

MINNESOTA LTAP

TECHNOLOGY EXCHANGE

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Minnesota Local Technical Assistance Program

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Congratulations, Minnesota Mousetrappers!



Congratulations to the recipients of Minnesota’s 2021 Build a Better Mousetrap Awards! First place goes to the City of New Brighton for its skid loader attachment (left), and second place to Freeborn County for step extensions for Macks. Read more on page 2.

Cargo securement strategies ensure safety

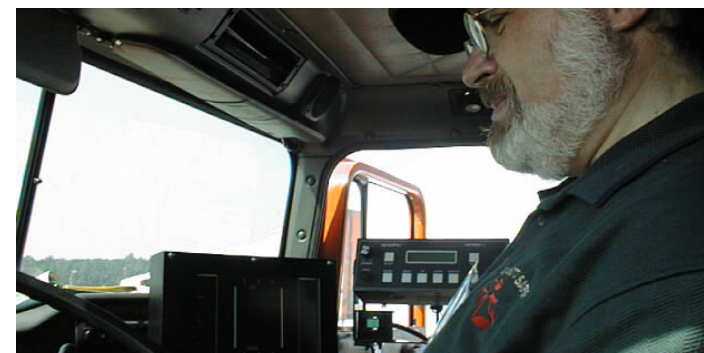


Heavy truck cargo can become dangerous if not secured properly. A Minnesota LTAP training event detailed the latest cargo securement strategies and outlined how drivers can use them to ensure safety.

Brian Barott, an equipment training specialist with the Minnesota Department of Transportation, described careful cargo securement as a form of defensive driving. He presented photos of truck cabs crushed by improperly secured loads and a video of cargo falling off its trailer as the truck rounds a corner.

Understanding vehicle dynamics, Barott said, is critical for safe and effective cargo securement. The overall goal is to ensure that nothing on the

Cargo continued on page 7



Driver training rules go in effect February 7

Is your agency ready? The Entry-Level Driver Training (ELDT) regulations from the Federal Motor Carrier Safety Administration (FMCSA) go into effect February 7, 2022.

Under the new requirements, an entry-level driver must successfully complete a program of theory and behind-the-wheel instruction prior to taking the Commercial Driver’s License (CDL) test.

The ELDT Program sets the baseline for training requirements for entry-level drivers. This includes drivers applying to:

- Obtain a Class A or Class B CDL for the first time.
- Upgrade an existing Class B CDL to a Class A CDL.
- Obtain a school bus (S), passenger (P), or hazardous materials (H) endorsement for the first time.

The new rules support FMCSA’s goal of ensuring that only qualified drivers are behind the wheel of commercial motor vehicles.

CDL continued on page 3



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READ THE
EXCHANGE
 online for links to publications
 and other resources.

HONORS

Mousetraps: An attachment, an extension, and a marker

First Place: City of New Brighton

Skid loader attachment

Problem: When dumping gravel and asphalt in smaller areas such as water main break sites, city staff were relying on a skid loader, shoveling, and a lot of hand luting to complete the job. This process was time- and labor-intensive and left a lot of material in the street to clean up.

Solution: The city purchased a skid loader attachment and modified it to allow workers to spread material faster, cleaner, and more evenly. Modifications included welding on a swivel plate, adding a hydraulic cylinder for leveling, creating and welding the tubing framework, and making screeds in different widths. It took 60 hours to create and cost about \$1,600. The attachment requires fewer workers, cuts the time it takes to do a job in half, and improves safety by helping keep workers out of traffic.

Second Place: Freeborn County

Step extensions for Macks

Problem: County workers could not safely scrape ice off of or clean the windows of their Mack trucks. It was dangerous trying to climb up onto the tire, especially while parked on the side of the road with other vehicles driving by.

Solution: The county purchased factory steps from Mack and modified them to make extensions to the existing cab entry steps, allowing workers to more safely climb up onto the truck tires to clean their windows. The modification process required sheet metal, square tubing, a welder, and a band saw, and it cost approximately \$200 per truck for materials. The step extensions will reduce the number of slips, trips, and falls that may have happened when workers were climbing on things that said “no step” or trying to pull themselves up onto the big tires.

Runner-up: Otter Tail County

Chip-seal marker installation tool

Problem: When installing chip-seal markers, county workers had to spend a lot of time getting on and off the tailgate of the pickup truck, walking down the road, and bending over to place each marker.

Solution: County staff created a chip-seal marker installation tool that allows one person to drive the pickup truck while another person in the back installs the chip-seal markers without getting off the tailgate. The tool took about one hour to fabricate and cost less than \$20 in materials. Chip-seal markers can now be installed at a minimum of double the speed with the same number of workers. ■



The chip-seal marker installation tool speeds up the process.



Submit your ideas for the 2022 Mousetrap competition!

As you work on projects throughout the year, please keep the 2022 contest in mind. We want to hear about your agency's creative solutions, and submissions are welcome at any time. To enter, just submit an entry form by May 15, 2022. You're also encouraged (but not required) to submit photos and short video clips showcasing your project along with your entry form. For more information, please contact Katherine Stanley at sell0146@umn.edu or 612-626-1023. ■

Minnesotans receive national APWA awards

Two Minnesota transportation professionals are among the 2021 award recipients from the American Public Works Association (APWA).



