



TECHNOLOGY EXCHANGE

A Newsletter of the Minnesota Local Technical Assistance Program (LTAP)

UNIVERSITY OF MINNESOTA
CENTER FOR TRANSPORTATION STUDIES

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»»» LTAP

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Learn the art of gravel road maintenance with new DVD

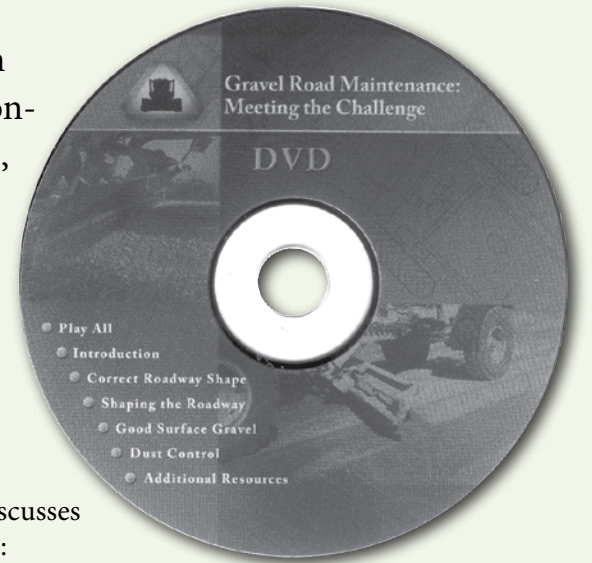
The workers who maintain gravel roads are making an important contribution to the safety, comfort, and convenience of their communities. Maintaining these roads, however, isn't easy—in fact, it is a tricky combination of art and science that workers must aim to develop. Minnesota LTAP has created a toolkit to teach maintenance workers, supervisors, and engineers the right way to perform gravel road maintenance.

The key component of the toolkit is a new DVD, *Gravel Road Maintenance: Meeting the Challenge*. The DVD can serve either as a stand-alone tutorial or as an instructor's tool to introduce the topics of gravel road maintenance.

Each chapter of the DVD discusses a specific maintenance topic:

- Correct Roadway Shape
- Shaping the Roadway
- Good Surface Gravel
- Dust Control

DVD continued on page 5



Register now for Spring Maintenance Training Expo

The 2006 Spring Maintenance Training Expo will be held April 11–12 at the St. Cloud Civic Center. It will emphasize quality training and education in roadway maintenance, best practices and operations, and new technologies.

Sessions are planned on the following topics:

- Gravel road maintenance
- Traffic calming
- Street sweeping, disposal, policies, and safety
- Work-zone safety
- Environmental issues
- Equipment purchasing and fleet management
- Maintenance operations
- Traffic striping

Vendors from a variety of companies will be on hand to show you their latest wares. You will also be able to earn credit toward a Roads Scholar certificate from Minnesota LTAP.

Township, city, county, and state maintenance operators and supervisors, plus transportation and research implementation personnel, are encouraged to attend.

Sponsors are Minnesota LTAP,

the Minnesota Local Road Research Board, Mn/DOT, the Minnesota Public Works Association, and the Minnesota Street Superintendents Association. The event is facilitated by the College of Continuing Education at the University of Minnesota.

Look for the expo brochure in the mail shortly or visit www.mnltap.umn.edu/expo. **LTAP**



Minnesota LTAP announces leadership change

by Cheri Marti

Jim Grothaus, our technology transfer engineer since 2001, was named director of Minnesota LTAP late last year. Jim launched a number of exciting new program directions over the past four years, and brings experience, a solid partnership network, and a passion for technology transfer to his new position. I am very pleased to support him in his expanded leadership role.

As for me, it has been a privilege to serve Minnesota LTAP as director for the past 13 years. With my recent appointment as an associate director for the Center for Transportation



Cheri Marti



Jim Grothaus

Studies, I will now support Minnesota LTAP on a broader level. This will include attracting and shaping new transportation education and information outreach opportunities for Minnesota, guiding program strategies, and supporting technology transfer innovation both in Minnesota and

Leadership continued on page 4

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Fall Maintenance Expo

See page 4 for coverage of the event.

SAFETY

Tips for tire life and worker safety

Air pressure

There's a direct relationship between proper air pressure and tire life. It's the most basic—and the most overlooked—factor in tire life.

1. Underinflation costs money. Operating on soft tires means they wear faster and the vehicle burns more fuel. At normal speeds, running tires at 20 percent under recommended pressure will reduce tire life by 16 percent and increase fuel use by 2 percent.

2. Know the proper pressure. Tires are designed to run with specific pressures based on the total load. Gather information on each truck's actual axle load, then use standard load charts to calculate the correct tire pressure. Ask your tire supplier for help and training. (For load charts, see www.godyear.com/truck.)

3. Expect tires to lose air. Rubber tires are made of a porous material; they lose air continuously. A truck tire is expected to lose up to two pounds a month according to industry standards. In addition,

air can leak through valve caps or small punctures.

4. Think about outside temperature. A tire will gain or lose a pound of pressure with every 10-degree Fahrenheit change in outdoor temperature. Tires with 100 pounds of pressure in August can lose several pounds of air by November or December. You could be plowing with underinflated tires, even though they may not be due for regular preventive maintenance.

5. Check pressure every season or before use. At a minimum, you should check tire pressure every season—more often is better. For infrequently used or seasonal equipment like motor graders, check tire pressure before operating the equipment. To get an accurate reading, be sure the tire is cold, at least three hours after last use.

6. Calibrate gauges monthly. Even with regular checking, tires could be at the wrong pressure due to faulty gauges. Invest in a master gauge (about \$100) and regularly calibrate all the gauges in the shop.

7. When reinflating tires, explosion is possible. Any radial tire that has been driven at less than 80 percent of its recommended pressure has the potential to “zipper rupture” when it is reinflated. That is, the side of the tire could explode. You can learn to recognize hazardous tires and how to reinflate them safely from videos or training programs provided by tire suppliers.

Tire wear

1. “Read” tires regularly. Check for signs of wear before tires sustain serious damage. Regularly look at tire walls for signs of zip-



Zipper rupture on tire side wall.

pering; inspect for cuts, cracks, blisters, or bulges. Measure tread depth. It should be no less than 4/32-inch on the steer axle and no less than 2/32-inch on all others. Run your hand over the tread and feel for abnormalities like rib edge feathering or cupping. Feathering is an early sign

of misalignment or could be caused by improper pressure. Take the tire/wheel assembly off and look at the face of the tire for any type of irregular wear pattern. For example, drive tires may develop heel and toe wear.

