TECHNOLOGY EXCHANGE
A Newsletter of the Minnesota Local Technical Assistance Program (LTAP)
UNIVERSITY OF MINNESOTA
CENTER FOR TRANSPORTATION STUDIES
www.mnltap.umn.edu The trusted resource for Minnesota's local transportation agencies Spring 2011 Vol. 19, No. 2

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'Un-paving': an unfortunate sign of the times

An important session at this year's annual TERRA Pavement Conference was devoted to "un-paving"—the practice of converting an asphalt-surfaced pavement to a gravel-surfaced pavement. The session included presentations by Ken Skorseth of the South Dakota LTAP and Professor Joe Mahoney of the University of Washington.

The conference was sponsored by TERRA (the Transportation Engineering and Road Research Alliance) in cooperation with a number of other organizations, including Minnesota LTAP.

Skorseth began by referring to the distastefulness of the topic: "I tried to put a positive slant on this topic by calling my presentation 'alternatives to paving' rather than 'un-paving.' Maybe that softens it a little bit. But the fact is, it's a bitter pill to swallow. In the glory days, right through the mid 70s, we were building pavements. In those days, I never dreamed I'd ever be talking about unpaving."

He said this issue wouldn't exist if it weren't

Unpaving *continued on page 4*

(Photo: cjberry—www.flickr.com/photos/c-j-berry)

Heavier loads are causing problems on local roads.

Associations announce annual awards

City Engineers Association of Minnesota
CEAM presents the Engineer of the Year Award and the Project of the Year Award during its January conference. For more details about the following awards, please see www.ceam.org.

Engineer of the Year Award
Jon Erichson, Austin city engineer/director of public works, was selected as the CEAM Engineer of the Year Award winner for 2010. His recent accomplishments include a multi-phased flood mitigation project and a large annexation/sewer project. The city implemented a half-cent sales tax to help provide local funding for the flood mitigation project he devised.

Project of the Year Award
The City of Osseo Central Avenue Improvements Project was selected as the CEAM Project of the Year Award winner for 2010.

Central Avenue once served as a major north-south corridor through the northern metro area until Trunk Highway 169 was rerouted around Osseo and Central Avenue was turned back over to the city as a local roadway. However, many regional commuters still use Central Avenue as a convenient thoroughfare, resulting in an average daily traffic in excess of 11,000 vehicles. The corridor's regional significance is matched by its local importance, serving as "main street" to Osseo's historic downtown.

Awards *continued on page 3*

ADA transition plan: Mn/DOT's new standards

Requirements for Americans with Disabilities Act (ADA) treatments in the public right-of-way are changing, and Mn/DOT has started implementing some of the new proposed requirements. Todd Grugel, the department's ADA program engineer, has a lot of experience in how and where to implement the ADA laws. "In the very near future, it will be legally mandated to provide accessible ramps and doing it is common sense," he said. "We can get better at doing these things." He discussed Mn/DOT's standards at the annual meeting of the City Engineers Association of Minnesota in January.

Transitioning from noncompliance to compliance
Grugel is in a unique position in that he works with all districts in the state. Although the ADA of 1990 was an extensive ruling, Grugel said, "It's been 20 years and requirements haven't changed and compliance is not great." The cost of noncompliance can be significant in terms of reconstruction costs and public trust. For example, Chicago spent $140 million over five years to come into compliance with ADA improvements; Penn DOT will spend $882 million over 10 years to reconstruct all curb cuts; and a court ruling in 2004 against the city of Sacramento requires the city to spend 20 percent of its entire transportation budget over the next 30 years to make the public right-of-way accessible.

In Minnesota, a transition plan for public entities with more than 50 employees is in place that requires these entities, with input from the disabled community, to identify facilities, programs, and services that limit access for persons with disabilities. The transition plan requires entities to describe methods to be used to make them accessible, along with a schedule and identification of those responsible for implementing the changes.

On the state level, Mn/DOT is assessing pedestrian

ADA *continued on page 2*

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POLICY

The Traffic Corner: Traffic impacts of wind farms

Aside from the very occasional visit from a windmill aficionado, wind farms don't generate a lot of vehicle traffic. But as the county engineers near the Buffalo Ridge in southwestern Minnesota know too well, that doesn't mean wind farms don't have an impact on the transportation system. Each wind turbine weighs about 200,000 pounds, delivered in pieces, with each truck load weighing upwards of 50,000 pounds. These are very big, very heavy tractor-trailer deliveries.

The pavement in the interstate system was designed to take the beating dished out by these deliveries, but the local roads used to get to the rural wind farm sites often don't have pavement designed to handle these large deliveries. The last legs of the delivery may very well be made on a gravel road. The damage caused by these deliveries can be a huge burden to the local road authorities if remedies for addressing roads damaged by the wind turbine delivery weren't made during the wind farm's approval process.

The Minnesota Local Road Research Board (LRRB) has developed tools to help local agencies hold developers of wind farms (or other land developments with significant trucking that may damage local roadways) responsible for any road damage they cause. *Best Practices: Managing Interactions between Local Authorities and Major Traffic Generators* can be found online at www.lrrb.org/trafcalc.aspx.

The interactive document includes the following useful information:

- Sample ordinances, permits, agreements, and maps
- Traffic calculator spreadsheet to quantify the traffic impact on roads and its associated costs
- Policy options to recapture roadway maintenance costs

The *Best Practices* toolkit was assembled for the LRRB by SRF Consulting Group and Richard L. Kronick & Associates. But just as important, the overall project was guided by a technical advisory group that consisted of representatives from many agencies, including seven counties that have dealt with the impacts of wind farms. Their first-hand experience is woven throughout the interactive document.

If you're in an area that may have future wind farm development, the *Best Practices* toolkit will help your agency protect its roadway infrastructure. **LTAP**

—Mike Spack, LTAP contributor

(Mike Spack, P.E., is an adjunct professor in the University of Minnesota Department of Civil Engineering. He is a regular contributor to the newsletter, writing brief articles on traffic engineering topics.)