Chris Petree

Chris Petree received the Harry S. Swearingen Award for Outstanding Achievement and Excellence in Chapter Service. Petree is a member of Minnesota LTAP's steering committee and a graduate of our Roads Scholar program. He has been in the public works profession over 28 years and currently is the director of Rochester operations for WSB in Minneapolis. He previously was Rochester's director of public works.

“Chris is passionate and dedicated to bringing education and learning opportunities to public works employees and

APWA members, which benefits communities throughout the state of Minnesota and beyond,” says Mindy Carlson, MnLTAP program director.

Matthew Morreim, assistant city engineer for the City of St. Paul, received the Professional Manager of the Year award in the transportation category. One of

the many achievements cited in his submission materials was developing and deploying an apprenticeship program (with the city's human resources office) to bring new employees into the workplace without the normally required commercial driver's license. These apprentices move into a street maintenance worker position after they gain their CDL.

And an unusual highlight: During the civil unrest and rioting in St. Paul following the murder of George Floyd in 2020, Morreim led the deployment of 12 plow trucks with street maintenance service workers to protect businesses in the University Avenue Midway business area. Public Works assisted with this effort until the National Guard arrived and took over the protection detail. ■

(Adapted from award submission materials. Read more about the awards at apwa-mn.org.)



Matthew Morreim

Technology Exchange

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Technology Exchange welcomes contributions and suggestions from its readers. Submit ideas and other comments to Pamela Snopl, managing editor.

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OPERA project: Trail plow cutting edges

The City of Eagan, Minnesota, Public Works Department maintains 130 miles of trails and sidewalks. But standard steel cutting edges on trail plowing equipment typically need to be replaced annually and, often, multiple times per winter snow season. The cost for parts and labor can really add up over five years.

Tungsten carbide vs. standard steel cutting edges

Eagan maintenance staff found tungsten carbide cutting-edge sections performed well on roadway snowplows, so they decided to explore the feasibility of also using the blade edges on trail plows. They wanted to determine if the quality of snow removal would be adequate and cost-effective when installed on trail plows.

Eagan received a \$5,000 grant through the Local OPERA Program to compare the effectiveness of tungsten carbide cutting edges to those of standard steel on trail plows.

Tungsten carbide proves more cost-effective

City staff estimated the potential cost-savings of using the tungsten carbide plow cutting edges would be \$5,700 over five years. Hardened steel edges, when replaced annually, cost \$1,480 per plow. Tungsten carbide blade edges, which last at least five years, cost \$1,700 each.

A project team studied three pieces of trail plowing equipment, all equipped with V-plows. The standard steel cutting edge remained installed on one plow, while the other two were equipped with the tungsten carbide wear edges: one with standard 12-inch-wide cutting-edge sections, the other with the standard sections cut in half to 6 inches. The team also monitored the quality of snow removal



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OPERA Funding
\$5,000

The project team used segmented and flexible tungsten carbide plow cutting edges.

by comparing three locations with similar pavement conditions on each trail plow route. Plow performance and cutting-edge wear were monitored over approximately 30 plowing events.

Eagan chooses tungsten carbide cutting edges for all trail plows

The team found each style of cutting edge provided acceptable finished results, with minimal snow left on the trail surface and significant portions of the trail surface scraped clean. Moreover, the team found no noticeable difference in the snow removal performance between plows with the 12-inch segments and 6-inch tungsten carbide segments. In addition, they had no issues with rocks or debris

becoming lodged in joints of the tungsten carbide wear edges.

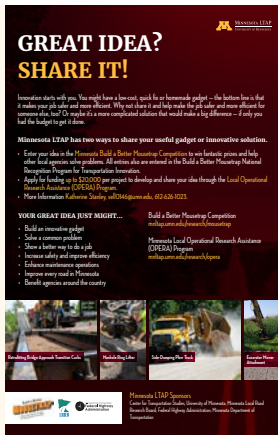
As a result of this study, the City of Eagan intends to use segmented 12-inch tungsten carbide cutting edges on all trail plowing equipment beginning with the 2021–2022 winter season. The project team also feels that other agencies may benefit from this research, too, because using tungsten carbide cutting edges on trail plows could provide a net reduction in replacement costs over the life cycle of the cutting edge while maintaining the quality of snow removal. ■



Send us your OPERA ideas: Tools, processes, or tips for COVID-19

Do you have ideas for improving tools or processes? Or maybe you've been finding solutions for COVID-related impacts to your job that could benefit other agencies? If so, please send your ideas to the LRRB's Local

Operational Research Assistance (OPERA) Program. The submission deadline is September 24, and funding is limited. Please see the OPERA web page for details: mnltp.umn.edu/opera. ■



Download free OPERA/ Mousetrap poster for your shop

Minnesota LTAP has created a 11x17-inch poster encouraging maintenance staff to submit their OPERA and Mousetrap ideas. Please post it in your shop or other work areas. It's free for downloading at mnltp.umn.edu/opera. ■

National Mousetrap: Paver smooths uneven spot repairs



Officials with the Lower Heidelberg Township in Berks County, Pennsylvania, needed a solution to improve the daily commute of their residents. Their issue was uneven pavement after completing spot repairs or filling in shoulders using a hand shovel or rake. In addition to the uneven pavement, the manual repairs put road crews at risk for back injuries.