2. Rotate tire position for longer life. Any rotation schedule is better than no rotation at all. How often it's needed depends on truck usage.

Tire repair

The only proper way to fix a tire is to put a patch on the inside and a plug through the injured area. Any repair from the outside will void the tire warranty, even if it is properly fixed later. **LTAP**

For more information

- www.4crawler.com/Diesel/Tires.shtml
- www.retread.org/Inflation/index.cfm/ID/198.htm
- www.tires101.com/
- www.tiresafety.com
- www.dualport.com/bustech/load_tires.html

The information in this article was adapted, with permission, from an article in the March–April 2005 newsletter of Iowa LTAP. Likewise, Iowa had adapted the article from the spring 2005 Wisconsin LTAP newsletter.



Check tire pressure at least every season; more often is better.

Intersections: Cameras reduce crashes; software improves signal timing

Minneapolis installed cameras at 12 dangerous intersections last summer in a program aimed at catching red-light runners. According to the January 24, 2006, Minneapolis *Star Tribune*, crashes at these intersections fell 16 percent from July to December, compared with the same time in 2004. The drop was even more dramatic in the program's first three months—53.6 percent—before the start of winter driving conditions. Police have issued more than 22,000 tickets so far.

One way to reduce traffic congestion—and perhaps lessen a driver's temptation to run a red—is to improve the signal timing at intersections. Below are some resources for traffic managers.

National Cooperative Highway Research Project 3-38(3): Traffic Adaptive Control

The inability of traditional fixed-time traffic signal control systems to automatically modify their timing plans, in response to both long-term and short-term changes in traffic demand, results in excessive delay and congestion. [www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+3-38\(3\)](http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+3-38(3))

Adaptive Signal Control/ACS Lite

Unlike their predecessors, Adaptive Control Software (ACS) systems are not based on a fixed cycle length; they can adjust the split, offset, cycle lengths, and phase order of the control signal. ACS uses sensors to interpret characteristics of traffic approaching a traffic signal, and using mathematical

and predictive algorithms, adapts the signal timings accordingly, optimizing their performance. http://ops.fhwa.dot.gov/traffic_sig_timing/adaptive.htm

Traffic Signal Timing Toolbox

This Web-based toolbox contains information about products resulting from FHWA's Traffic Signal Timing Program and other traffic signal timing resources. This toolbox is intended to provide middle managers and technical staff with resource materials (e.g., guidance documents, manuals, program descriptions, self assessments, etc.) to help them better time their signals and/or upgrade their existing systems. http://ops.fhwa.dot.gov/traffic_sig_timing/toolbox.htm **LTAP**

Technology Exchange

The **Minnesota Local Technical Assistance** Program is part of the Federal Highway Administration's Local Technical Assistance Program (LTAP). LTAP is a nationwide effort designed to foster and improve information exchange among local practitioners and state and national transportation agencies. Minnesota LTAP is administered by the Center for Transportation Studies at the University of Minnesota, and cosponsored by the Minnesota Local Road Research Board and the Minnesota Department of Transportation.

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Any product mentioned within should not be considered a product endorsement. Authors' opinions/findings do not necessarily reflect the views of Minnesota LTAP.

Contact us

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Technology Exchange welcomes contributions and suggestions from its readers. Submit articles, news items, potential topics, and other comments to Pamela Snopl, managing editor.

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Report synthesizes whitetopping experiences

Thin whitetopping and ultra-thin whitetopping are alternatives for rehabilitating flexible pavements and optimizing pavement life. Many types of whitetopping projects have been completed locally, statewide, in adjoining states, and nationally. The experiences from these projects, along with research completed by the LRRB, are synthesized in a report published by Mn/DOT and the LRRB.

Synthesis of Current Minnesota Practices of Thin and Ultra-Thin Whitetopping, by Chunhua Han of Braun Intertec Corporation, describes what has been done and what has been learned:

- When and when not to use thin and ultra-thin whitetopping
- Which type of whitetopping fits best
- How to choose materials, thickness, joint spacing, and other physical design features
- How to choose construction techniques
- Risks associated with this rehabilitation process

Whitetopping is a portland cement concrete (PCC) overlay on hot-mix asphalt (HMA) layers. The three types of whitetopping commonly used in highway pavements are defined by Mn/DOT as follows:

- Conventional whitetopping is ≥ 6 inches thick.
- Thin whitetopping (TWT) is 4 to 6 inches thick.
- Ultra-thin whitetopping (UTW) is 2 to 4 inches thick.

The synthesis focuses on TWT and UTW and discusses the performance, use, and cost of the various types of whitetopping. It provides guidance for evaluating the potential for use and selecting the design that has the best chance of being successful in Minnesota.

Current practices in Minnesota and adjacent states have shown that TWT has been used successfully and is an important alternative for rehabilitating HMA pavements of medium-volume roads. If designed and constructed properly, TWT is also an alternative for rehabilitating high-volume HMA pavements.

A PDF of the report, 2005-27, is available at www.lrrb.org/PDF/200527.pdf. **LTAP**

Rating Minnesota's roads

Drivers can often tell when a road is in need of repair from the bumps and vibrations they feel while cruising down the road. This past year Mn/DOT, on behalf of Minnesota counties, started collecting that "seat of your pants" data to help counties direct attention to those roads that need it most.

Pavement condition rating is not a new concept. States keep track of highway conditions to evaluate performance and prioritize maintenance. Some counties conduct crack surveys, but "almost none of them has ever measured the smoothness of their pavements," said Dave Janisch, Mn/DOT pavement management engineer. In past years, Mn/DOT has surveyed county roads when it finished covering state highways but was "only able to do four to five each year before the snow flew," Janisch said. With funding from State Aid, Mn/DOT now tests about 6,500 miles of county highways per year. The bulk of the money went for the purchase of

a new tool: a 2005 Ford E-350 Digital Inspection Vehicle (DIV).

Traditionally, surveyors have driven down the side of the road looking for indicators of wear such as bumps, cracks, and ruts. The DIV, outfitted by Pathway Services, Inc., automates the pavement-rating data collection with digital cameras and range-finding lasers.

Mn/DOT records three scaled indices when evaluating paved highways. The first, present serviceability rating (PSR), measures the roughness of the pavement. Three front-mounted lasers on the DIV take eight measurements per inch at highway speed to calculate the roughness, which is then expressed on a scale from zero to five (very poor to very good).

