed to your Internet Explorer browser and/or your Outlook email. If your organization uses a web browser or email system outside of these, please contact your IT department for instructions on how to add a feed.



RSS stands for "Rich Site Summary". It's also been dubbed "Really Simple Syndication", and the symbol to the left is the icon to let you know a feed is available. An RSS feed notifies subscribers when new content is published to a web site. In the case of MDT's Research feed, notifications

are pulled from the content that's added to our [What's New web page](#). The content on this page is updated whenever a new product is posted on any of our project pages, and as it's added, you'll receive a notice if you're subscribed to the feed. It allows our users, for the first time, to be notified of products beyond final reports. Plus, it saves time, as users no longer have to check back with our What's New page regularly.

We also continue to have listservs set up to which we send out email notifications of new final research reports, experimental project reports, research project solicitations, requests for proposals, and the Research newsletter. To sign up for these email alerts, visit our [registration page](#) and fill out your contact information (all that is required is an email address) under the corresponding publication type for which you want to be notified.

Utilizing these technologies can help you stay informed quickly and efficiently with the new research that is being produced by MDT. If you have any questions, please contact Katy Callon (kcallon@mt.gov or 406-444-6338).

NEW RESEARCH REPORTS

[Field Investigation of Geosynthetics Used for Subgrade Soil Stabilization, Phase II](#)

[A Peer-to-Peer Traffic Safety Campaign Program Final Report](#)

A listing of all past and current projects can be found at http://www.mdt.mt.gov/research/projects/sub_listing.shtml.

NEW EXPERIMENTAL REPORTS

[Crack Sealing Milled Asphalt Pavement Prior to Overlay](#)

[Plant Mix Seal \(PMS\) on Concrete Pavement Dowel Retrofit](#)



[Seal Coast Asphalt Emulsion over Existing Chip Seal](#)

[Stay-Tuff Woven Fence Construction](#)

A listing of all past and current projects can be found at
http://www.mdt.mt.gov/research/projects/exp_sub_listing.shtml.

CALENDAR OF EVENTS

August

MDT RRC Meeting 8/27/14

September

Highway IDEA Proposals Due 9/1/14
ACRP Legal Research Topics Due 9/5/14
ACRP Synthesis Research Topics Due 9/12/14
NCHRP Research Topics Due 9/15/14
Rail Safety IDEA Proposals Due 9/16/14
Transit IDEA Proposals Due 9/16/14
MDT RRC Meeting 9/24/14
TCRP Legal Studies Research Topics Due 9/30/14

October

Domestic Scan (NCHRP 20-68A) Proposals
Due 10/15/14

MDT RRC Meeting 10/29/14

November

AASHTO Annual Meeting
11/20-24/14

December

MDT RRC Meeting 12/17/14

January

TRB Annual Meeting
1/11-15/15



REMINDER

Information on research services and products, such as research and experimental project processes and reports and technology transfer services, can be found on the Research web site at www.mdt.mt.gov/research.

MDT's library collection can be searched through the [library catalog](#). The catalog and other information resources are available through the [MDT Library web site](#).

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