The Black Top and Shoulder Stone Paver was the solution. Developed by the road crew, the paver allows asphalt mix to be unloaded and laid down in just 6 to 8 minutes compared to 35 minutes using a hand shovel or rake. The paver, which cost \$1,950, allows workers to set an even height for more level paving.

Township officials say this patch repair method is a huge cost-saver and provides a smoother riding surface for drivers and a safer task for road crews. ■

Learn more:

- Matt Clay, road foreman, Lower Heidelberg Township, Berks County, 484-256-3558, mclay@lowerhbtwp.org

CDL from page 1

To find training providers or learn how your agency can become a training provider, please visit <https://tpr.fmcsa.dot.gov>. You may also subscribe for news and updates.

And stay tuned—Minnesota LTAP will also be providing updates and potential training opportunities from Minnesota agencies and colleges. ■



MAINTENANCE

Managing winter maintenance in a changing environment

Management techniques for snow and ice operations are undergoing a shift, and supervisors need to adapt their strategies if they wish to keep ahead in a changing environment. A webinar at the 2021 American Public Works Association (APWA) Snow and Ice Conference detailed how.

Lee Perkins, director of public works and engineering for Renfrew County in Ontario, Canada, said that the gold standard for management strategies has changed in recent decades toward a more team- and communication-oriented approach. This is in part because of the unique, multi-generational mix of workers in the winter maintenance field—many with varying work philosophies and familiarity with technology.

This change is also needed because of the steady development of new technologies. Fast-paced data has become a central part of maintenance planning, and specialized training is becoming increasingly important as computers and other complicated (and expensive) technologies integrate with maintenance vehicles.

Winter maintenance success will increasingly depend on effective planning, training, communication, and teamwork. Adapting to these changing needs, Perkins said, will be a slow process, since traditions tend to die hard and government organizations are generally slow to change.

Team-focused strategies

Taking a team- and communication-focused approach to management can serve as solid bedrock for creating an effective winter maintenance system, Perkins said. The “keys for success” include:

- Communicating effectively
- Developing staff and delegating roles effectively
- Promoting an honest, fair, and cordial work environment
- Caring for the needs of the team members
- Being able to work well under stressful conditions
- Taking a proactive approach to issues
- Giving sincere feedback
- Listening to staff
- Developing and promoting effective training

Overall, the welfare and success of the team should be a top priority. “It’s never about the role,” Perkins said. “It’s not about climbing the ladder, getting to the next level and all that. It’s always about the goal.”

Winter maintenance planning

Developing an official, written winter maintenance plan is important for a number of reasons, Perkins stressed. For the public, it outlines what levels of service they should expect from the department. Within the department, it serves to identify responsibilities and roles, outline strategies and resources, and establish a line of succession.

“If you’re prepared, luck is definitely on your side,” Perkins said. He outlined what an annual winter maintenance plan might look like:

Later winter/early spring

- Gather and analyze past-season information to be used in future planning—weather patterns, personnel hours spent, payroll total, etc.

Spring

- Schedule planning meetings for all relevant stakeholders.
- Review lessons from the past season and make plans for the coming season.
- Check equipment and facilities, restock supplies.

Late spring/early summer

- Forecast personnel/staffing needs.
- Estimate vehicle/equipment requirements.

Late summer

- Issue new contracts.
- Develop public outreach for the coming year.
- Finish any planned maintenance/upgrades of facilities.
- Check that you have or can get necessary equipment/materials.

Early fall

- Issue winter operations plans/maps.
- Brief officials and the public on the plans.
- Conduct training.
- Issue equipment.
- Inspect routes.
- Conduct practice dry-runs.

Early/mid-winter

- If there’s no snow yet, double-check equipment, materials, route plans, and communication/notification systems.
- If there’s snow, have an active strategy in place for inspecting, reviewing, and fixing any equipment or plans that need alteration.

Late winter/early spring

- Begin again.

“It really is just an endless planning cycle,” Perkins said.

Planning resources

The APWA offers a Winter Maintenance Supervisor Certificate workshop during its annual North American Snow Conference. Perkins also recommended looking at existing winter maintenance plans for guidance, such as MnDOT’s *Maintenance Manual*: dot.state.mn.us/maintenance/manual.html. ■

—Sophie Koch, MnLTAP freelancer



U researchers and Edina snowplow drivers team up to reduce salt in Minnesota’s waters

University of Minnesota researchers collaborated with the City of Edina on a research project that aimed to gather data and create tools for reducing road salt contamination in Minnesota’s urban waters.

“When operators have the right tools to do their jobs, they can maintain a high level of service and use less salt,” says Jessica Wilson, Edina’s water resources coordinator.

The first step in this project was to gain a better understanding of how chloride moves from roads to watersheds, says Larry Baker, the principal investigator and a professor in the Department of Bioproducts and Biosystems Engineering.

One noteworthy finding is that chloride movement doesn’t tend to be gradual—rather, it comes in short bursts during a handful of events spread across the year. During both winters of the study (2017–18 and 2018–19), the researchers found that around 90 percent of the yearly chloride loading moved off the

roads in under eight non-consecutive days.