The second index is surface rating (SR), which is calculated by reviewing images of the roadway taken by four digital cameras: two pointed down at the road, one pointed ahead, and another pointed to capture the shoulder and right-of-way. Evaluators

at Mn/DOT's Pavement Management Unit in Maplewood look at the images using software that came with the DIV and rate the road section based on the frequency and severity of defects in the first 500 feet of each mile and section.

The pavement quality index (PQI) is the last of the three, calculated using the PSR and SR to give an idea of the general condition of the road. A high PQI (up to 4.5) means a road will most likely not need maintenance soon, whereas roads with low PQIs can be singled out for maintenance. This simple road scoring system makes it easier for engineers to explain why repairs are needed, for counties to see how their roads compare to their neighbors' roads, and to determine which roads need attention most urgently, allowing Minnesota counties and State Aid to direct resources more effectively.

"The data tells the story," said Freeborn County Engineer Sue Miller. "[Our] data is showing that we will

need to reduce the 406 miles of bituminous surfacing in the next 10 years based on a lack of financial resources to reconstruct or maintain," Miller said. It also helps counties evaluate which maintenance methods are most effective, which, according to Miller, will ultimately "result in the highest and best use of our tax dollars in maintaining such a critical part of the infrastructure."

The images and data from the road surveys are saved and distributed to each county for later use. This allows them to "check pavement type, right-of-way details, et cetera, without having to drive anywhere," Janisch said. "Many Mn/DOT staff use this system daily, saving them many hours of travel." **LTAP**

—Jim Hammerand, LTAP intern

OPERA project:

Blower attachment to remove grass clippings from gravel roads

The *Exchange* regularly highlights projects completed under the LRRB's Local Operational Research Assistance Program (Local OPERA). Following is another example from the 2005 OPERA annual report. For a copy, please visit www.mnltap.umn.edu/opera.

Local OPERA helps to develop innovations in

the construction and maintenance operations of local government transportation organizations. Learn more about the program and apply for OPERA funding online at www.mnltap.umn.edu/opera, or contact Jim Grothaus, Minnesota LTAP director, 612-626-1077, mnltap@umn.edu.

Project leader: Jeffery J. Langan, Former County Engineer, Marshall County Highway Department

Problem: Many farmers are paid to maintain the land adjacent to county or township roads. This job may involve mowing the roadside grass planted to increase wildlife habitat and minimize erosion. Since many farmers use their own equipment to mow along roads, the arrangement is a financial benefit for taxpayers. As a result of farmers' mowing methods, however, grass clippings are constantly thrown on top of the gravel road surface. These clippings mix into the gravel material and create large piles during summer maintenance road blading, which must then be spread in road ditches, effectively wasting many tons of gravel. If they are not spread, they pose a threat to drivers and mower operators in the future.

Solution: A blower attachment on the front end of a motor grader can blow the grass clippings off the gravel surface and out of the way of the moldboard, preventing clippings from mixing with the gravel.

Procedure: Three blower attachment assemblies were built and mounted on the front end of a motor grader: two for standard front hitches and one for a para-lift (quick hitch) attachment. The frame, front hydraulic cylinder, and hydraulic system of the motor grader were used for the blowers, the housings of which were salvaged from grain-bin blower assemblies. After a month of use on five different motor graders, necessary modifications were made and the blowers were used for another trial month.

Results: After the first month, the blowers needed a few key modifications: the standard hitch attachment was redesigned to allow full lifting capabilities, the quick coupler attachments were replaced to prevent the hydraulic oil from overheating, and a plywood chute was attached at the discharge opening to better direct the blowing air to the desired location. Following these modifications, the blower proved to be an effective tool for removing grass clippings from gravel roads at a cost less than replacing gravel that mixes with clippings. The blower also increases driver safety by keeping clipping piles off the road surface.

Cost: \$4,785 (\$4,000 approved for project)

Implementation: Marshall County plans to fabricate six additional blowers to equip its entire motor grader fleet. Additionally, townships in Marshall and neighboring counties purchased four blowers from Marshall County for their own gravel road maintenance activities.

Status: Completed **LTAP**



MAINTENANCE

A sampling of the Fall Maintenance Expo

Even heavy rainfall the night before couldn't dampen attendance at the 2005 Fall Maintenance Expo, held October 5 and 6 in St. Cloud. Many street and highway maintenance workers had been busy pumping water from flooded streets that first morning but still made time to attend expo sessions, visit the extensive exhibits, and compete in the ever-popular Snowplow Rodeo and the newer Skidsteer Rodeo.

Expo sponsors were the Minnesota Department of Transportation, the Minnesota Local Road Research Board, Minnesota LTAP, the Minnesota Street Superintendents Association, and the Minnesota Public Works Association.

Following is a sampling of just some of the training sessions held during the two days.

Proper brake-inspection techniques for snowplows

As a Mn/DOT transportation program specialist, Brian Barott plays a key role in the design, development, and delivery of snowplow operator training in the Metro district. Good brakes are particularly important in snowplowing operations because of poor driving conditions and the wide and over-weight vehicles involved.

Barott reviewed the three brake components—service, emergency, and parking—and how they function in an air-brake system. He described how to check and maintain air tanks, and reviewed the parking/emergency spring-brake release system.

He also distributed a pretrip brake inspection guide as a class handout and showed a video of the proper techniques for testing the braking system. The video included tests for proper push rod travel, compressor buildup time, air warning signals, and emergency brake valve application.

Treated salt for cost-effective roadway deicing

Greg Felt, highway operations engineer for Scott County, reviewed his agency's experience with treated salt on county highways. "Treated" salt is sodium chloride mixed with any product that makes it melt ice faster. The product is usually magnesium chloride or calcium chloride, mixed into the stockpile or added at the spinner on the salt spreader.

Scott County had success with two approaches: adding 6 to 8 gallons of magnesium chloride or calcium chloride per ton of salt when wetting at the spinner, or mixing 6 gallons of magnesium chloride with 2 gallons of a sticking agent (corn syrup or molasses) in a stockpile. If they used 8 gallons of magnesium chloride, it tended to leach out of the stockpile.

Leadership from page 1

nationally. In addition, I look forward to contributing to the National LTAP/TTAP Association as a member of its leadership team as well as upcoming new Minnesota initiatives such as the Center for Excellence in Rural Safety.