Mike Spack

ADA *from page 1*

ramps, signals, and crosswalks this year; next year sidewalks will be addressed.

Paying to do it twice

"Use a proactive approach when new installations or repairs are needed," Grugel said. Information and guidelines are available to help. For example:

- Technical memos provide guidelines to aid in designing and building compliant structures.
- Right-of-way areas are covered by Adoption of Public Right Of Way Accessibility (PROWAG) guidelines.
- Installation of all new signals and signal rebuilds is clarified in Accessible Pedestrian Signals (APS) guidelines (www.apsguide.org).
- Curb and ramp guidelines are available at www.dot.state.mn.us/ada/resources.html.

In addition, last year Mn/DOT dedicated three engineers to the statewide ADA program who can answer questions.

"Check while contractors are doing ramp work because once it's done, the state owns it and, if it's wrong, it's expensive to tear out—and you're essentially paying to do it twice," Grugel said.

Informal and formal training is currently Grugel's focus. The training goal is to establish statewide consistency and create a seamless process from state to county to local levels.

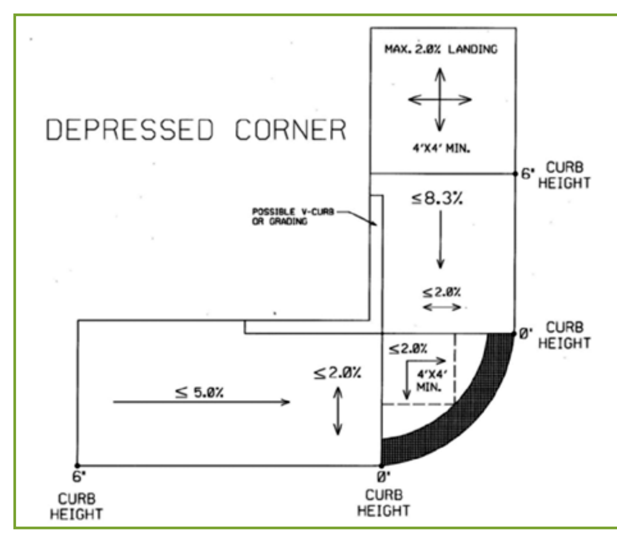
Facilitating monthly ADA Stakeholder Committee meetings is another tool to successfully get projects done with input from all parties concerned. These meetings result in agreements and partnering that encourages a two-way relationship with local stakeholders.

"What we're learning," Grugel said, "is that PROWAG is difficult to apply in the field, especially in retrofit situations." Standard designs cannot be applied to all situations and, he said, "We get that." PROWAG works 75 to 80 percent of the time; however, it cannot be achieved in every situation. "I say, do it if it works," he concluded.

PROWAG "shoulds" and "shalls"

When constructing curb ramps, the goal is use the best design possible so that they are compliant and also meet Mn/DOT's requirement that they're maintainable. The basic requirements involve the width of the access route, maximum cross slope, landing requirements, and curb ramp length.

A variety of ramp types offer solutions for a number of potential problems that contractors may face. For example:



- The perpendicular ramp is perpendicular to the curb line. The grade break occurs at the flow line.
- A parallel ramp is used in narrow sidewalks with a tight right-of-way situation. The curb is sloped to match the slope of the ramp.
- Combined perpendicular ramps consist of two perpendicular ramps with a shared landing. If the ramps are directional, the grade break should be at the front of the truncated domes.
- A depressed corner is constructed with a 2 percent maximum slope with parallel ramps and blended transitions rising out of a depressed corner.
- A fan ramp is a sloped ramp with grade on the domes.
- The tiered ramp is used when it's necessary to make up grades with the initial curb.

Some of the "shalls" include: landings are required (not just desirable); curb ramps will consist of a 4-foot by 4-foot minimum landing with a maximum 2 percent cross slope in all directions; and ramp lengths are dependent on grades, not dimensions. Other "shalls" include: always maintain the flow line; perpendicular and parallel ramps can have a maximum of 5 percent gutter slope because the path of travel is perpendicular to the flow line; and all other ramps should have flattened curbs.

Grugel wrapped up with a final bit of wisdom: "Call before pouring." **LTAP**

—Jeanne Engelmann, LTAP freelancer

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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Technology Exchange is published quarterly. For free subscriptions, mailing list changes, or extra copies, contact us at the address or phone number below.

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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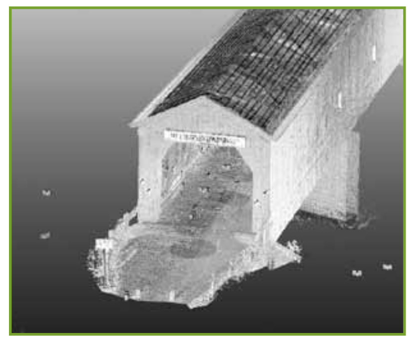
Printed on 50 percent recycled fibers, including minimum 30 percent postconsumer waste.

The Local Road Research Board is a major supporter of Minnesota LTAP

LRRB UPDATE

OPERA spotlight: Laser Scanning Technology



The City of Zumbrota contracted with the University of Minnesota Duluth's Natural Resources Research Institute (UMD NRRI) to complete three-dimensional scanning and data processing of the Zumbrota Covered Bridge, the only remaining historic covered bridge in Minnesota. Constructed in 1869 and relocated several times, the bridge now spans the Zumbro River in a city park.

The information was used to assemble a complete digital representation of the bridge and to generate a 1/100-scale three-dimensional replica.

The scan data, images, and figures were provided to the City of Zumbrota for its records. The as-built documentation produced by the project could be used, if needed, to repair or reconstruct the bridge in the future. The approximate project cost was $10,000.