“It occurs when you have these large melt events,” Baker says. “Particularly these ‘winter mix’ events, where you might have snow falling that accumulates, melts, and then freezes.” A contributing factor in this pattern may be roadside snow piles, which were shown to accumulate large amounts of chloride.

The researchers then developed scenario models to evaluate chloride movement throughout larger watersheds. They also created an Active Management Toolkit with a training guide and spreadsheet tools. One spreadsheet, for example, allows users to forecast chloride concentrations in groundwater depending on the percentage of impervious surfaces. This active management approach—checking the effects of actions and making adjustments—is one way that local agencies may be able to reduce salt use while maintaining winter traffic mobility, Baker says.

The U team also coordinated workshops with Edina public works staff at the end of each winter of the study. The workshops brought together the researchers and plow operators and their supervisors to share data and knowledge for improving operations.

The workshops generated a suite of solutions to reduce salt use. For example, operators in the first workshop proposed the purchase of carbide blades to improve ice removal, which led the city to purchase and install five carbide blades in 2018. The carbide blades seemed to improve ice removal and had the side benefit of being far less noisy than steel blades, Baker says.

The research was funded by the Minnesota Local Road Research Board. The final report, toolkit, and two videos are available on MnDOT’s research project website. ■

—Sophie Koch, MnLTAP freelancer

Learn more:

- *Adaptive Management to Improve De-Icing Operations* (MnDOT, 2021)



'Road Map' will help organize and prioritize public works assets

An asset management program can help public works departments organize resources, finances, and risks and manage public expectations. Speakers at the 2021 APWA Snow and Ice Conference outlined a "road map" that details how to create one.

In 2018 the APWA created the National Asset Management Technical Committee to provide support for members. One of the committee's more recent projects is the Asset Management Road Map—an online, 12-step guide for creating an asset management program.

An asset is defined as any item that provides value—and for a public works department, this can include many things. A paved road is an asset, as is a road sign or a snowplow.

Toby Rickman, deputy director for public works in Pierce County, Washington, and a member of the technical committee, said that the Road Map was designed as an interactive, living tool, with each step supplemented by resource libraries.

"This is an opportunity for all of you, as members, to share information with each other and add to these libraries that will grow over time," Rickman said.

Each step in the Road Map is called a stop. Becky Bonebrake, senior civil engineer at the City of Overland Park, Kansas, and another member of the technical committee, traded off with Rickman describing each one.

Stop 1 – Organize roles, responsibilities, and assignments

Pick the people who will be responsible for delivering the asset management plan overall and identify the positions, competencies, and responsibilities of each person. Ideally, they should be from all levels of the public works organization.

Stop 2 – Establish asset management policy and strategy

In clear, concise, and simple language, determine what the overall goals of the asset management

plan should be and what specific tactics it will use to meet those goals.

Stop 3 – Set levels of service for the system

Determine, in a quantifiable manner, the quality and availability that the community should expect from the agency's assets.

Stop 4 – Collect asset management information

Create an inventory database for the agency's assets. For a public works department, this might include information such as location, materials, manufacturer, install date, condition, and work history.

Stop 5 – Assign criticality/risk

Criticality is defined as a measure of how important an asset is; the more critical it is, the more impact it will have if it fails. Risk combines criticality with the probability of an asset failing. Assigning criticality and risk can be used to prioritize assets and juggle funding.

Stop 6 – Set target level of service (operational)

Analyze the service needs of the community and establish how these needs will be prioritized. If a road needs maintenance, for example, it is wasteful to do repairs too early but dangerous to do them too late.

Stop 7 – Develop maintenance and operational strategies

Create a plan that details how and when to service the needs of the community.

Stop 8 – Develop capital improvement strategy

Create a plan that details how to fund assets. Having a long-term view is generally advisable; this involves considering the long-term storage and maintenance of assets. Criticality and risk should also enter into the plan, as it helps prioritize funding.



Stop 9 – Develop financial strategy

This ties in with Stop 8 but takes a broader approach to budgeting; in the long term, what is the most cost-effective way of accomplishing the asset management goals?

Stop 10 – Assemble asset management plan

Put everything together and outline the necessary activities/programs in each area of the plan. Again, think in the long term (10 to 20 years).

Stop 11 – Implement asset management plan

Get the plan out to government bodies and the public and set things in motion.

Stop 12 – Review and adjust

Analyze the effectiveness of the plan and make adjustments as necessary.

Look for version 1.0 of the Road Map on the technical committee's website in the fall of 2021. A long-term plan and discussion about version 2.0 is already being developed, which Rickman said might include expanded library resources and any necessary adjustments or expansions to the stops. ■

—Sophie Koch, MnLTAP freelancer

New from Clear Roads

Following are some recent materials from the Clear Roads national research consortium: clearroads.org.

Pre-wetting methods and procedures

Researchers detailed the current state of the practice for pre-wetting salt and other solid materials, capturing details on equipment, methods, materials, and application rates. The project also identified a list of preliminary recommendations to help agencies get the most benefit from pre-wetting.

Advanced technologies for winter operations

This project produced a guide to implementing eight emerging and recently developed winter maintenance technologies. By understanding the options and their benefits, agencies can make better-informed decisions about which technologies to invest in.