Over the years, Minnesota LTAP has strengthened and expanded our services because of the unwavering commitment to technology transfer by our program sponsors: the Minnesota Local Road Research Board (LRRB) and its Research Implementation Committee, Mn/DOT, and the FHWA. Julie Skallman, Mn/DOT State Aid engineer and current chair of the Minnesota LTAP Steering Committee, together with the committee members, has expertly guided the program and filled the gap whenever expanded support was needed. My sincerest thanks to the countless individuals—consultants, agency, industry, and association members—who contribute their time and expertise to making technology transfer happen in Minnesota. **LTAP**



The experience made Scott County a real believer in treated salt. The county used an average of about 2,600 lbs. of a salt/sand mixture per lane mile, but just 424 lbs. of treated salt. For the 39 snow/ice events for which treated salt was applied, costs plunged more than \$204,000, or 25 percent of the total snow and ice control budget.

Treated salt offers a number of advantages: lower costs, quicker spring cleanup, less deadheading, and fewer citizen complaints.

Spring cleanup was also quicker and more economical with treated salt. Cleaning the residue of a salt/sand mixture took six weeks with 10 tandem trucks, one sweeper, and one water truck, but the same crew could sweep treated salt from the system in just two weeks, saving more than \$94,000.

The county found other advantages, too. Less deadheading to reload salt meant drivers spent much more time plowing and deicing. The mixture worked better and cleared lanes by the second pass. And citizen complaints dropped to zero from 5 to 10 per event in the first season of treated-salt usage.

Felt offered the following steps for implementing a treated-salt program:

- Train your operators on how salt works and how to spread it.
- Publish spread-rate tables based on pavement temperatures.
- Track usage by operator and route.
- Calibrate sanders, and invest in ground-oriented sanders.
- Educate your public and officials, and set policies.

Speed and space management for safe snowplow operations

Brian Barott returned for a second time and presented speed and space management tips to reduce stress when plowing.

Managing speed involves adjusting to ice and snow, shady roads, traffic flow, curves, visibility, and bridges.

Managing space involves being aware of everything around you:

- Be aware of overhead obstacles such as high lines, tree limbs, and overpasses. The bottom frame of the box should never be higher than the top of the west coast mirror.
- Know the area around your vehicle: up, down, sideways, front, rear.
- Remember that blind areas increase as vehicle size increases.
- Make sure the front space cushion is four-plus seconds on a dry day. It should be five to six

seconds during inclement weather.

- Look far enough ahead to be able to stop. A motorcycle or car can stop in half the distance that a plow truck needs.

Barott led a productive class discussion of plowing speed under different weather and traffic conditions. He used slides depicting some typical snowplow situations (including other vehicles in varying positions) to encourage the class to describe potential problem areas and ways to avoid them.

One of the best practices he identified is actually pretty basic: defensive driving. This means you do not involve yourself in the mistakes or actions of others. The last thing you want to do is brake hard with an empty box and a plow mounted on the front.

Parking lot and sidewalk snow and ice control

This session, presented by Connie Fortin of Fortin Consulting, Inc., was an overview of a new training course designed for maintainers of private-sector parking lots. Although more elementary than the training developed for public works professionals, the course offers good ideas and suggestions that can be applied to any parking lot or sidewalk. Many local public maintenance workers perform winter maintenance on parking lots and sidewalks as well as on streets and highways, and can benefit from this information.

Fortin explained which maintenance techniques are appropriate for these areas and distributed application rate guidelines for deicing. The handouts recommend treated salt or dry salt rather than sand or sand/salt mixtures.

Fortin also gave a basic environmental primer. Winter parking lot and sidewalk maintenance contributes an estimated 7.5 percent of the chlorides (and an undetermined amount of sediment and other pollutants) that enter our waters. Some other points of interest:

- Everything we do on land affects water quality.
- Water and pollutants stay together and always run downhill.
- Of all the water on earth, 99.5 percent is unsuitable for human consumption, either because it is ocean salt water or polluted.
- Ten percent of Minnesota public waters have been tested, and 40 percent of those were impaired. They are becoming less fishable and less swimmable.

Fortin is the co-author of the *Minnesota Snow and Ice Control Field Handbook for Snowplow Operators*, recently produced by Minnesota LTAP (available at www.mnltap.umn.edu). **LTAP**

—by Pat Murphy

Minnesota LTAP Technical Support Engineer

Grader attachment patches potholes, ruts

The Asphalt Grader Attachment, designed by Tim Van Berkomp from the Washington State DOT Shelton Maintenance Office, is used for patching trenches, potholes, and ruts. Two “boots” or blades are attached to a road grader’s moldboard blade. The boots are width-adjustable for patching and can also be rotated out of the way for full-blade-width asphalt patching. Tim had help from co-workers Aaron Corliss and Eric Hembury in building this apparatus. The first version was constructed in 1995. Since then, the grader blade attachment has changed little in design. The last modifications were done in 1996.

The design of the unit is pretty straightforward. Brackets are bolted on the far left and right backside of the grader blade. These brackets protrude slightly forward of the blade with round shoes welded to the brackets. Each end of a pipe rests in these shoes. The pipe runs horizontally at full-blade width on the top front of the grader blade. The attachment blades have a collar on each one that allows them to slide over the pipe.

Picture a towel rack mounted to a wall in your bathroom with a couple of coat hangers on it that slide left and right on the towel bar, only the bar is about 12 feet wide! That’s how the attachment blades are adjusted for width, by sliding them back and forth on the pipe. By using this design, the attachment blades can also be swung up and out of the way of the grader blade if full-width patching is desired.

Total cost to build this invention was about \$500, with most of the material obtained from the

scrap pile. The only item purchased was the pipe that the attachment blades slide back and forth on to adjust for patching width.

The greatest savings are in reducing the potential for back injuries from raking asphalt all day long. The crew size needed for this type of operation has been reduced from five or six people to three. Minimal raking and shoveling of asphalt is now required.

The greatest savings are in reducing the potential for back injuries from raking asphalt all day long.

Other benefits include smoother patches, lower labor costs, and a more efficient operation. The asphalt concrete pavement grinder (pavement mill), rented from the City of Bremerton to prepare the potholes, costs about \$700 a day. The old way of doing business meant the crew would spend up to two hours preparing the potholes using the grinder and then filling them by hand with about 40 tons of asphalt concrete pavement. When the patching attachment is on the grader, the crew can follow the grinder and place the asphalt at a faster rate. This translates into savings in time and money for both equipment and men, and increased safety because the crew spends less time on the roadway.

“The best thing about this invention is the



The two “boots” are width-adjustable for patching.

reduced potential for back injuries that could end up being a lifelong disability,” said Larry Deemer, WSDOT maintenance supervisor.

For more information contact Deemer, WSDOT Shelton maintenance office, at 360-427-2110 or at ldeeper@wsdot.wa.gov. **LTAP**

By Dave Sorenson, WST2 traffic technology engineer. Reprinted with permission from Michigan LTAP’s January/March 2003 newsletter. Originally adapted from the Washington State Technology Transfer Center (WST2) newsletter, Issue 78, spring 2003.