The laser scanning technology used to document the bridge also has a wide variety of additional applications. Potential uses include excavation control, structural analysis and maintenance, construction progress monitoring, asset management, reverse engineering, quality control, and recording crime and accident scenes. ***LTAP***

OPERA fact sheets online

The Exchange *regularly highlights projects completed under the LRRB's Local Operational Research Assistance Program (Local OPERA). Project fact sheets, along with the full project reports, are posted on the OPERA website as they are completed throughout the year. The fact sheets are also compiled into an annual report. All are available at* www.mnltap.umn.edu/opera.

New at LRRB.org

Mn/DOT and the LRRB initiated a preliminary investigation into the issues surrounding the maintenance, preservation, and possible conversion of low-volume paved roads to gravel. A research synthesis—*Decision Tree for Unpaving Roads* (TRS1007)—highlights relevant research and information related to road surfacing decisions, pavement preservation techniques, cost analysis, and current road agency experiences.

Another synthesis—*ADA Compliance Reference and Training Materials* (TRS1004)—presents results of a review of relevant reference and training materials from federal agencies, advocacy groups, and other state DOTs.

These and other materials are available on the LRRB website: www.lrrb.org. ***LTAP***

Reverting to gravel gains local interest

The Minneapolis *StarTribune* published an article about reverting roads to gravel on March 27 (www.startribune.com/local/118713504.html). The article talks about South Dakota, Iowa, and Michigan, and indicates that changes in Minnesota are likely. ***LTAP***

Awards *from page 1*

To accommodate the demands of increasing residential and commercial populations and to facilitate the future prosperity of downtown Osseo, Central Avenue's infrastructure required an "extreme makeover" of utilities, roadway pavement, and streetscaping.

The corridor's storm sewer was completely replaced and expanded to mitigate local flooding problems; watermain was upsized from 6 inches to 10 inches, with new 6-inch service lines extended to all properties, increasing fire protection throughout downtown and the entire city; and the seven-block roadway was paved with concrete to provide a long-lasting solution to the city's perpetual street maintenance responsibilities.

High-quality streetscape improvements reflect the city's sentiments and dedication to downtown Osseo. Gateway monuments greet visitors at both ends. Decorative paver sidewalks direct pedestrians along a corridor of ornamental trees, planter boxes, benches, bollards, and waste receptacles.

The street is lined with decorative LED lighting with poles that support seasonal banners, flagpoles, and hanging flower baskets. The boulevard was constructed using pervious pavers, reducing stormwater runoff into the street and storm sewer.

Honorable Mentions—Project of the Year Award

Three projects received honorable mentions: the City of Madison Lake Wastewater Regionalization Project, the City of Marshall TH 23 Pedestrian Facility Separation Project, and the City of Rochester 2nd Street SW Street and Transit Reconstruction Project.

Minnesota County Engineers Association

MCEA presents awards during its annual conference in January. For more details, please see www.mncountyengineers.org.

Engineer of the Year Award

Stearns County Engineer Mitch Anderson received the 2010 Outstanding County Engineer of the Year Award.

Anderson's efforts have resulted in resurfacing of over 700 miles of highways, reconstruction of over 140 miles of highway, replacement and/or construction of over 60 bridges, construction and/or oversight of over 40 traffic signals and 4 roundabouts, and construction of over 50 miles of bike trail. ***LTAP***

Gateway monument: Welcoming travelers to Osseo at the south end of Central Avenue

Pedestrian area: Pedestrian zone (on right) and amenity zone featuring pervious pavers and in-grade planters (on the left).

Photos: Bolton & Menk, Inc.

PAVEMENT CONFERENCE

Un-paving *from page 1*

for the combination of increasingly heavier loads—and pavement design standards that have not kept up with those loads. Currently, many western states including South Dakota have no limits on vehicle weight or on the number of axles a vehicle can have. As a result, heavy vehicles are legal and common in those states. Furthermore, Skorseth said, "Vehicle size is growing right at the time when many of these pavements are reaching the ends of their lives."

Like it or not, there is a need for knowledge about alternatives to paving—and Skorseth assessed several strategies:

- Back to gravel
- Stabilized gravel
- Thick base with asphalt surface treatments, including BST (chip seal) and Otta seals

Back to gravel? Be careful!

Skorseth cited an SDDOT study (http://apps.sd.gov/Applications/HR19ResearchProjects/oneproject_search.asp?projectnbr=SD2002-10) published in 2004 that looked at the 20-year life-cycle costs of 120 road sections in 26 South Dakota counties. The pavements were of three surface types:

- Gravel
- BST (bituminous surface treatment, i.e., prime coat + chip seal on aggregate base)
- Hot-mix asphalt (HMA)

The study indicated that the life-cycle cost of gravel-surfaced roads increases sharply with average daily traffic (ADT). Because of this, Skorseth said, gravel-surfaced roads are only suitable up to about 170 ADT. If user costs are included, he added, the break point moves down to 150 ADT. "Most of these user costs are related to loss of fines," Skorseth said. "Especially in a semi-arid climate [such as parts of western South Dakota], dust causes accidents and loss of aggregate, which in turn requires addition of material and increased blading."

The life-cycle cost of BST-surfaced roads (primer and chip seal on aggregate) increases almost as steeply as that of gravel-surfaced roads. As a result, Skorseth said, the effective limit for BST surfaces is 650 ADT.

In comparison, the cost of HMA starts high but increases the least steeply of all, making it the most suitable surface for ADTs above 650. *(Note: Joe Mahoney, whose presentation is discussed below, stated that current Washington State policy is to convert HMA surfaces to gravel-with-chip-seal surfaces on roads that carry up to 5,000 ADT.)*

Skorseth warned that there are additional reasons to question the conversion of HMA surfaces to gravel: "The quality and availability of gravel vary greatly in some places, including South Dakota." He added that, if truck traffic is 25 to 50 ADT and there is low subgrade support, which he defined as CBR ≤ 3%, the gravel layer will need to be at least 14.5 inches thick. "That's hard to maintain when trucks are knocking it off constantly and the blade needs to be out there every other day."