Tools and strategies for developing severity indexes

Researchers created a step-by-step guide and a flowchart tool to help agencies identify or develop severity index methods that fit their needs and their available data sources. Once implemented, these storm and winter severity indexes will allow winter maintenance managers, researchers, and transportation agencies to more effectively compare winter operations among localized areas, districts, and states. Agencies are also better able to compare individual storms across years. ■



Road weather data improves performance dashboards

A six-page fact sheet describes how agencies may leverage road weather data to develop and improve performance measures for enhanced storm management and performance management dashboards. The document was developed by the Every Day Counts (EDC) Weather Responsive Management Strategies (WRMS) team.

Performance management is an important application for WRMS. It enables agencies to better guide investments and measure progress by using historic and real-time data as well as forecasted information. WRMS data management tools can use road weather data from mobile and connected vehicle technologies to enhance agencies' existing performance measures.

The fact sheet discusses considerations for data collection; development of road weather performance indices; and data usage, application, and sharing. It provides resources for topics such as performance measures in snow and ice control operations, snow removal performance metrics, and examples of state DOT dashboards.

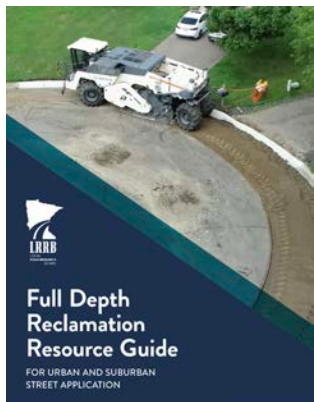
(Adapted from EDC News, July 15, 2021.)



Every Day Counts is the FHWA's initiative to advance a culture of innovation in the transportation community in partnership with public and private stakeholders.

PAVEMENT

Full-depth reclamation: Guidance for urban areas



Full-depth reclamation (FDR) is a common strategy used on rural roadways to reduce costs for materials and hauling. City and county engineers across Minnesota, however, have questioned FDR's feasibility in urban settings.

To help cities and counties determine feasibility, the Minnesota

Local Road Research Board developed informational materials on how to conduct FDR within urban areas. Topics include curb and gutter, utilities, storm sewers, and manholes.

A reference guide covers what to consider when choosing candidate roads, specification/construction and inspection, and costs.

Following are excerpts from a two-page FAQ sheet that complements the guide.

Can FDR be used in urban areas?

Yes, many Minnesota cities are now using FDR in urban settings. All the material is reclaimed, and any excess reclaimed material is either incorporated on site or removed for use on other projects. Reclamation around or near curb and gutter and utilities is easy with talented operators.

Is there a MnDOT specification for urban design?

MnDOT Specification 2215 Reclamation can be modified by special provisions. The City of Shoreview has shared its special provisions; it is included as an appendix to the Reference Guide.

What practices or precautions are used on or around underground utilities?

Castings and valve boxes may be removed and covered with metal plates at a lower elevation out of the depth zone planned for pulverization. After reclamation is completed prior to final surfacing, castings are adjusted and placed to finish grade. Many urbanized applications have found that full-depth bituminous patches around structures mitigate settlement issues and compaction challenges near manholes/valve boxes. As an alternative, manholes and/or valve boxes may be left in place, marked well, and squared off from the reclamation.

How close can the reclaimer get to utilities/curb and gutter?

Quality operators can navigate the reclaimer within inches of the curb line. Remaining asphalt can be cleaned up with skid steer operation. When utility castings at the surface remain in place, the reclamation operator will mill up to one to two feet away. The remaining asphalt near castings can be removed with skid steer operations; typically, full-depth bituminous material is placed around the structure.

FDR typically results in a thicker pavement structure (higher profile). How should this be accounted for within the confines of existing curb and gutter, utilities, intersections, driveways?

The desired thickness is determined during the pavement and mix design procedures. The typical section in an urban setting will guide the use of excess reclaimed material.

Does urban FDR require any special equipment?

Urban FDR without the use of a stabilizing agent requires:

- Self-propelled reclaimer
- Motor grader, loaders
- Water truck with spray bar
- Pneumatic-tired, pad foot, and/or double drum vibratory rollers for compaction

Optional equipment for use in an urban setting may include small mill machines to traverse around utilities in small spaces or along curb lines. Milling may be done before or after reclamation if excess material is a concern

How does the FDR process (equipment train) work within the confines of urban settings?

Cul-de-sacs and tight radii can still be a challenge, especially for stabilized full-depth reclamation. Where geometrics challenge use of stabilization, material can be removed manually, stabilized in another area of the project, and hauled back to the cul-de-sac for placement. Work near curb and gutter and around utilities is easily accommodated as noted above. ■



Asphalt membrane reduces air voids, improves performance

J-Band is a void-reducing asphalt membrane (VRAM) product. These products—mixes of asphalt binder, polymer, and modifiers—hold new asphalt in place and migrate upward into the asphalt layer, filling air voids. MnDOT and other agencies rely mostly on anecdotal evidence and manufacturer claims to judge VRAM products and applications.

In a MnDOT-funded project, researchers evaluated the use of J-Band in an asphalt pavement on State Highway 22. Tests showed higher bond strength, lower permeability and air void levels, and improved crack resistance.

