

SOLUTIONS



RESEARCH PROGRAMS

Fall 2020

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PROJECT HIGHLIGHTS

Guidelines for Chemically Stabilizing Problematic Soils

https://www.mdt.mt.gov/research/projects/geotech/chemical_stablize.shtml

The goal of this high value research project (see page 4) was to develop a comprehensive guideline to effectively evaluate the suitability and concentration of chemical additives to improve problematic subgrade soils. The following research objectives were laid out to achieve the goal of the project.

1. Determine the efficiency of common soil stabilizing agents for mitigating problematic Montana soils.
2. Develop protocols for selection of additive type and dosage.
3. Understand sulfate heaving issues and shed light on factors such as additive types along with reactive alumina and silica.
4. Examine scope and impact of using stabilizing agents to mitigate problematic soils against current MDT practice.



Some of the important observations/findings are as follows:

1. Out of the six soils collected, there were two high plasticity clays, two low plasticity clays, one low plasticity silt, and one silty sand. Two out of six soils contained soluble sulfates in excess of 10,000 ppm and, all but one soil contained organic content greater than 1%. Such soils require special attention in selecting stabilization method and durability.
2. It was noted that only 2% lime was sufficient to increase strength above 50 psi for all soils tested in this research. One soil required 7% cement to increase the strength above 50 psi whereas 2% lime was enough. However, some of these samples have high sulfate contents which can cause issues with durability.
3. Of the three different accelerated curing protocols studied in this research, Humidity Controlled Accelerated Curing (HCAC) is the most practical and reliable. This protocol is recommended when time is of the essence, otherwise, the ASTM standard 7-day curing protocol should be used.
4. Based on the Freeze -Thaw and Wetting – Drying durability studies, the



- results generally show that cement treatment is most compatible in terms of durability at 7-9% cement. It should be noted here that two soils would be suitable to be treated with cement but did not fare as well as the others.
5. The durability of chemical treatment on four of the soils was poor compared to other Montana soils. This could be due to the high amounts of sulfates present in these soils.
 6. Special borrow is more favorable than chemical stabilization in the long term when compared to soils that failed in the durability tests. When considering soils that performed well in the durability test, chemical stabilization is the more favorable alternative than special borrow.
 7. The general cost increase in construction is higher for special borrow than chemical stabilization. The percentage increase in initial construction cost due to the use of a

- chemically treated subgrade soil varied from 6.9% to 8.4%. The increase in construction cost for pavements on special borrow varied from 12.6% to 15.3%.
8. Based on the results of the lifecycle cost analysis (LCCA), it can be concluded that using chemical stabilization on problematic soils is more advantageous than special borrow, if the durability of the treatment is high. When durability results are poor for chemical treatments, special borrow is more cost advantageous in the long term. It should be noted that the life cycle costs and analyses for this research project are based purely upon construction costs. Additional incurred costs and/or time that would be included during project design and development to implement chemical stabilization have not been included in this analysis.

For more information, visit the project page at the above URL or contact Susan Sillick (ssillick@mt.gov or 406.444.7693).

Production Rate Estimation and Activity Sequence Logics Using Daily Work Report Data

https://www.mdt.mt.gov/research/projects/const/production_rates.shtml

Accurate and reliable project duration estimation is highly dependent upon two major components:

- ★ Reasonable production rate estimation of major work items
- ★ Logical sequencing of those work items

Phase I of this research developed an MS Excel based production rate estimation tool (PRET). Phase II (this project) of this research resulted in the development of construction activity sequence logic diagrams for most common work types at MDT. Six most common highway project types in MDT are:

- ★ overlay (urban)
- ★ overlay (rural)
- ★ safety
- ★ seal & cover
- ★ bridge reconstruction and rehabilitation

These work types account for more than 60% of highway projects at MDT. The current list of controlling work items has been expanded into 48 items. For each work type, a construction activity sequence logic diagram was developed to illustrate frequent controlling work items and their sequential relationship.

The results of this research project can help MDT quickly identify the most common controlling work items and develop a reliable sequence logic for different types of highway projects.

For more information, visit the project website at the above link or contact Susan Sillick (ssillick@mt.gov, 406.444.7693).



Void-Reducing Asphalt Membrane (VRAM)

<https://www.mdt.mt.gov/research/projects/condon.shtml>



Centerline rumble strips (CLRS) are grooves within the centerline that produce noise and vibration when the tires of a vehicle come into contact with them. The noise and vibration alerts the driver that they have departed from their lane and gives the driver an opportunity to recover. Centerline rumble strips have an additional benefit of helping drivers navigate during poor weather conditions such as fog, snow, and rain.

In an effort to mitigate potential deterioration, the department has elected to test the efficacy of adding a void reducing asphalt membrane (VRAM) on Primary 83 near the town of Condon, Montana.