Stabilized gravel

Turning to roads with stabilized gravel surfaces, Skorseth summarized SDDOT's observations of three roads:

- A high-quality South Dakota gravel road stabilized with annual chloride treatments has held up very well since 1998. The road is used by seven-axle concrete trucks at a rate of 80 ADT. Less than 200 tons of additional gravel has been needed in 12 years.
- In 1989, 8 inches of gravel was placed on a road in the Black Hills region, and, in Skorseth's words, the road was "aggressively reshaped." The road carries 1,000 ADT. Since 1998, it has been treated annually with liquid magnesium chloride. In the ensuing 12 years, a total of 4 inches of gravel has been added. Visual inspection suggests little environmental effect. The cost of annual treatment, gravel replacement, and blading has averaged $3,600 per mile per year for five years.
- A road in Richland County, Montana, receives heavy traffic from agribusiness and oil and gas development. (Montana places no limits on the size or configuration of trucks.) The problem for this road is the limited availability of gravel. "The base," Skorseth said, "is crushed gravel, but the fines are non-plastic. Their solution is to mix Bentonite™, a highly plastic clay, into the top 3 inches of an 8-inch gravel layer. They call it 'poor man's pavement.'" He warned that Bentonite is a dangerous material. "If you get too much on your tires, the tires swell up until the vehicle stops. And when one driver held the accelerator down, it took out the transmission!" In the same location, tests are being conducted on prototype equipment for accurate application and mixing. They also have experimented with calcium chloride—both applying it to the surface and mixing it into the top layer. Initial performance has been excellent.

Surface treatments and Otta seals

Skorseth discussed two other case studies involving surface treatments. First, he showed a road in Davison County, South Dakota, that carries up to 150 trucks a day. It was reconstructed in 2007 with geotextile, 12 inches of base gravel, and a BST surface. At that time, the plan was to place 4 inches of HMA in 2009, but when the time came the overlay was not done due to budgetary considerations. Skorseth said the BST surface remains and is now showing flushing distress. "I'm surprised it lasted this long!" he added.

Finally, Skorseth discussed a road in Pierre, South Dakota, that has been treated with Otta seal. The road carries 375 ADT—about 30 percent of which are trucks. "Since there's no strength in the surface," he said, "all of the strength must be in the base. This road has performed well so far, but a road like this could require as much as 20 inches of base." Although a well-known Iowa study reported a 1-ton loss of gravel per vehicle per day, he added, "that's too general; there are too many variables." ***LTAP***

—Richard Kronick, LTAP freelancer

Gravel-surfaced roads are only suitable up to about 170 ADT.

Washington State unpaving strategies

Professor Joe Mahoney of the University of Washington presented information on unpaving activity in his state. Like Skorseth, he lamented that—only because of budget reductions—many HMA-surfaced pavements in Washington must be converted to BST surfaces.

Cost of BST

The cost of building a lane-mile of BST is about $25,000, Mahoney said. "This value might appear high," he added, "but it is a loaded cost. It includes contractor costs, taxes, traffic control, WSDOT inspection, and testing."

Check for top-down cracking

Mahoney emphasized the importance of checking for top-down cracking on HMA-surfaced pavements before converting them to BST surfaces. He also discussed research from several worldwide sources, including MnROAD, showing that chip sealing soon after construction significantly reduces aging in HMA binders.

Continuous improvement

Mahoney discussed an initiative that he has organized in Washington to improve paving practices. Each year since 2006, he has hosted and moderated a workshop with representatives from WSDOT and paving contractors. "We put all issues on the table and invite everyone to offer their opinions. No decisions are binding on WSDOT. But in fact, these workshops have had an impact on numerous revisions of the standard specifications and BST practices." Mahoney summarized the lessons learned from these sessions:

- We need to have a BST design standard—especially important as aggregate payment by the square yard becomes standard.
- In the 2009 workshop, WSDOT favored aggregate payment by the square yard. Contractors: not so much.
- WSDOT policy for maximum amount of aggregate is 70 tons/lane-mile.
- Maximum surface temperature for BST dropped from 140°F to 130°F in the 2010 specification.
- P200 should be reduced from the current acceptance standard of 1.5 percent to no more than 1 percent. Actual statistics show the average for WSDOT projects is about 0.9 percent.
- Two WSDOT regions fog seal their chip seals; some choke and fog to reduce snowplow damage.
- After chip seal, one Washington region places 3/8-inch HMA on heavy-traffic intersections and reports no more whipping rock off of intersections.
- BST is possible on 12 to 15 percent grades. "We can chip seal anywhere if we have good traffic control—and you have to pay good money to do that," Mahoney commented.

In closing, with the current downward trend in funding, Mahoney said, it is certain that more HMA-surfaced pavements will be converted to BST surfaces. But research shows that, if a pavement is structurally adequate, a BST surface can serve for many years—and that, with appropriate leveling of HMA surfaces before chip seal, good ride quality can be maintained. ***LTAP***

—Richard Kronick, LTAP freelancer

PAVEMENT CONFERENCE

Mark Seeley: 'Climate change is here and we need to adapt to it'

Photo: Brian Sorenson

Heavy rains and flooding are becoming more common—like this example north of Henderson, Minnesota, in fall 2010

Mark Seeley, the University of Minnesota's well-known professor of meteorology and climatology, spoke at the TERRA Pavement Conference in St. Paul. His message was clear and compelling: "The Great Lakes region, including Minnesota, is experiencing a profound climate change—and we need to think about how to adapt to it."

Shorter winters

To support that contention, Seeley presented data for both winter and summer that have been gathered from hundreds of professional and volunteer statewide observers. In the winter months, he said that on a statewide basis, since 1997:

- We have had fewer blizzards.
- Nearly every location in the state has had fewer days with measurable snow.
- But there have been more days with 4 inches or more of snow—so when we do get snow, we get more of it at once.
- Unfortunately for pavement maintenance budgets, there have been more freeze-thaw cycles than at any other time in the state's climate record, going back to 1880.