DVD from page 1

The DVD can also be used for presentations to the public to explain what can be done to their local roads, what is being done, and why it needs to be done. Because of the critical role these roads play—such as bringing goods to market and transporting children to school—citizens aren’t shy about complaining to public officials when they see a problem.

Ken Skorseth, field services manager with the South Dakota LTAP Center, brings his many years of experience to his narration of the DVD. Safety is a key theme of his lessons. Potholes develop quickly—even overnight after a rainfall—on an incorrectly shaped roadway, he says, and can cause drivers to lose control of their vehicles. By making clear how important their jobs are, Skorseth says, the DVD helps workers “take pride in their work on gravel roads.”

The DVD was created in partnership with SRF Consulting Group with funding from Mn/DOT’s State Aid for Local Transportation Division. In addition to the DVD, the toolkit includes the FHWA’s *Gravel Roads Maintenance and Design Manual* and an instructor’s guide.

Copies were mailed in January. If you would like to order one, please contact Mindy Carlson of Minnesota LTAP at 612-626-1077, mnltp@cts.umn.edu. **LTAP**

Maintenance Research Corner

The members of the Mn/DOT New Technology, Research, and Equipment Committee (NTREC), as well as staff of Mn/DOT’s Maintenance Operations Research (MOR), publish a monthly one-page bulletin of their latest news and findings. Below are highlights from recent bulletins. If you would like to be added to the bulletin mailing list, please e-mail Benjamin Zwart of Mn/DOT Maintenance Research at ben.zwart@dot.state.mn.us.

Shoulder reclaimer project

This grader-mounted unit not only reclaims material, it is also equipped with a vibrating roller to level and pack it in place. Jeff Kirk from the Moose Lake Truck Station is shown operating it at right. Labor costs are reduced as well as the amount of equipment necessary for this kind of operation. Moving at around 10 mph accomplishes a lot in a short amount of time.

For more information, contact Monica Hendrickson, subarea supervisor with Mn/DOT District 1, at 320-245-2324.

Joma rubber-coated plow cutting edges

Because of a late start last winter, the D-3B St. Cloud R&D Committee is continuing to evaluate Joma Black Cat cutting edges. Trucks were set up with plow up/down timers to moni-



The unit reclaims material, and a vibrating roller levels it and packs it in place.

tor and record use of both the Joma and standard carbides. This data will then be analyzed to determine the possible benefits of the Joma edges. Other things being considered are the squeegee effect, noise reduction, and reduced vibration.

For more information, contact Terry Newgard, D-3B Milaca TS, 320-983-6789, or Todd Sangren, D-3B Elk River TS, 763-441-2545.

Stainless steel liquid tank project

Mn/DOT’s stainless steel elliptical truck boxes make it difficult to install many of the tanks that were previously used. This new design became a

reality with the help of Ron Heim and the D-6W Research and Development Committee. This design provides for a lower center of gravity to aid driving safety and still features a 1,300-gallon capacity. Summer months will find it being used as a water tanker, and during winter it will be used as a liquid anti-icing truck.

For more information, contact Ron Heim, D-6W Owatonna, 507-446-5907. **LTAP**

POLICY

Workshop shares practices for context sensitive design

Since the 1960s, the American public has been clear about its attitude toward transportation projects: context matters. External stakeholders “expect more, better and quicker, within budget—and with their approval,” said Scott Bradley, Mn/DOT landscape architecture chief, at the Midwest Region Context Sensitive Design and Solutions (CSD&S) Workshop, held August 24–26 in Minneapolis.

CSD&S, explained Bradley, chair of the conference planning committee, “is about advancing the objectives of safety and mobility with preservation and enhancement of aesthetic, historical, environmental, and community values...reflecting societal

values in our public works.”

The sponsors of the workshop were Mn/DOT and the Federal Highway Administration (FHWA). Minnesota is one of five pilot states originally selected by the FHWA to advance CSD&S initiatives; as part of this work, Minnesota LTAP has offered several sessions of CSD training for local governments and Mn/DOT in recent years.

Following are summaries of several of the workshop presentations. In addition, Powerpoints of many of the presentations are on the CSD&S site:

www.cts.umn.edu/csd. **LTAP**

—Pamela Snopl, Exchange editor

A rose by any other name...

You may be wondering: is it context sensitive design (CSD), or context sensitive design and solutions (CSD&S), or just content sensitive solutions (CSS)? CSD was the preferred term in the approach's early years, but over time the focus has changed to “solutions.” Different speakers at the workshop used different terminology, which is reflected in these articles.

Design flexibility in rural and developing settings

Speakers in this session corrected some CSD&S misconceptions: that it is chiefly for urban areas, raises costs, and reduces safety and flexibility.

A case in point was the redesign of Washington County State Aid Highway 21, a rural road that runs through a state park. Craig Churchward of HNTB Corporation explained that the county viewed the corridor—with an accident rate about three times the state average—as substandard. “To others,” Churchward said, “it was a sublime experience of being outdoors.”

The initial redesign called for straightening and flattening the road and widening a bridge. At a public hearing for the project, however, 60 to 70 residents “dressed like trees or lumberjacks” protested the plan, he said. As a result of public opposition, the county shelved the project for more than 10 years.

During the delay, projects completed in other scenic areas of the state provided useful lessons, and the state developed more flexible standards for natural preservation routes. Armed with these new standards and using CSD&D concepts, the county restarted the project in 1998.

The engagement process put in place included public meetings at multiple venues, township meetings, and county board meetings. Stakeholders defined the issues, developed goals, and suggested criteria. Professionals then developed options, which the stakeholders evaluated—and in some cases, rejected.

The result is a corridor that is multimodal, environmentally sensitive, and blends with the rural aesthetic of the area. What's more, Churchward said, the project was cheaper than originally planned, and “accidents are down dramatically.”

Kimberly Sannes of Compose Rose, Inc., in Duluth (formerly of Mn/DOT) discussed the “re-invention” of Minnesota Highway 1 in Lake County. The 15-mile roadway had so many curves and grade changes, she began, that “it actually made people sick when driving.” The DOT's task was to preserve the good elements of the road while eliminating the bad.

Basically unchanged since the mid-1930s, the road had some engineering flaws: little to no shoulder, changing lane widths, no clear zone, poor drainage, and no planned ditches. In addition, bridges were narrow and failing rapidly. Still, 420 vehicles per day (60 of them trucks) used the road at an average speed of 41 mph—9 mph less than the posted speed limit.