Maintenance Operations Research kick-starts the study

Potholes and similar asphalt failures typically occur at the seams between lanes. At these edges, asphalt's higher air void content makes it more susceptible to moisture penetration, freeze-thaw damage, and other failures.

Typically, the density within 6 inches of the longitudinal joint is lower than the density throughout the mat. To mitigate potential failures, crews can

spray a VRAM product at the seam location before the asphalt paving.

In 2017, Jerry Geib and Charlie Kremer submitted a proposal to MnDOT's Maintenance Operations Research (MOR) program. Geib, research operations engineer with MnDOT's Office of Materials and Road Research, and Kremer, materials engineer in MnDOT District 7, requested \$15,000 to test J-Band for longitudinal joint treatments. Their proposal was approved, and the funding was used to purchase the J-Band product.

In 2018, a 1-mile section was paved on TH 22 and treated with J-Band. At the test site, in Blue Earth County south of Mankato, J-Band was applied in an 18-inch-wide band at the longitudinal joint followed by a top layer of 1.5 to 2 inches. Another mile of pavement with no VRAM served as a control.

MnDOT then funded a study by Iowa State University to evaluate J-Band's performance. Researchers gathered a sample of the hot-mix asphalt to determine binder and mix gradation and collected about 40 cores from the two sections. They conducted lab tests on the cores for a range of properties. They returned to the paving site in October 2019 to do a visual survey for signs of distress and examine the density of mat locations and joints.

Results: J-Band extends pavement service life

The researchers found that J-Band migrated up into the top asphalt layer and reduced air voids from 8.5 to 5 percent. The product reduced water incursion and improved pavement strength. In laboratory testing, VRAM outperformed control sections in terms of bond energy, fracture energy, work of fracture, and surface energy.

"This VRAM is performing as advertised," says Eddie Johnson, research project engineer with MnDOT's Office of Materials and Road Research and the technical liaison for the study. "It reduced water



Researchers tested samples from an asphalt pavement on State Highway 22 that included J-Band under the longitudinal edge joints of asphalt lanes.

flow greatly. Mechanical tests indicated that J-Band strengthens the pavement structure."

Cost savings over time could be significant. "Trying to solve longitudinal joint cracking through compaction effort is not really possible," says Joseph Podolsky, bituminous materials scientist with Iowa State University and the study's principal investigator. "Using VRAM products is easier. The material should benefit long-term pavement performance where it is used."

Kremer notes that the cost of J-Band (or similar products) would be affected by product availability and application logistics.

MnDOT's Office of Materials and Road Research is writing a special provision for VRAM use, Geib says. ■

Learn more:

- *Use of J-Band to Improve the Performance of the HMA Longitudinal Joint* (MnDOT, 2020)



A mound of fill indicates where a test core was pulled from a joint that used J-Band.

THE SHELF

Minnesota LTAP partners with the MnDOT Library to operate a state-of-the-art service that can help you track down almost any resource from Minnesota or beyond. Questions? Contact Marilee Tuite, Minnesota LTAP librarian, 612-626-8753, ctslib@umn.edu.

Impacts of Internally Cured Concrete Paving on Contraction Joint Spacing Phase II: Field Implementation of Internally Cured Concrete for Iowa Pavement Systems (Iowa State University, April 2021)

Discusses a full-scale field demonstration using internally cured technology and its performance in rural roadways.

Construction & Materials Best Practice for Concrete Sidewalks (Massachusetts DOT, April 2021)

Summarizes an 18-month effort to investigate best practices to incorporate into the materials and construction of concrete sidewalks to mitigate surface scaling damage induced by freeze-thaw cycles in the presence of deicing chemicals.

Cycling Past 50: A Closer Look into the World of Older Cyclists (Minnesota Transportation Institute, April 2021)

Reports on 2,300 responses to a nationwide survey of older adults who cycle, including the impact of COVID-19 on older adults' cycling habits, the impact of aging on ability and agility, the impact of the built environment, types of bicycles, and opportunities to cycle with others.

Evaluation of the Filtration Effectiveness of Dewatering Bags and Assessment of Potential Improvements (Virginia Transportation Research Council, April 2021)

Evaluates the filtration effectiveness of dewatering bags approved for use by VDOT and selected dewatering bags that are

not currently approved by VDOT but are claimed to provide a higher level of filtration performance.

Inclusion of Speed and Weather Measures in Safety Performance Functions for Rural Roadways (IATSS Research, April 2021)

Determines how traffic speeds and different speed measures interact with roadway characteristics and weather conditions to influence the likelihood of crashes.

Street-level Flooding Platform: Sensing and Data Sharing for Urban Accessibility and Resilience (C2SMART Connected Cities with Smart Transportation, April 2021)

Describes the FloodSense project that began in 2020.

NCHRP Synthesis 564: Practices for Selecting Pedestrian and Bicycle Projects (TRB, May 2021)

Summarizes state DOT practices for selecting pedestrian and bicycle projects, excluding design elements.

Rural Transit Fact Book (Upper Great Plains Transportation Institute, May 2021)

Provides statistics and information on rural transit in America.

Transportation Research Circular E-C272: Technology Exchange on Local Roads Bridge Programs (TRB, May 2021)

Summarizes panel discussions of the Local Roads Bridge Programs.