He added that our winters are getting shorter. Since the 1980s, winter comes later and spring comes earlier. As a result, January has surpassed March as our snowiest month simply because more of March precipitation is now liquid rather than frozen. In 2010, he reminded the audience, our state had an early and sudden spring, leading to the earliest corn-planting season in our history. If we have another early, sudden spring this year, he warned, "we will have flooding in every watershed in the state."

More and more rain—for 3,000 years!

Seeley showed equally disturbing trends for Minnesota summers. "We used to get about 60 percent of our total annual precipitation from thunderstorms. But since the 1980s, it's about 70 to 75 percent," he said. "This is a problem for farmers, for road building and maintenance, and for storm sewer runoff systems." In the past 20 years, on an annual basis, we have received more rain than ever before—and southern Minnesota has been hit the hardest. He provided these examples:

- Since 1991, the town of Winnebago, in Faribault County, has had 40 occurrences of rainfall of 2 inches or more—including an 11-inch rainfall on September 22–23, 2010, that produced one of the largest flash floods in state history.
- The town of Hokah, in Houston County, had 24 inches of rain in August 2010.
- There have already been three large flood events in southern Minnesota since 2000 that are outside the bounds of the state climatology office's "historic occurrence calculations." All have caused great damage.

Seeley also noted consistent increases in precipitation since the dustbowl days of the 1930s. In 2010, our wettest year in history, the state had an annual rainfall average above 34 inches for the first time ever, he added.

Seeley then put an exclamation point on the rainfall data by discussing a 2010 paper published by members of the University of Minnesota's Department of Geology and Geophysics. By studying the layers of stalagmite formation in Spring Valley Caverns (Fillmore County), they concluded that Minnesota's rainfall has been on a general upward trend for the past 3,000 years.

Coming back to the modern era, Seeley added that "even though the state as a whole will continue to be wetter, we will continue to have some regions—notably northeastern Minnesota—in severe drought. Lake and Cook Counties have had droughts every year since 2005, so the disparity across the state is greatly amplified."

Seeley then showed that while our rainfall has gone up, our summer high temperatures have generally gone down. For example, the number of 90°F or higher days in the Twin Cities has steadily declined since 1945.

But, he added, "In the same time frame, the water vapor content is on the rise; we're having more days with 70-degree dew points. Previously, that was characteristic of 30 degrees north latitude rather than 45 degrees [the latitude of the Twin Cities]."

While overall temperatures are going down, he explained, overnight minimum temperatures are going up: "Before 1996 there was never an 80 degree dew point in Minnesota. But since then, we've had those dew points all over the state—with several occurrences in our northernmost counties. This gives us a higher heat index. Most of the heat waves in Minnesota from 1883 through about the middle of the 20th century were caused by high temperatures. But since then, most of the heat waves were caused by high dew points—not temperature. And that's not happening only in Minnesota; it's the trend throughout the Great Lakes region including Manitoba."

Adapting to climate change

Seeley predicted that, statewide, we will continue to have:

- More intense thunderstorms with large hail.
- More flash floods.
- More heat advisories as a result of high dew points.

"The data tell us the climate is changing," he concluded. "We may debate the causes, but to be good citizens, we need to accept it. And I'm speaking for all of the climatologists in our region. We all agree. So it's important to factor this into your work and your perceptions of the world around you."

In response to questions about what can be done, he provided some examples of how we are already adapting: "Some places have increased the size of their runoff systems to handle the increased precipitation. Some farmers have installed controlled drain tile systems, so they can retain water when they need it and get rid of it when they don't. We are already doing these things to adapt. We need more knowledge—and then more discussion about ways to respond to these trends." ***LTAP***

—Richard Kronick, LTAP freelancer

Pavement conference materials online

PowerPoint presentations from the 2011 TERRA Pavement Conference are online at www.terraroadalliance.org/events/pavementconf/2011. Minnesota LTAP will post a summary of the presentations on its website this spring.

Rohrbach Award recipient Rick West: passion for a job well done

In keeping with tradition, Mike Robinson, the 2010 recipient of the Gerald Rohrbach Award for Excellence in Pavement Research, presented the 2011 award to this year's recipient: Rick West.

West, the county engineer in Otter Tail County, said he has "learned a lot from folks who have been in the trenches for a long time, people who are dedicated and have passion for what they do. I've always felt the same way. I have a passion for a job well done."

Mike Robinson and Rick West

West said the first recommendation he would make to a younger county or city engineer is to "develop a good relationship with your county board or city council. If they value your abilities and recommendations, you can do a lot of great things. But building that relationship does not happen overnight. When you appear before them, you need to make the very best recommendation you can. And if they don't adopt your recommendation, don't take it personally. As long as you know you did the best you could, it is what it is! And if you feel passionately about it, maybe in six months you can take another run at it. Over time, I think boards recognize it if you are in fact providing them with the best possible recommendations. And if you continue to do that, you will build that relationship."

In addition to being an informal mentor to many civil engineers and an LTAP instructor in gravel road maintenance, West has held every office in the leadership of the Minnesota County Engineers Association. He also is the current chair of the Local Road Research Board. He has been a county engineer in Minnesota for 24 years. ***LTAP***

—Richard Kronick, LTAP freelancer

MAINTENANCE

'Appearance'—the success or failure measurement of a streetscaping project

When a streetscaping project is finished, residents have three basic expectations: grass should be green and lush, plants should be thriving, and concrete should be flawless. If one of these items fails to meet resident expectations, the project could be viewed as a failure.

Minnesota's weather extremes can be hard on plants and trees, so the task of selecting, planting, and maintaining healthy, good-looking plantings takes careful planning, said Fred Rozumalski, Barr Engineering Company, at the annual meeting of the City Engineers Association of Minnesota in January. He said great plantings that last and look great can be part of the landscape design by following basic tips: make space for plantings; provide good, deep soil; design simple plantings and choose plants for the specific conditions; and water by capturing stormwater.