JBAND is the selected VRAM product, which is produced by Asphalt Materials. It is applied by spray truck as a heavy fluid membrane under the intended longitudinal joint. Per

manufacturers information, once cured, the JBAND remains a non-tracking stripe; as production asphalt cement (AC) is applied over the membrane and compacted, it migrates into the overlay to reduce joint permeability. It has been reported on average that 50-70% of the VRAM may migrate into the AC overlay. The JBAND was applied in two passes at approximate 9" (23cm) in width.

The southbound (SB) lane was milled and swept. A hand-blower was used to clean the milled centerline before a pass of VRAM was applied to the milled centerline joint at the specified application rate of 1.67 lb./ft based on an 18" (46cm) wide strip with an average product thickness of 5/32". Then the lane was paved. The same process followed on the northbound (NB) lane.

The measure of effectiveness (MOE) prevalent with this project will focus on:

- ★ Construction practice
- ★ Long-term durability of the VRAM/JBAND application at the centerline joint

VRAM is a unique project that may not show any discernable distress for years. In order to see performance it will need to be monitored for five years or more.

For more information, visit the project website at the above link or contact Jeremy Schneidt (jschneidt@mt.gov, 406.444.6269).

Welcome to New Staff Member Vaneza Callejas



Vaneza Callejas joins us from CTC & Associates as a Research Project Manager. She joined our team in March. Vaneza has over 14 years of project management experience in the educational technology, e-learning, and education industries.

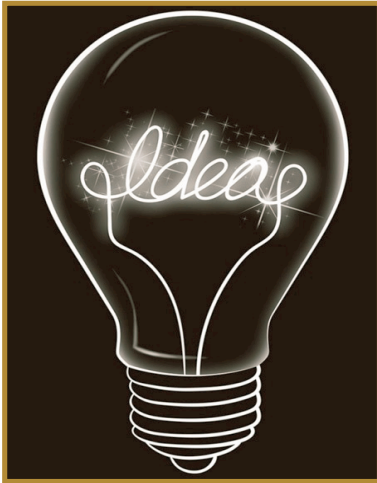
She has extensive experience with application, and enterprise software development. Vaneza has a Bachelor's degree in fine and studio arts from Concordia University (Montreal). Vaneza is managing most of our research projects.



2021 Federal Fiscal Year Research Projects and 2022 Federal Fiscal Year Solicitation

Submit your Research Ideas

<https://www.mdt.mt.gov/research/unique/solicit.shtml>



MDT is currently soliciting for research ideas for the 2022 FFY.

A Stage 1: Research Idea form is due by March 31, 2021.

You can subscribe to the [MDT Research Solicitation listserv](#) (see the second to last listserv form) to receive notice of our annual solicitation for research ideas.

For FFY 2021, the following projects were moved forward to the Technical Panel stage:

- ★ [Artificial Intelligence \(AI\) Based Tool to Estimate Contract](#)
- ★ [Effective Wildlife Fences through Better Functioning Barriers at Access Roads and Jump-Outs](#)
- ★ [Exploration of UHPC Applications for Montana Bridges](#)
- ★ [Feasibility of Non-Proprietary Ultra-High Performance Concrete \(UHPC\) for Use in Highway Bridges in Montana](#)
- ★ [Safety Evaluation of Sinusoidal Centerline Rumble Strips](#)

For more information, please contact Susan Sillick (ssillick@mt.gov, 406.444.7693).

DID YOU KNOW?

High Value Research

Every year, there is a competition among state DOTs, DC, and Puerto Rico for High Value Research. Within each of the four AASHTO regions, four high value research projects are selected, for a total of 16 high value research projects nationwide. These projects are called the Sweet Sixteen. Each region conducts voting by peers to identify their top four projects. All of the submittals are published each year in a document titled [Research Impacts: Better – Faster – Cheaper](#). In addition, a brochure of the Sweet Sixteen titled [Research Makes the Difference](#) is published annually. Winners present their projects at the annual summer AASHTO Research Advisory Committee (RAC) meeting and are also presented with a certificate at the award luncheon. In addition, winners may present a poster at the TRB Annual Meeting the following year.



For more information, please contact Susan Sillick (ssillick@mt.gov, 406.444.7693).



LIBRARY CORNER

Special Library Association Conference 2020

<http://www.mdt.mt.gov/research/unique/services.shtml>



The MDT library has been extremely active in the special library community over the last several months. From the website, “The SLA Annual Conference is the main event for special librarians and information professionals keeping up with the latest challenges and trends in information, knowledge, and library management”. This year the MDT library was responsible for coordinating events contributed by the Transportation Division. As such, we were asked to emphasize management, curation, archival, research information, data, and content management. With these topics in mind, the transportation community offered a robust collection of sessions throughout the conference.

This conference was originally planned for June of 2020, to be held in Charlotte, North Carolina. In a pivot of grand proportions, the conference was moved to the Accelevents virtual platform to be held over the first two weeks of October.