Funded in part by the U.S. Forest Service, the upgrade had to meet both Mn/DOT and Forest Service specifications. Mn/DOT standards for this type of road—such as a design speed minimum of 50–70 mph—were higher than the Forest Service's recommendations. Other factors in the project included the impact on wildlife mobility, five properties eligible for the National Historic Register, and recreation and tourism concerns.

Further complicating the project was the emotional bond the public had with the road. Sannes received much mail from readers: “most [letters] were heartfelt, personal stories about their childhood, [their] cabin, about how the road affected them,” she recounted. Letters from Canada and even Europe were evidence of the “global interests in 15 miles of Highway 1,” she said.

The development process included much agency and local involvement. Foresters, landscape architects, archeologists, historians, biologists, botanists, engineers, and aquatic wildlife specialists were all represented, and a diverse local advisory committee included chamber of commerce members, loggers, tribes, environmentalists, city and township officials, and area residents. Mn/DOT sought and received a waiver from the FHWA for design flexibility.

The outcome is a 40-mph design speed, 12-foot lane width, 10-ton road, with a 1-foot gravel shoulder. The road closely follows the existing alignment, and a wildlife crossing is included. “The project... will be an improvement [over] what is there today,” she concluded.

New tools in the CSD&S toolbox

Phil Myrick of Project for Public Spaces (PPS) presented highlights of a useful new Web site:

www.ContextSensitiveSolutions.org. The site (shortcut www.aboutcss.org) is a one-stop place to access and exchange information on CSS-related issues and topics. It also shows you how to initiate, facilitate, and produce a community-oriented transportation planning process. In addition, it provides an overview of CSS, its historic framework, case studies, and images of projects and design elements.

The site was made possible by the FHWA, PPS, and several other organizations. Practitioners and advocates with suggestions and recommendations, or those who wish to contribute in any way, should contact Myrick at 212-620-5660 or info@contextsensitivesolutions.org.

Mike Marti of SRF Consulting described another helpful site: Mn-traffic-calming.org. Traffic calming and CSD&S are both intended to make the transportation system blend into the natural and built environments, he explained. The site, developed by the Minnesota Local Road Research Board (LRRB), includes results of LRRB research into traffic calming, including a report (2002-02) that describes techniques available in Minnesota. The site also identifies reasons to implement traffic-calming devices and means to measure effectiveness.

Kathleen Harder of the University of Minnesota described the benefits of using simulation to design driving environments. Simulations are far less costly than building a test environment in the real world, she said, and minimize risk.

The benefits of such tools are already in place at a rural intersection in Goodhue County. Harder and the LRRB identified Trunk Highway 58 as a major crash problem and decided it needed analysis. Harder's simulations found the minor road didn't clearly warn drivers that they were approaching a major road and possibly dangerous intersection. Based on simulation experiments, Harder recommended several low-cost solutions: a traffic island, pavement markings, two gated stop signs with a reflectorized surface, and a large sign on the major road warning of a crossroad. The measures have resulted in slower approaches, she reported. **LTAP**

Asset management helps Eagan improve service levels

Asset management tools are helping the City of Eagan improve service levels and save money, said Tom Struve, Eagan public works operations manager (and member of the Minnesota LTAP Steering Committee), at the 6th TRB National Conference on Transportation Asset Management, last November.

Eagan uses various tools to manage city facilities, utilities, parks, and much more. For example, since the mid-1990s officials have used

GPS to record and map the species, diameter, condition, and location of all boulevard trees over three years old. And since 1990, Struve said, the city has maintained a database of the depth, area, and water levels of more than 800 bodies/wetlands. This information is used to identify and model watersheds, identify areas for treatment, and track the effects. The database is updated with each new housing development.

Other uses for the treasure of data

include capital planning, efficiency evaluation, budgeting, repair and maintenance scheduling, examination of liability/exposure, and customer service. Technical challenges still remain in integrating multiple systems, Struve said.

The city's most advanced use of asset management is for the street system. Officials issued an RFP for a pavement management system in 1989, Struve said, and have subsequently rated all city roadways at least

every three years. A formal Pavement Management Program (PMP) was adopted in 1997, followed by a sign management program in 1998. The goals of the Pavement Management Program are clear:

- Program and implement the most long-term, cost-effective maintenance strategies to ensure the overall weighted average pavement condition index (PCI) of any neighborhood will be no less than 45.

Asset management continued on page 7

The Shelf

Questions? Contact Arlene Mathison, Minnesota LTAP librarian, 612-624-3646, e-mail amathison@cts.umn.edu.

Reports

Achieving a High Level of Smoothness in Concrete Pavements Without Sacrificing Long-Term Performance

(Federal Highway Administration, FHWA-HRT-05-068)

This report contains guidelines on how highway agencies and contractors can achieve smooth, long-lasting portland cement concrete (PCC) pavements. The report assesses whether high initial smoothness necessarily results in better long-term performance; identifies design features and material properties that can cause an initially smooth PCC pavement to exhibit detrimental long-term performance; provides guidance on materials properties, design features, and construction procedures to avoid these detrimental effects; and more.

A Guide for Addressing Collisions Involving Unlicensed Drivers and Drivers with Suspended or Revoked Licenses

(NCHRP Report 500, Vol. 2) and **A Guide for Enhancing Rural Emergency Medical Services** *(NCHRP Report 500, Vol. 15)* *(Transportation Research Board)*

The goal of the AASHTO Strategic Highway Safety Plan is to reduce annual highway fatalities to 1 fatality per 100 million vehicle-miles of travel. This goal can be achieved through the widespread application of low-cost, proven countermeasures. Vol. 2 provides strategies to reduce the number of crashes due to unlicensed drivers and drivers with suspended licenses. Vol. 15 provides strategies that can be employed to enhance rural emergency medical services.

Long-Term Plan for Concrete Pavement Research and Technology—The Concrete Pavement Road Map: Vols. 1–2

(Federal Highway Administration, FHWA-HRT-05-052, FHWA-HRT-05-053)

The Long-Term Plan for Concrete Pavement Research and Technology (CP Road Map) is a holistic, strategic plan for concrete pavement research and technology transfer. Vol. 1 describes why the research plan is needed, how it was developed, and generally, what the plan includes. Vol. 2 describes in detail the 12 tracks of research, including general overviews, track goals, track action items, a list of subtracks, and detailed problem statements within each subtrack.

