

MINNESOTA LTAP TECHNOLOGY EXCHANGE

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Minnesota Local Technical Assistance Program

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INSIDE:

AWARDS
CEAM and MCEA annual awards..... 2

LRRB UPDATE
OPERA project: greener pavements 3
Videos on YouTube 3
FY14 research projects 3
Cushion release frame..... 3

PAVEMENT
Long-life asphalt pavements 4
Truckers & 10-ton roads 5

TRAIL MAINTENANCE
Preventive maintenance strategies... 6

INFORMATION SERVICES
The Shelf & search tools..... 7

TRAINING AND EDUCATION
Calendar 8
Concrete flatwork specs 8
Gravel road training 8

Technology Exchange gets a spring makeover



Spring is a time for fresh starts—which in our case, means a new look for the *Technology Exchange*. In this issue we swap out the old look in place since 2003 with a maroon-and-gold color palette, color photos, and a new typeface. The new look is already on our website, and we'll phase it in to other materials over coming months.

We chose the new palette in part to better reflect our connection to the University of Minnesota. Like the U, Minnesota LTAP provides opportunities across the state for continuing education and lifelong learning—creating the skilled workforce needed today and tomorrow.

The new look is also intended to make the *Exchange* easier to read and more visually interesting.

We hope you like it! **LTAP**

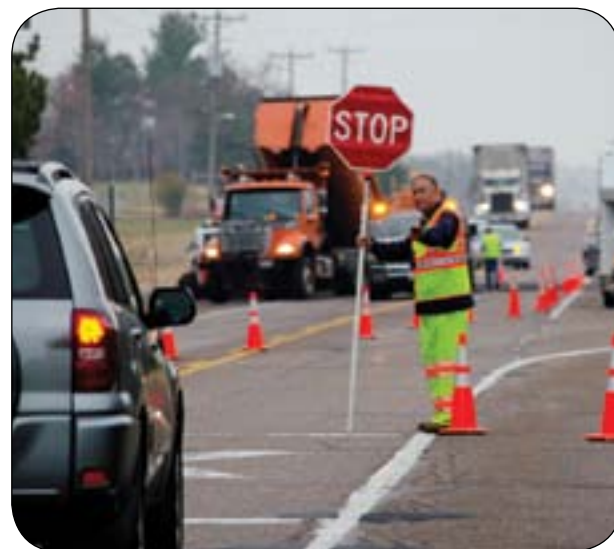
Work-zone safety online tutorial open for business!

Getting ready for the road construction season means more than dusting off the orange cones and barrels—it's also a good time for workers to brush up their skills and knowledge about work-zone safety.

A free online tool is now available from Minnesota LTAP to provide this important training. The Work-Zone Safety Tutorial is designed for all sorts of workers: full-time or seasonal staff, contractors, utility or cable crews, and so on.

"Spring is a very intense season for road repairs and road work, and it's good to get geared up now," says Monica Beeman, traffic engineer for the City of St. Paul and a member of the advisory panel that guided the tutorial's creation. "The online tutorial is a good starter

Tutorial continued on page 8



Achieving long-life asphalt pavements

SNEAK PEEK at our next issue:
Long live concrete!
We'll have another article from the pavement conference in our next *Exchange*—about long-life concrete pavements.

"A large percentage of our asphalt pavements today are overlays," said Jon Epps, associate director of the Texas A&M Transportation Institute, at this year's TERRA Pavement Conference. "Some public and private pavement owners would be happy if the performance life of their overlaid pavements was 5 years. New long-life pavements should be expected to last 40 or 50 years," he declared.

In a presentation on how to achieve long-life asphalt pavements, Epps divided his comments into these categories: design, construction, rehabilitation and maintenance, and other issues.

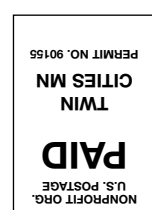
Design

Epps limited his comments on design to issues related to the asphalt layer itself, and assumed a good subgrade and base. "We can design pavements to last 40 years from a thickness standpoint, but we'll need to mill and fill two or three times during that period," he said. "We want to minimize premature pavement distress, and we want to minimize rehabilitation and maintenance. That's going to require the latest in materials, technology, and contractor know-how."

Long live asphalt continued on page 4



Photos courtesy Jon Epps, Texas A&M



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AWARDS

Associations announce annual awards

Each year the City Engineers Association of Minnesota (CEAM) and the Minnesota County Engineers Association (MCEA) honor outstanding people and projects. The awards are presented at their annual conferences in January. Highlights are below; details are on the association websites.