Offering three days of live sessions, October 14-16, the conference included keynote presentations, interactive discussions, networking events, and live education sessions. Live sessions were recorded and made available for attendees to view on demand at their convenience.

The sessions organized by the Transportation Community include:

Do Your future Self a Favor With the Read Scale: Small Actions Now Have Big Impacts Later: Former Dean of Libraries at Texas Tech University Bella Karr Gerlich explained how to use the READ Scale reference ranking tool to get quantifiable data about the complexity of the questions special libraries receive. This tool can help library staff gather statistics that are important to show in annual reports and to stakeholders.

NTKN LibGuide Petting Zoo

This session was an overview of the [NTKN LibGuides](#) funded by the National Transportation Library. These guides are free to anyone who wants to use them. Contributors from special and academic libraries affiliated with transportation gather as information on our topics based on research needs. We maintain these guides to provide the most useful resources we can for researchers, practitioners and other interested parties.

Virtual Tour of Linda Hall Library of Science, Engineering & Technology - A “Lifesaver” Resource for Many – Cosponsored with the Engineering Division

This virtual tour of the famous Linda Hall Library of Science, Engineering and Technology, located in Kansas City was an impressive session. The faculty of the library took turns discussing their respective sections and took us on a tour of their stacks and archives.

We Have High Standards! The 2020 Standards Update –

Co-sponsored with the Engineering Division. This session is where Transportation and Engineering libraries get up-to-date information on standards and specifications. This update is a yearly session that always provides a wealth of information.

Reference Rodeo and The Data Collection Connection

This session hosted a panel of experienced data collection experts. They discussed their research and the tools they use to evaluate the impact of special libraries and information services. The panel discussed reference tracking services and shared open access resources that can help you gather statistics.



Government Transportation Research Information Committee Meeting

An important SLA tradition for the Transportation Division since the 1980s, the Government Transportation Research Information Committee (GTRIC) meeting, remains an opportunity for the transportation community to benefit from educational programming and networking. Attendees engaged in a round table discussion on best practices, technology, and general information exchange regarding the unique challenges of transportation librarianship.

Transportation Community Business Meeting

All division members were welcomed to join the board brainstorming ideas for division activities and services.

It has been a busy few months at the MDT Library and we are glad to have had the opportunity to contribute to the greater SLA experience for all divisions.

For more information, please contact Bobbi deMontigny (bodemontigny@mt.gov, 406-444-0871)

CALENDAR OF EVENTS

January

- TRB Annual Meeting 1/4-1/29
- ACRP Synthesis Panel Nominations Due - 1/17
- MDT RRC Meeting - 1/21

February

- TCRP Panel Nominations Due - 2/5
- BTSCRIP Problem Statements Due - 2/12
- NCHRP Synthesis Topics Due - 2/17
- MDT RRC Meeting - 2/25

March

- NCHRP IDEA Proposals Due- 3/1
- TCRP Synthesis Topics Due - 3/19
- MDT RRC Meeting - 3/31

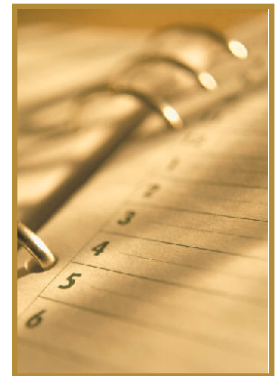
- Submission of High Value Research
Due - 3/31

April

- ACRP Problem Statements Due - TBD
- MDT RRC Meeting - 4/30

May

- TCRP IDEA Proposals Due- 5/15
- MDT RRC Meeting- 5/26



For additional information, please see: <http://rppm.transportation.org/Lists/Calendar/calendar.aspx>.



NEW RESEARCH PROJECTS

[Artificial Intelligence \(AI\) Based Tool to Estimate Contract Time](#)

[Effective Wildlife Fences through Better Functioning Barriers at Access Roads and Jump-Outs](#)

[Exploration of UHPC Applications for Montana Bridges](#)

[Feasibility of Non-Proprietary Ultra-High Performance Concrete \(UHPC\) for Use in Highway Bridges in Montana – Phase 2: Field Application](#)

[Safety Evaluation of Sinusoidal Centerline Rumble Strips](#)

NEW RESEARCH REPORTS

[Effective Production Rate Estimation and Activity Sequencing Logics Using Daily Work Report Data: Phase 2](#)

A listing of all past and current research projects can be found at

http://www.mdt.mt.gov/research/projects/sub_listing.shtml

NEW EXPERIMENTAL PROJECTS

[Barrier Reflector Durability Study](#)

[Condon North & South Void Reducing Asphalt Membrane \(VRAM\)](#)

[Gilford East CRS-2P AND CHFRS-2P Emulsion Comparison and Fog Seal](#)

NEW EXPERIMENTAL REPORTS

[Fog Seal over Chip Seal \(FSCS\) Applications](#)

A listing of all past and current experimental projects can be found at

http://www.mdt.mt.gov/research/projects/exp_sub_listing.shtml



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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