In the session, Rozumalski was joined by three other speakers: Chuck Joswiak, Matthew Zeller, and Thomas Venema.

Stick with showy grasses and plants with interesting foliage

Rozumalski offered some additional "dos" and "don'ts."

- Avoid planting narrow areas because it's hard to find plants that will work well.
- Use grasses for vertical interest and height.
- Choose shrubs and other plantings for existing conditions (think hot, cold, dry, wet, and road salt).
- Select shrubs and grasses for textures that provide interest; avoid flowers because they are high maintenance and don't bloom long enough.

The Minnesota climate dictates choosing plants that are tolerant of extreme conditions. Rozumalski suggested low-bush honeysuckle (an ideal low-maintenance shrub), grasses, and low-growth sumac. Drought-tolerant tree species include bicolor oak, elm hybrids, hackberry, and honey locust, to name a few.

"Use native plants in the right places," he said. "Native plants do well on prairies or big expanses, but they don't belong on boulevards because they look messy and are hard to weed."

Design simple, easy-to-maintain plantings, Rozumalski continued. Simple plantings make it easy and quick to weed with crews that are not educated in plant/weed identification. When plants grow to the point of touching each other, weeds are minimized and thus the need for a lot of weeding is minimized. Watering is another aspect of design that should be thought through to minimize maintenance: use depressed islands and curb-outs to capture stormwater in plantings.

Provide deep soil: one cubic foot of soil per square foot of tree canopy at maturity is the rule of thumb. "Plants need oxygen, sunlight, and drainage to survive," Rozumalski said. Don't crown-up the soil around trees and other plantings but instead depress it so water stays in the planting area. If importing new soil is not an option, decompact the soil to get oxygen down to the roots. Adding organic matter is a good way to both loosen the soil and add nutrients.

Turf—to mulch or not to mulch

Mulch is important. Chuck Joswiak, a landscape contractor and erosion control specialist with Windscapes, discussed ways to successfully establish turf on construction projects. "We all encounter problems in the field," he said. "The key to getting it right involves the engineer's specifications, the contractor that does the installation, and the engineer who holds the contractor to those specs."

A good contractor will read the bid and follow the specifications. Questions to answer to prepare good specs include:

- Will the project be done in phases?
- How big is the area involved?
- How much maintenance will be done after installation is completed?
- Will the project be ready when the contractor gets there?

Key factors for success involve topsoil, timing of installation, careful project management and planning, soil preparation, correct choice of sod versus seeding, and maintenance. Topsoil must be good soil that includes good compost or organic material. Organic material will mean less watering, less runoff, and healthier plants. Soil preparation involves deep tilling to avoid soil compaction that interferes with all aspects of plant growth.

Drought-tolerant honey locust trees work well for streetscapes.

Sod vs. seed

The choice of using sod versus seeding depends on expectations: sod will green up quickly but it's expensive, salt destroys it, it requires a lot of water, and it doesn't tolerate heat well. Various methods of seeding, such as terraseeding™ (application of seed with a half-inch to 2-inch blanket of composted organic-growing media, air-blown onto the site), are less expensive than sod. Plus, the soil and seed can be applied in one application, the process is faster, and germination better—but it takes longer to green up and look good.

Terraseeding™ has become very popular across the country. In addition to the convenience of applying soil and seed at the same time, it blends well into existing seeded areas, is easy to blow on slopes and on other hard-to-access areas, and looks good within four weeks.

Maintenance in the specifications should also be considered. Watering should be based on the season and method of installation. Fertilizing should be done by a licensed contractor and mowing, if necessary, should be done on a 30-day, 60-day, or yearly maintenance schedule. "Write specs based on expectations for the final outcome and hold contractors accountable," Joswiak concluded.

Bad things can happen to concrete

Another important aspect of appearance is the look and durability of concrete used on projects. Matthew Zeller, of the Concrete Paving Association, and Thomas Venema, of American Engineering Testing, Inc., talked about concrete applied in sidewalk and driveway projects and in highway and street surfaces.

"Bad things can happen to concrete, including popouts and surface scaling," said Venema, who focused on sidewalks and driveways.

Popouts are holes in the concrete surface that appear after the aggregate expands. They can be caused by physical or chemical problems. In Minnesota, deep cracking often happens with limestone aggregates. A shale popout occurs when water freezes and expands above soft pieces of shale, limestone, or even coal. The more soft pieces there are in the aggregate, the more popouts will occur. Popouts can also happen when the concrete edge surrounding a piece of shale expands.

What is the frequency of popouts based on the various aggregates available in the state? All aggregate sources in Minnesota contain soft materials, so specifications should include the percentage of soft materials allowed:

- ASTM C-33 aggregate will have 20 to 30 popouts in a 3-foot by 3-foot area.
- Mn/DOT 3137 will have 15 to 20 popouts.
- Mn/DOT 3137 bridge structure aggregate will have 5 to 10 popouts.

Surface scaling occurs when patches or pockmarks cover larger areas. Scaling results from inadequate air entrainment caused by overfinishing, poor finishing, high water-to-cement ratio mixes, lack of proper curing, or late fall concrete placement that isn't fully cured before being subjected to freeze-thaw cycles and/or salt. When concrete that hasn't fully cured is exposed to deicing salts (including salts labeled as environmentally friendly), surface scaling can occur. Popouts can be repaired by drilling and filling with epoxy, and scaling can be repaired by sandblasting and patching.

Zeller said Minnesota has more than 5,000 aggregate sources, and each part of the state has rock that causes problems—yet Minnesota is known for having some of the best aggregate available. Aggregates with common features can perform very differently. "For example, some limestone is worse than others, so you need to sample the aggregate you're going to use," Zeller said.