City Engineers Association of Minnesota

2012 Engineer of the Year: Tom Mathisen, Crystal City Engineer and Director of Public Works

2012 Project of the Year: City of Maple Grove's 2012 Bass Lake Road Reconstruction Project from CSAH 101 to Vicksburg Lane. Maple Grove was the lead agency and contracting authority throughout the project, while Hennepin County partnered in funding the project. In addition, SRF Consulting Group, Inc. (SRF) prepared preliminary and final design plans and construction administration services.

The project upgraded Bass Lake Road from a two-lane rural roadway to a four-lane divided urban corridor to support rapidly growing traffic volumes and development efforts. The new modern facility improves the roadway's vertical and horizontal curvature and offers new features to non-motorized users.

The project accommodates existing developments while minimizing impacts to natural and historical features. A notable aspect is the Elm Creek Bridge. A "three-in-one" structure was designed and built around the existing twin box culverts to maintain the flow of Elm Creek. This led to large cost savings as it eliminated the need for extensive hydrologic analysis and maintained necessary flood control parameters. The three-in-one structure also incorporates bicycle and pedestrian connections under Bass Lake Road in unison with roadway and creek needs.

A 70-foot long bridge with approach embankments constructed of a combination of expandable shale aggregate, lightweight expanded polystyrene (EPS), and conventional materials was used to compensate for the increased roadway elevation needs. The EPS spanned deep compressible organic soils across nearly 500 feet of roadway with a zero net loading embankment section on both sides of Elm Creek.

The selected design accelerated the construction schedule, avoided extensive soil removal and replacement, and mitigated significant dewatering measures.

Minnesota County Engineers Association

2012 Engineer of the Year: Al Forsberg, Blue Earth County Engineer

2012 Project of the Year: Anoka County design/build construction of County State Aid Highway 14. Koochiching County received a Special Project of the Year award for the County State Aid Highway 155 construction in International Falls.

2012 Safety Award: Olmsted County

Olmsted County was concerned about the number of crashes occurring on its roadways, specifically



The Bass Lake Road Reconstruction Project minimized impacts to natural and historical features.

Photo courtesy CEAM

"As a public works department, we believe it is our mission to save lives on our transportation infrastructure system in Olmsted County."

— Olmsted County Engineer Mike Sheehan

fatal and life-changing injury crashes. In the five-year period from 2003 to 2007, Olmsted County averaged 2,230 crashes per year on all roads. However, the local system (county, municipal, and township roadways) accounted for 59% of all crashes, more than 52% of fatal crashes, and 70% of severe-injury crashes—indicating a need for safety mitigations on local roads. As a result, the county sought a systematic approach to address safety concerns and prioritize safety projects.

Beginning in 2008, Olmsted County applied for and was awarded federal funds through MnDOT to develop the first County Road Safety Plan (CRSP) in the state. The primary objective of this plan is to identify a specific set of safety-oriented projects at specific locations to address the most severe crashes on the county's system of highways.

As part of the CRSP development, the county hosted workshops and discussed strategies with 4E partners. The efforts resulted in the development of a plan and initiation of safety projects on the county road system including:

- Edge-line rumbles
- Enhanced edge lines (wider pavement markings and safety edge)
- Curve delineation
- Rural street lights (six intersections)
- Red-light enforcement lights (main signal corridor)

From 2003 to 2007, Olmsted County's local road system accounted for

59%
OF ALL ITS CRASHES,
more than
52%
OF FATAL CRASHES,
and
70%
OF SEVERE-INJURY CRASHES.

The county is now updating efforts to analyze the safety improvements undertaken since the plan's inception. Olmsted County's preservation program includes safety edge and edge-line rumbles or 6-inch edge line in residential areas. Plus, projects include a minimum of a 2-foot paved shoulder and 4-foot paved shoulder, if available, for bicyclists and pedestrians. Additionally, Olmsted continues to have excellent partnerships with the District 6 traffic office to include safety improvements at intersections with county roads and state highways. **LTAP**

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Technology Exchange

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LRRB UPDATE

OPERA Spotlight: Greener bituminous pavements

Project leader: Alan Goodman

Agency: Lake County Highway Department

OPERA funding: \$8,000

Problem: Inflationary cost increases, including dramatic changes in the cost of asphalt and fuels, have doubled the cost of bituminous pavements in Lake County over the last 10 years. In addition, bituminous surfaces in the county are subject to premature wear because the aggregates available locally are soft.

Solution: Lake County developed potential reclaimed asphalt pavement (RAP) mixes containing imported, high-quality aggregates that could be tested in a low-volume pavement project. These mixes allowed the county to reduce the amount of new asphalt needed while also using surplus RAP material available from local surface renewal projects. The addition of high-quality aggregates also provided a more durable bituminous surface.