Properties and Aggregate Potential of Coarse Taconite Tailings From Five Minnesota Taconite Operations, Report 2004-06 and Taconite Tailings and Their Use in Road Construction (brochure)

(Minnesota Local Road Research Board, MN/RC 2004-06)

The goal of this study was to evaluate the technical and economic viability of using coarse taconite tailings for aggregate purposes in road construction. The report presents well-documented, technical data from five sites relating geological, mineralogical, and chemical properties to performance when used in road construction. The report is available online at www.research.dot.state.mn.us/detail.cfm?productID=1898.

The LRRB also produced a seven-page brochure highlighting some of the report's findings, including sources for taconite tailings, how taconite tailings can be used by cities and counties, and additional resources and contacts. The brochure is available from the LRRB Web site at www.lrrb.gen.mn.us/more.cfm?code=1985.

Roadway Safety Hardware Asset Management Systems Case Studies

(Federal Highway Administration, FHWA-HRT-05-073)

Since the early 1990s, the term "asset

management" has grown to embrace a broad array of tasks and activities aimed at identifying, assessing, prioritizing, evaluating, maintaining, rehabilitating, renewing, preserving, improving, and managing assets. This report addresses asset management of roadway safety hardware in the United States, and provides information to state DOTs on roadway safety hardware management systems that could help increase their use of state-of-the-practice techniques.

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines

(Federal Highway Administration, FHWA-HRT-04-100)

Pedestrians are legitimate users of the transportation system, and they should, therefore, be able to use this system safely. Pedestrian needs in crossing streets should be identified, and appropriate solutions should be selected to improve pedestrian safety and access. Deciding where to mark crosswalks is only one consideration in meeting that objective. The purpose of this study was to determine whether marked crosswalks at uncontrolled locations are safer than unmarked crosswalks under various traffic and roadway conditions. Another objective was to provide recommendations on how to provide safer crossings for pedestrians.

CD-ROMs

Introduction to the Inspection of Ground Anchors and Soil Nails and Inspection of Ground Anchors

(Federal Highway Administration)

These CDs were developed as digital training modules for project engineering personnel, highway construction inspectors, and contractor staff on the subject of ground anchor inspection. They provide "just-in-time"

training to project engineering staff, as well as construction staff, on the project site as opposed to the traditional classroom setting. These CDs feature narration, video clips with expert opinions, anchor installment animation, and user comprehension testing and access to anchor installation forms on the FHWA Office of Bridge Infrastructure geotechnical Web site (www.fhwa.dot.gov/bridge/anchor/).

Pavement Preservation Toolbox: Strategies for Preventative Maintenance Programs

(Federal Highway Administration)

This Foundation for Pavement Preservation (FP²) CD is a collection of industry and agency references on various pavement preservation techniques and practices, including slurry seal and microsurfacing, providing cost-effective options to prolong pavement service life.

DVDs

Preventative Maintenance—It's a Decision and Surfacing Systems: Pavement Performance Champions

(International Slurry Surfacing Association)

This two-video DVD package explains the advantages, benefits, and economics of pavement preservation and slurry system preventive maintenance treatments for existing asphalt roadways. The videos (and included brochure) explain in lay terms, compelling graphs, and graphics the reasons for acceptance and use of these types of surface treatments. **LTAP**

Index of 2005 Exchange articles online

It's easy to find articles from 2005 or previous years. Just go to our Web site at www.mnltap.umn.edu and click on "Exchange newsletter" in the Publications menu. **LTAP**

Asset management from page 6

- The global overall weighted average PCI of all paved streets in the city's system will be no less than 75.

The PMP organizes maintenance strategies toward four objectives: consolidation of work activities, extended life cycle, stabilized work load, and financial stability. Since 1989, the average weighted PCI for the city's entire system has remained relatively static at approximately 84 while the average age of the system has increased from 8.5 years in 1988 to 17.3 years today (see chart below).

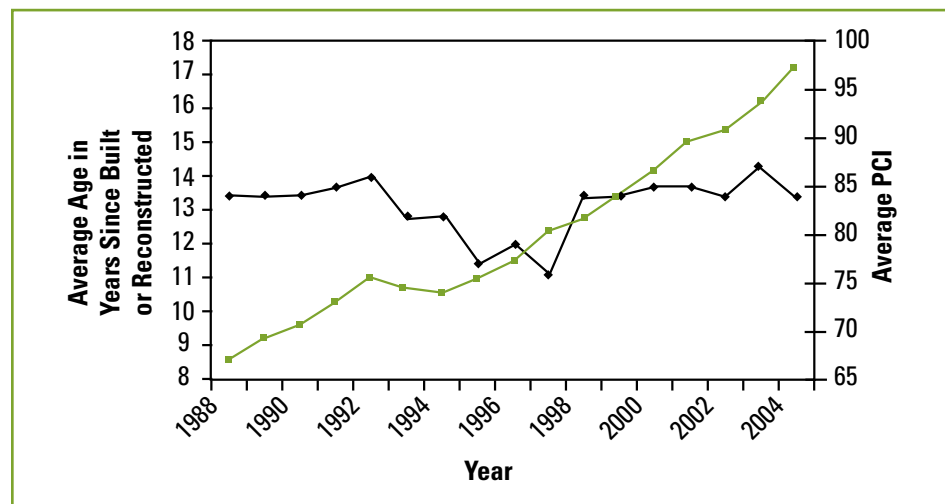
Decision makers use this information to review and refine the city's annual infrastructure refurbishing and maintenance plans and to coordi-

nate with county and Mn/DOT capital improvement plans (CIPs). City officials use the information for cost estimates, maintenance notices, and neighborhood meetings and public hearings.

A key benefit of asset management, Struve said, is that "elected officials have good information and they stand behind it." The overall result, he concluded, is "a great public improvement program and extraordinary service for our residents."

For more about Eagan's success, please contact Struve at TStruve@cityofeagan.com. **LTAP**

—*Pamela Snopl, Exchange editor*



Age of system vs. Pavement Condition Index (PCI) rating

Below is another of Minnesota LTAP's Worker and Workplace Safety Tip Sheets. To download a copy, visit www.mnltap.umn.edu/publications.



Safety Tip #5

Ladders

Ladders come in all shapes and sizes, so choose the proper ladder for the job. For example, never use a stepladder as a straight ladder, because it will tend to slip out from under you.

The following tips will help you avoid accidents:

- Ladders should not have cracks in their steps or vertical structures.
- Wooden ladders should not be painted, as the paint hides the cracks.
- Homemade or job-site-made ladders are allowed, but must be built according to OSHA Standard 1926.1053.
- Rungs/steps of ladders should always be kept free of oil, grease, or other slippery substances.
- Portable stepladders should not be longer than 20 feet.
- Steps should be a uniform distance apart—not less than 10 inches or more than 14 inches.
- Spacers should be installed between each step to help prevent step failure.
- Always stay at least 10 feet from overhead electrical lines, and never use aluminum ladders near them.