Design and Development of an Automated Truck Mounted Attenuator (Safe-D National UTC, May 2021)

Describes an automated TMA system that will remove the driver in future phases from the TMA vehicle in mobile and short-duration work-zone operations using a short following distance leader-follower control concept.

NCHRP Research Report 966: Posted Speed Limit Setting Procedure and Tool: User Guide (TRB, June 2021)

Explains a speed limit setting procedure that considers factors beyond the 85th percentile speed, including both driver speed

Search me

The Minnesota LTAP website features custom search engines to help you find information. You can search:

- LTAP & TTAP Centers
- State DOTs
- Transit agencies
- University transportation centers

Bookmark mnltp.umn.edu/publications/library.

Other great resources are:

- LRRB's site: lrrb.org
- MnDOT Library's catalog: dot.state.mn.us/library ■

choice and safety associated with the roadway. ■

Transportation Library e-books available to cities, counties

The MnDOT Library has introduced a new service called cloudLibrary, which allows local agencies to borrow ebooks remotely. The new collection features ebooks that support professional development as well as policy and planning topics. Through the Minnesota Transportation Libraries Program, the ebooks collection is available to all city and county engineers and practitioners—all you need is a MnDOT library card ID. If you don't have an ID, please contact the library. ■

Cargo from page 1

trailer—even the tie-downs being used—can move in any direction.

"If you tip it over," Barott said, "the cargo should stay with the trailer."

Barott's presentation largely focused on cargo loads at or over 10,000 pounds. According to state and federal regulations, the tie-downs (or combination of tie-downs) holding the cargo in the forward, rearward, and lateral directions should each be able to carry at least 50 percent of the cargo's weight.

Tie-downs—both straps and chains—are generally rated for the weight they can support with a "working load limit," measured in pounds of force. The overall "aggregate" working load limit of the entire tie-down system must meet or exceed half the weight of the cargo, Barott said.

Tie-downs can be attached to the cargo in one of two ways—directly or indirectly:

- Direct securement attaches directly to the cargo itself, as in the case of a bulldozer chained to a flatbed—all tracked and rubber tire equipment. Direct tie-downs are also required to meet

downward-force requirements; when set at the proper angle, they should support a minimum of 20 percent of the cargo's weight.

- Indirect securement goes over the top of the cargo and keeps it in place using downward force, as in the case of a load of logs, lumber, or guard-rail.

Generally, direct securement is more effective if kept at a low angle (close to being as flush with the flatbed as possible), and indirect securement is more effective if kept at a high angle. Tie-downs should never be knotted or twisted, Barott added, and they should run straight from the cargo to the flatbed with no sideloading.

Barott also recommended checking the cargo securement after the first 50 miles of driving and again after three hours or 150 miles (whichever occurs first).

Overall, Barott said, the key is to always think in terms of safety. State and federal regulations should be followed, but they might not account for every scenario faced by a truck driver, and "technically legal" might not always translate to "safe."

"Don't say, 'Ah, that's good enough,' because the minute you tell me that, I'd be going back to look at what you did," he said.

The Minnesota Roadway Maintenance Training and Demo Day was sponsored by Minnesota LTAP, MnDOT, the Minnesota Local Road Research Board, and the Federal Highway Administration. The event was held in May in an online format, and the recording is available for viewing. ■

—Sophie Koch, MnLTAP freelancer



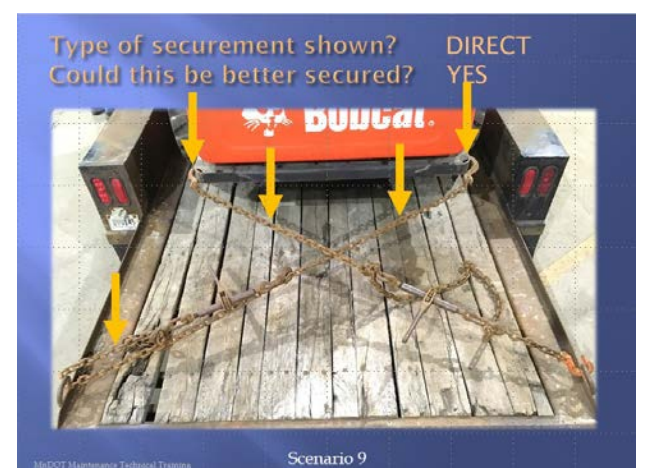
Avoid securement devices hooked to tracks (device can move on track, pad, or cleat). Look for manufacturer tie-down hook points. Tie-down system (chains) should be crossed when equipment is as wide or wider than the trailer. Also, must have 80% of the track or tire supported by trailer decking.

WATCH THE VIDEO:

The cargo securement training is available for free viewing at mnltp.umn.edu/training/roadway.



This is a close-up of the left rear tie-down system. It is incorrectly assembled—the chains can move. Provide separate hooks on both ends of the chain and bring the extra chain toward the center, at the binder.



Both chains in the tie-downs are twisted. In the left tie-down system, the D-ring is incorrectly assembled so the chain can move back and forth. To correct this load: Uncross the two tie-down systems so the hooks fit the manufacturer's hook points better.