Procedure: The project team analyzed characteristics of typically available milled materials from local roads, locally available screened sand, Mesabi aggregate, and locally available fine aggregate material. The team then developed a wear and non-wear bituminous mix to be used on a half-mile segment of Marble-Kane Lake Road in Lake County. The non-wear mixture used 45 percent RAP, and the wear mixture used 40 percent RAP. Project partners included the University of Minnesota Duluth, the Minnesota Asphalt Pavers Association, and the Minnesota Department of Transportation.

Results: Cost comparisons show that Lake County saved about 19 percent on

the non-wear and 4 percent on the wear mixture by using high percentages of RAP. The material was easy to compact and met density requirements, and the results of visual project inspections were positive. Quality improvements resulting from the addition of Mesabi aggregate and locally available screened sand are hard to measure. However, the use of these two components together with

the RAP and fine aggregate from a local gravel pit allow for a higher degree of quality control.

Approximate cost: \$154,000

Implementation: Follow-up lab testing will be conducted to determine crack susceptibility and mix characteristics. Field investigations will also continue to evaluate mix performance compared to adjoining standard bituminous pavements.

Status: Complete **LTAP**



Lake County saved about 19 percent on the non-wear and 4 percent on the wear mixture by using high percentages of RAP.

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. All are available at mntlap.umn.edu/opera.

New YouTube videos to increase driver safety

In an effort to increase roadway safety, the LRRB has produced three YouTube videos to educate the public:

- Speed Limits: Why Do We Have Them?
- Stop Signs: Why Do We Have Them On Residential Roads?
- Minnesota Pothole Professionals: Smoothing the Way to Safer Travel

The first two videos help drivers understand the correct purpose and function of speed limits

and stop signs—thus minimizing the number of requests for lower speed limits and new stop signs throughout local neighborhoods. The third video encourages drivers to keep roads safe and smooth by reporting potholes.

Each three-minute video features interviews, animations, and on-location footage. The videos are available at youtube.com/user/MnDOTResearch. **LTAP**

OPERA-funded plow invention used this winter

A mechanical linkage technology developed in part with funding from the Local OPERA Program—the Cushion-Release Push Frame—got some use this winter.

Hitting an uneven pavement edge or an obstacle like a manhole cover gives a jolt to tractor-mounted snow blowers. The push frame can be installed on snow blowers, front-end loaders, and other equipment to help "walk" over obstacles by absorbing the impact.

The technology was put to use in St. Paul and Bloomington this winter. It's also been used in Chanhassen, Alexandria, and Sauk Center, as well as in Fargo, North Dakota, and on the U of M Duluth campus.

The OPERA website has a fact sheet describing it. More information about the push frame, including video of it in action, is at Safeloader.com. **LTAP**



The Cushion-Release Push Frame helps take the jolt out of winter maintenance.

LRRB FY14 research projects

The LRRB approved the following research projects in December:

- Next Generation Bridge Management Tools and Inspection
- Tack Coat Testing—Measuring Field Bond Strength
- Development of a Digital Highway Framework to Facilitate Crash Avoidance: Serving County Roads
- Major Equipment Life Cycle Cost Analysis
- Guidelines for Permeable Pavement Systems
- Flagger Operations: Investigating Their Effectiveness in Capturing Driver Attention
- Investigation of Optimal Mix Design of Full-Depth Reclamation Stabilization with Cement and Emulsion
- Minnesota Steel Pipe Service Life Map
- Best Management Practices for Establishment of Salt-Tolerant Grasses on Roadside
- Transportation Investment and Economic Development in Rural Minnesota

If you would like to take part in shaping any of these projects, please contact Sandy McCully of MnDOT at 651-366-3768, Sandra.McCully@state.mn.us. **LTAP**

Highlighted LRRB project: Innovative Bridge Construction for Minnesota Local Roads

This research synthesis (TRS1203) outlines new bridge design and construction methods used by Minnesota counties. Innovative techniques (several of which have already been used in other states) range from GRS abutments to crash-tested open metal railings. The report also includes implementation ideas and recommendations as well as federal funding opportunities. **LTAP**

PAVEMENT

PAVEMENT

Long live asphalt pavements!

from page 1

"In terms of thickness design," Epps continued, "we will need to select mixtures for different depths in the pavement surface to optimize certain properties. Mix design is always a compromise among a number of factors, including durability and rutting resistance." He showed a simplified pavement cross-section with three layers.

In designing the top layer of a pavement, designers should focus on safety, Epps said. "To do that, we need to solve the friction, splash/spray, and noise problems." The top layer also has to resist permanent deformation, thermal cracking, and water action. "The middle of the pavement is where you can use RAP and RAS to increase the mixture's stiffness," Epps said. "Today, I think most asphalt plants have two silos, so you can make more than one mix design in a day. You can tailor-make asphalt for different applications.