EVENTS & TRAINING

Calendar

If your professional organization meets on a regular basis, let us include the information here. Contact us at mnltp@umn.edu.
For an up-to-date list of events in Minnesota and nationwide, please see the LTAP events Web page: www.mnltp.umn.edu/workshops.

Date	Event	Location	Contact
February			
LTAP 9	Work-Zone Traffic Control (0.5 cr)	St. Cloud	Kim, United Rentals, 612-521-4200, 800-766-5483
LTAP 15	Work-Zone Traffic Control (0.5 cr)	Rochester	Kim, United Rentals, 612-521-4200, 800-766-5483
LTAP 22	Work-Zone Traffic Control (0.5 cr)	Mankato	Kim, United Rentals, 612-521-4200, 800-766-5483
LTAP 15	Traffic Engineering Fundamentals (1.0 cr)	St. Paul	Jeff Preston, 651-604-4816
LTAP 16	10th Annual Minnesota Pavement Conference (1.0 cr)	St. Paul	Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu
LTAP 21	Asphalt Pavement Maintenance and Preservation (1.0 cr)	Rochester	Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu
LTAP 22	Asphalt Pavement Maintenance and Preservation (1.0 cr)	Brainerd	Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu
LTAP 23	Asphalt Pavement Maintenance and Preservation (1.0 cr)	Medina	Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu
March			
2	50th Annual Asphalt Contractors Workshop/Minnesota Quality Initiative Workshop	Brooklyn Center	MAPA, 651-636-4666, info@mnapa.org
LTAP 2	11th Annual Transportation Career Expo	Minneapolis	Mindy Carlson, 612-625-1813, carlson@cts.umn.edu
LTAP 2	Work-Zone Traffic Control Seminar (0.5 cr)	Prior Lake	Kim, United Rentals, 612-521-4200, 800-766-5483
LTAP 9	Work-Zone Traffic Control Seminar (0.5 cr)	Brooklyn Center	Kim, United Rentals, 612-521-4200, 800-766-5483
16-17	CPAM Annual Concrete Paving Workshop	Duluth	Concrete Paving Association, 651-762-0402
21-22	14th Annual "How To" Training and Education Workshop	Fargo, N.D.	Rick Shomion, 651-296-3035, rick.shomion@dot.state.mn.us, www.atssa.com
22-23	Mn/DOT Environmental Stewardship and Streamlining Workshop	Brooklyn Park	Julie Grazier, 612-624-3708, conferences5@cce.umn.edu
April			
LTAP 5	5th Annual Road Salt Symposium	St. Cloud	Jeanne Prok, 952-472-3540, jeanne@freshwater.org
LTAP 11-12	Spring Maintenance Training Expo (1.0 cr/day)	St. Cloud	Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu
LTAP 18	Gravel Road Maintenance and Design (1.0 cr)	Owatonna	Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu
LTAP 20	Gravel Road Maintenance and Design (1.0 cr)	Brainerd	Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu
LTAP 26	Gravel Road Maintenance and Design (1.0 cr)	Thief River Falls	Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu
May			
24-25	17th Annual CTS Transportation Research Conference	St. Paul	Julie Grazier, 612-624-3708, conferences5@cce.umn.edu
October			
4-5	Minnesota Fall Maintenance Expo (1.0 cr/day)	St. Cloud	Kathy Warren, 651-351-7432, kwarren@usinternet.com

LTAP workshops

LTAP workshops, along with events cosponsored by Minnesota LTAP, are marked with an **LTAP** above. Check the Web for details: www.mnltp.umn.edu/workshops. You may also register online.

Brochures advertising upcoming LTAP workshops are mailed six weeks prior to the first scheduled workshop. Electronic notices are sent as a reminder approximately three weeks later. To be included on our electronic mailing list, please contact Minnesota LTAP at mnltp@umn.edu or call 612-625-1813.

Disability accommodations are provided upon request.

CTAP workshops

If the events above aren't convenient for you, consider scheduling a Circuit Training and Assistance Program (CTAP)

workshop in your neck of the woods. CTAP uses a fully equipped van to provide on-site technical assistance and training. Current CTAP training courses and special presentations are:

- Asphalt Pavement Maintenance (0.5 cr)
- Culvert Installation and Maintenance (0.5 cr)
- Dust Control on Unpaved Roads (0.5 cr)
- Gravel Road Maintenance (0.5 cr)
- Roadside Vegetation Management and Erosion Control (0.5 cr)
- Snow and Ice Control (0.5 cr)
- Work-Zone and Flagger Safety (0.5 cr)

CTAP workshops are informal and usually hands-on—in fact, many are held in or adjacent to maintenance facilities. Sites with easy access for the van are preferred. CTAP fees

are \$250.00 for 8 to 10 participants and \$350.00 for 11 to 40 participants. The fees are for a two- to four-hour CTAP workshop.

To schedule classes, call the CTAP instructor, Kathy Schaefer, at 651-282-2160, or e-mail Kathleen.Schaefer@dot.state.mn.us.

Roads Scholar credit

You can earn credits in Minnesota LTAP's Roads Scholar program by attending LTAP and CTAP workshops and other cosponsored events. (Credits are indicated above.) To learn more or enroll in the program, visit www.mnltp.umn.edu/program/roadsscholar. **LTAP**

Workshop poster available

The 2006 Minnesota LTAP workshop poster was distributed at the annual county and city engineers meetings, and copies are being mailed to a broad mailing list. If you do not receive the poster by mid-March, please contact Minnesota LTAP at 612-626-1077 or e-mail mnltp@umn.edu.

For workshop details and registration information, please visit our Web site at www.mnltp.umn.edu. **LTAP**



Road Salt Symposium is April 5

What are the environmental impacts of road salt? What can we do to reduce them? Find out at the Fifth Annual Road Salt Symposium, April 5 in St. Cloud. A mix of environmental and transportation professionals are expected to attend.

The founders of this event are two environmental organizations: the Freshwater Society and Fortin Consulting Inc. Minnesota LTAP is an event cosponsor.

To register, contact the Freshwater Society at www.freshwater.org. For more information, call Connie Fortin, Fortin Consulting Inc., at 763-478-3606, www.fortinconsulting.com. **LTAP**



What's Ahead

- Toward Zero Deaths Conference coverage
- Pavement Conference coverage
- Weather and Loads Video
- And more!