Durable concrete resists the freeze-thaw cycle. "You can increase durability by minimizing permeability," said Zeller, "which is accomplished by using a low water ratio and curing it to minimize cracking." Curing compound should be applied to all exposed concrete surfaces to hold the water in the mix; losing water causes loss of strength. Curing compound should be applied as soon as possible after finishing. It can be applied with a sprayer, and adding pigment to the compound allows the contractor to see where the spray has been applied to assure uniform coverage. Cold weather is the most vulnerable time to lay concrete because, in dry and windy conditions, the concrete is more likely to dry too quickly, thus sacrificing strength.

The Mn/DOT Concrete Engineering Office website has helpful information (www.dot.state.mn.us/materials/concrete.html), as does the Minnesota Pollution Control Agency (www.pca.state.mn.us). In addition, the National Ready Mixed Concrete Association provides information about concrete practices (www.nrmca.org). ***LTAP***

—Jeanne Engelmann, LTAP freelancer

INFORMATION SERVICES

The Shelf

Links to these publications and many more are on the LTAP website. Questions? Contact Anne Shelley, Minnesota LTAP librarian, 612-626-8753, ctslib@umn.edu.

Roadway Departure Safety: A Manual for Local Rural Road Owners (Federal Highway Administration, 2011)
This document provides information on effectively identifying roadway departure safety issues in local areas, choosing the countermeasures that address them, and evaluating the benefits of those treatments.

Intersection Safety: A Manual for Local Rural Road Owners (Federal Highway Administration, 2011)
This document provides information on effectively identifying intersection safety issues in local areas, choosing the countermeasures that address them, and evaluating the benefits of those treatments.

Minnesota Disaster Management Handbook (Minnesota Department of Public Safety, 2010)
This handbook provides a variety of tools to help emergency managers mitigate hazards, prepare for emergencies, and enhance the response and recovery phases of any emergency situation.

Floodplain Management and Flooding (Minnesota Department of Natural Resources, 2011)
The Floodplain Management Unit oversees the administration of the State Floodplain Management Program by promoting and ensuring sound land-use development in floodplain areas in order to promote the health and safety of the public, minimize loss of life, and reduce economic losses caused by flood damages.

Emergency Preparedness and Response (Centers for Disease Control and Prevention, 2011)
During a flood and its aftermath, know how to protect your personal health and safety. In winter and early spring, it is especially important to understand the health threats associated with exposure to cold weather and cold water. ***LTAP***

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 www.mnltap.umn.edu/publications/library.

Another great resource is TLCat, the Transportation Libraries Catalog. It is an online database of the leading transportation libraries with extensive transportation-related research and publications. Along with links to many other organizations, TLCat is accessible at www.mnltap.umn.edu/Topics Organizations.html. ***LTAP***

Disaster management resources on LTAP website

Minnesota LTAP has created a disaster management Technical Topics page on our website with links to resources like the *Minnesota Disaster Management Handbook* from the Minnesota Department of Safety and *Emergency Preparedness and Response (Floods)* from the Centers for Disease Control and Prevention. Check it out at **www.mnltap.umn.edu/Topics/Disaster.html**. ***LTAP***

Don't get caught with your trees down

An active 2010 storm season left communities in nearly every Minnesota county cleaning up tree damage. Minnesota led the nation with 104 tornadoes last year, according to the National Oceanic and Atmospheric Administration (NOAA), the most the state has ever experienced. Preliminary NOAA data also included 382 reports of damaging winds across the state.

Many of these storms caused widespread tree damage, ranging from snapped branches and limbs to downed trees blocking roadways. Cleaning up after such destructive events requires time, organization, and resources. Taking some simple steps before and after a storm can help make sure your area's resources are used wisely. Following are some tips from the Vermont LTAP's December 2010 newsletter.

—Christine Anderson, LTAP editor

Preparing for the storm

A town's best response to a storm is before it strikes. Save time and money by taking these easy steps now to prepare your town for the next storm event.

- Make arrangements with contractors for assistance with cleanup. Develop an agreement with a local tree service before the storm strikes.
- Know your utility company and keep its phone number by your desk. Utility companies are an important player in storm cleanup, especially around power lines. Start building a relationship with them now.
- Plan now for debris. One of the biggest challenges to storm cleanup is figuring out where all the debris is going to go. Decide now how your town will store debris. What will you do with all the debris from private property that inevitably makes its way to the public right-of-way?
- Identify priority areas for debris cleanup. Create a map of areas that need attention first, such as primary transportation or evacuation corridors, routes for emergency vehicles, or medical treatment centers.
- Identify areas where roadside vegetation is typically damaged during storm events and consider doing some vegetation management to develop greater storm resistance.

After the storm

After the storm strikes, the real work begins. Before you hit the roads clearing debris, follow these steps.

- Assess the damage. Where is it? Was the whole town hit, or was one area hit harder than others? Don't send resources out until you know where they are needed most.
- Identify if there are any live electric wires and contact the local utility company immediately for assistance. Block public access to areas where lines are down.
- Follow your town's disaster response plan. Review priority cleanup areas and the debris removal plan and make sure everyone follows it.
- Implement a triaged response to cleanup. Phase 1 should be clearing debris from roads to allow for at least one lane of travel. Phase 2 is removing debris and debris disposal. Your first priority is to open up as many major travel arteries as soon as possible.
- Take safety precautions. Be on the alert and stay away from downed utility lines and dangerous hanging branches. Make sure all employees use appropriate personal protection equipment (such as hard hats, gloves, and chain-saw chaps for those running a saw).
- Document everything. It's hard to re-create records after the cleanup has occurred. Keep accurate and detailed records on volume of debris, what equipment is used in storm cleanup, and how many staff hours are spent on cleanup. These records will provide important information in the event of financial reimbursement from state and/or federal agencies.
- Survey threats to public right-of-way and trees that should be removed after the immediate response. These include trees that have been uprooted, split in half, or structurally undermined by the storm and threaten a target such as a building, utility lines, or road.