TRAINING

MnLTAP plans in-person and virtual training

Minnesota LTAP will experiment with multiple options of in-person and virtual workshops this fall. Dates and delivery mechanisms are listed below and posted on our website. “We’re pleased to resume some on-site workshops,” says Mindy Carlson, LTAP program manager. “And because of the tremendous success our virtual workshops had reaching audiences we have never reached before, we want to con-

tinue our virtual training as well.”

Please visit our calendar for a variety of learning opportunities being offered by Minnesota LTAP and other agencies. Thank you for your patience and support as we maneuver through this ever-changing transitional time. ■

Calendar

Fall Maintenance Expo
(1 RS Maintenance credit) LTAP
Oct. 6–7, St. Cloud

Minnesota Truck-Weight Education Training
(1 RS Maintenance credit) LTAP
Oct. 6, Rochester
Oct. 7, Mankato
Oct. 13, Grand Rapids
Oct. 14, Detroit Lakes
Oct. 20, Elk River

Minnesota’s Best Practices for Traffic Sign Maintenance and Management
(1 RS Maintenance credit) LTAP
Oct. 19, Brainerd
Oct. 27, Rochester
Jan. 13, virtual

Transitioning into Leadership: Essential Skills for Supervision
(1 RS Leadership credit) LTAP
Oct. 29, virtual

Writing that Works! Communications Skills for Construction
(1 RS Maintenance and 1.0 RS Leadership credit) LTAP
Dec. 9, Waite Park

Asphalt Pavement Rehabilitation: Products, Processes, and Strategies
(1 RS Maintenance credit) LTAP
Feb. 9, Mankato
Feb. 10, Waite Park
Feb. 15, virtual

MnLTAP online courses

Culvert Design and Maintenance – \$45
(1 RS Maintenance credit) LTAP

Sign Maintenance and Management for Local Agencies – \$45
(1 RS Maintenance credit) LTAP

Gravel Road Maintenance and Design
– \$45
(1 RS Maintenance credit) LTAP

Fundamentals of Construction Inspection – Free
(1 RS Maintenance credit) LTAP

Other online courses eligible for RS credit

Maintenance Stormwater – Free
(0.5 RS Maintenance credit)

Math Basics for Maintenance Technicians
(1 RS Maintenance credit) – Free

Administration and Management Basics
(1 RS Leadership credit) – Free

Installation and Management of Roadside Turfgrasses – \$175
(1 RS Maintenance credit)

More agencies take MnLTAP online classes

By going virtual because of the pandemic, Minnesota LTAP was able to attract new people to our classes. “I was really pleased and amazed at the total number of people who attended the virtual work-zone traffic control classes,” says Kathy Schaefer, CTAP instructor. “We were able to reach approximately 41 agencies that have not requested this training in the past!” ■

LTAP training

LTAP training is marked above with an **LTAP**. Check the web for details and to register: mnltp.umn.edu. To be added to our mailing list, email mnltp@umn.edu or call 612-625-1813.

Roads Scholar Program

You can earn credits in Minnesota LTAP’s two Roads Scholar (RS) certificate programs by completing LTAP and other cosponsored training. One certificate is focused on maintenance operations and the other on leadership and supervision. To learn more or enroll in the program, visit mnltp.umn.edu/roadsscholar. ■

Program connects local agencies and interns

Will your agency need an intern next summer but you’re not sure how to find one? The Local Agency Transportation Internship Program (LATIP) connects local agency employers across Minnesota with current students pursuing careers in the field of transportation. LATIP aims to help city, county, and township agencies attract and develop the future workforce while giving students experience with real-world transportation projects.

The program is sponsored by Minnesota LTAP with funding from the Minnesota Local Road Research Board and is administered by the Center for Transportation Studies.

How it works

The program gathers summer internship postings and posts them in one online location for students to view and apply. LATIP also markets this collection of internship postings to students; in the pilot year, the program reached out to all five campuses of the University of Minnesota and to Minnesota State University, Mankato. Marketing is targeted to students in transportation-related areas of

study through the program’s connection to student groups, faculty, and career services staff.

LATIP offers agencies support and follow-up during the interviewing and hiring process. This includes providing insight into applicant pool trends, suggested timelines, and additional opportunities for students. There’s no cost to submit a posting or to participate in the program. However, your agency is responsible for interviewing, hiring, and paying your selected candidate(s).

Students find direct links to agency applications on the LATIP website.

Pilot results

In 2021, a total of 16 positions were posted from 11 participating agencies. In a follow-up survey, 100 percent of the responders said they would participate in the program in future years and that it was very easy to participate. More than 40 percent of responders said they think participating in LATIP led to an increase in applicants. One survey comment: “This was a great start, and I think it will be a great program moving forward that we can expand.”

Plans for next year

In 2022 the program will expand its reach and include targeted marketing to community and technical school students in Minnesota.

“This new element of the program will help provide more students access to internships with transportation and public works departments in local agencies across the state, including those students pursuing two-year degrees,” says Stephanie Malinoff, director of Minnesota LTAP.

Learn more about how the program works and why your agency should consider posting a job next year with LATIP by visiting our page for employers. Job postings will be accepted November 1 to February 15. Beginning January 1, postings will be added to the website on a weekly basis. Student outreach will begin in late January to coincide with the start of spring semesters. ■

Learn more:

- Local Agency Transportation Internship Program: mnltp.umn.edu/training/internship



The new internship program builds on a long-established version with MnDOT.