Don't get caught with your trees down during the next storm. The better you manage public trees, the less likely they are to sustain heavy damage in the next storm. Consider doing an inventory of public trees or trees in the right-of-way. Knowing the condition of trees along your major travel arteries may help you be more prepared for the next storm event. Removing hazard trees before the next storm will save your town time and money. Remember, what you do now—and the way you do it—will strongly shape how much tree damage you will have during the next storm. ***LTAP***

*(Photo: *BGP* www.flicker.com)*

Identify priority areas for debris clean-up.

The LRRB published a report in 2008, *The Road to a Thoughtful Street Tree Master Plan* (2008-32), by Gary Johnson: www.lrrb.org/pdf/200832.pdf. An outreach plan for the project is also under development.

TRAINING AND EDUCATION

Calendar

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

	Date	Event	Location	Contact
	May–November			
	May 24–25	CTS Transportation Research Conference	St. Paul	www.cts.umn.edu/Events/ResearchConf
LTAP	May 26	Work-Zone Traffic Control Seminar (0.5 cr)	Lakeville	Highway Technologies, 800-766-5483, Mike.Leaf@hwy-tech.com
	Aug. 16	TERRA Innovation Series event	Albertville	www.terraroadalliance.org/events
LTAP	Sept. – Apr.	Truck-Weight Compliance Training	Statewide	612-625-2900, cceconf2@umn.edu
	Oct. 5–6	Minnesota Fall Maintenance Expo	St. Cloud	http://mnfallexpo.com
	Oct. 6–7	AirTAP Fall Forum	Brainerd	www.airtap.umn.edu/Events/FallForum
	Oct. 12–14	Minnesota Public Transit Conference	St. Paul	www.mpta-transit.org
	Nov. 16–17	Minnesota Toward Zero Deaths (TZD) Annual Conference	Duluth	www.minnesotatzd.org/events/conference

LTAP workshops

LTAP workshops, along with events cosponsored by Minnesota LTAP, are marked with an ***LTAP*** above. Check the Web for details: www.mnltap.umn.edu/training. 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, contact Minnesota LTAP at mnltap@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:

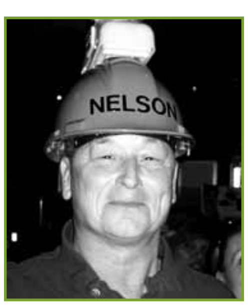
- Asphalt Pavement Maintenance and Preservation (0.5 cr)
- Culvert Installation and Maintenance (0.5 cr)
- Gravel Road Maintenance / Dust Control (0.5 cr)
- Roadside Vegetation Management and Erosion Control (0.5 cr)
- Snow and Ice Control Material Application (0.5 cr)
- Truck and Equipment Washing Best Practices (0.5 cr)
- Work-Zone Traffic Control and Flagger Training (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 651-366-3575, 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). Required workshops and electives are subject to change. To learn more or enroll in the program, visit www.mnltap.umn.edu/roadsscholar. ***LTAP***

Training news: Ken Nelson, website, and more



Ken Nelson

The countdown is over for one of Mn/DOT's long-time employees. Ken Nelson retired in March after serving 36 years and 8 months.

I want to send a BIG thank-you out to Ken for all of the help and support he has offered our LTAP and CTAP programs over the years. Ken served as a CTAP instructor for a stretch, and for the last several years he helped Kathy Schaefer teach the Work-Zone Flagger Safety Training to local agency personnel.

Many transportation vendors know Ken well as the master coordinator of exhibitors at the Spring Maintenance Training Expo. He also taught educational sessions at the expo and sat on the planning committee for years.

Those who know Ken know that there is so much more I could say about him, but this column just doesn't get that much space. Ken, you will be missed, but we hope you have the time of your life!

In other news, be sure to check out the new look and navigational tools on our LTAP website. We work hard to keep the look fresh and the news as relevant and interesting as possible. Currently on the home page we are featuring a new disaster management topical resource page. It includes information on emergency preparedness and response and floodplain management. We also keep an eye out for YouTube videos regarding education on transportation-related topics. If you go to the site right now you will find a video of Doug Fischer, the Anoka County Engineer, talking about potholes, how the public can report them, and the crew patching them. We hope you enjoy the new look and content!

—Mindy Carlson, LTAP coordinator

SHARE YOUR EXCHANGE PLEASE ROUTE TO OTHERS

Snowplow simulator training coming to a city or county near you

The Minnesota Department of Transportation (Mn/DOT) has two mobile snowplow simulators and two static snowplow simulators. The mobile simulators, mounted in the back of a semi-trailer, travel around the state, and the two static simulators are housed at the Mn/DOT Arden Hills Training and Conference Center in Shoreview.

Snowplow and Safety Simulator Training uses state-of-the-art technology to prepare drivers to expect the unexpected and deal with the challenges of adverse winter driving and road conditions.

With the simulator, trainers can create an unlimited combination of hazardous situations involving weather, traffic, and road conditions that a driver may rarely encounter in the real world.

The simulator provides training in a safe, off-the-road setting. This reduces insurance costs, fuel costs, fleet maintenance, liability exposure, vehicle damage, training costs, and worker compensation claims.

The simulator provides the student with a basic plow cab control system with everything from a 15-speed max manual transmission to an automatic transmission. The plow and wing are operated with a touch screen. Like a real plow, the simulator has a steering wheel, fans, horn, turn indicators, mirror and seat adjustments, interactive dashboard, and other controls. The steering is responsive and the sound is realistic. The view screen gives a 180-degree view with very realistic graphics.

All snowplow drivers, regardless of years of experience, can benefit from training in the simulator. This includes anyone who has snowplowing as part of their position description or who plows as a seasonal or temporary driver.

Training will consist of a four-hour class divided into three parts:

- PowerPoint presentation
- Computer-based training—a self-paced training that is taught on a laptop computer
- Simulator driving performance

The cost for training is $75 per person for a four-hour block of training.

The simulator will be coming to your district, and the training can be scheduled for your group. Contact Andrew Kubista, 651-366-3560, andrew.kubista@state.mn.us, or Rick Shomion, 651-366-3576, rick.shomion@state.mn.us. ***LTAP***