"In the bottom layer, fatigue resistance is important. To achieve that, we need greater asphalt content and smaller nominal aggregate size. These are not new concepts," he said.

In designing a pavement to resist fatigue, it's important to realize that if "you're below some level of strain on the pavement, you can have a nearly unlimited number of loading repetitions without damage," Epps said. "That idea has been reflected in concrete pavement design guides since the 1930s. But to my knowledge, it's not in the AASHTO guide, although there are some aspects of it in the MEPDG [Mechanistic Empirical Pavement Design Guide]."

Turning his attention to mix design, Epps commented on important design factors:

- **Nominal maximum aggregate size**—"Specify a nominal maximum size based on economics and lift thickness. As a contractor, I want the biggest aggregate size possible because it will require less asphalt binder in most cases—and binder is a big cost factor. But with a large nominal maximum aggregate size, there's greater potential for segregation in the stockpile and in the mix as it's placed. A smaller maximum aggregate size in the asphalt mixture will reduce segregation. Also, the most crack-resistant mixes are the ones with aggregate size of 1/4 inch or less, all other things being equal. So in all ways, aggregate size is critical."

- **Recycled materials**—"If a large percentage of the binder in RAP will be incorporated into a new mixture, keep in mind that those recycled binders may have an 80 or 90 PG grade. Roofing binders will range from 125 to 150 PG grade. So they're very stiff binders. Each 6 degrees of increase in the PG binder scale doubles the stiffness. That doesn't mean those materials can't be used."

"Pavement performance problems with the use of high quantities of RAP or RAS usually are not evident in the short term (three to five years). In some states, performance problems are now evident. Most of the issues are involved with cracking when very stiff asphalt mixtures are placed in thin pavements. Fatigue cracking, reflection cracking, and thermal cracking can all occur early in the life of the pavement."

"New long-life pavements should be expected to last 40 or 50 years."

—Jon Epps

Construction—it's all about quality

Epps emphasized the importance of QC/QA in construction and discussed several strategies for achieving quality. For example, he listed the major mechanical components of a pavement construction project—the plant, lay-down machine, trucks, and

Conference materials online

Presentation slides and selected videos are available from the TERRA Pavement Conference at terraroadalliance.org.

TERRA sponsored the conference in cooperation with CTS, the U of M Department of Civil Engineering, the Minnesota Local Road Research Board, the City Engineers Association of Minnesota, the Minnesota County Engineers Association, MnDOT, Minnesota LTAP, the Minnesota chapter of the American Public Works Association, and the Minnesota Street Superintendents Association. **LTAP**



"We must have certified technicians to do our sampling and testing, and they must operate in an accredited laboratory."

—Jon Epps

compactors—and said it's essential to coordinate all of them. "If you don't get that balance right," he warned, "there will be issues with segregation, compaction, and cost."

Epps stressed equipment calibration as another major quality factor: "I can't tell you how many chip seal or spray-application binder jobs I've been on where the distributors were in horrible condition. We have specifications in place to prevent that, but we have to enforce them. Some states such as Arizona require distributors to be calibrated annually. They measure the quantity of asphalt sprayed from each nozzle. Some states measure the distribution of asphalt across the spray bar. On old pavements, you need to spray more asphalt outside of the wheel paths than in the wheel paths."

"The construction materials we use every day pose a huge risk to both buyers and sellers. There will be disagreements. So how do you reduce the buyer-seller risk and get closer to the same answer? You can't test more often because you don't have the people or the labs. So we have to advance the technology so it allows us to sample more frequently and get a better distribution of what's really out there. That's how to get a better construction job."

Construction in the U.S. is not yet ready for performance-related specifications. "I believe in them," Epps said. "But it's very difficult to meet those specs with today's technology. I'm in favor of using quality control data not only in the control process but also in the acceptance procedure. Some states don't allow that; other states do. I would not allow quality control tests to be used as part of the acceptance without quality assurance for verification by the public agency. Without that, we are not treating contractors fairly. There has to be verification to keep the playing field level."

Epps advocated certification of technicians and perhaps construction crews: "We must have certified technicians to do our sampling and testing, and they must operate in an accredited laboratory. If not,

when you get to quality control, quality assurance, and verification testing, things will be out of control.

"Based on conversations with a number of states and on my experience over the years, if I could control just two things on an asphalt project, I would take the sample from the plant and compact it with a laboratory compactor according to the standard laboratory procedure. And I would control air voids in that sample—4 percent plus or minus. The second thing I would control is in-place air voids."

Rehabilitation and maintenance

Epps listed the most important issues for pavement rehabilitation and maintenance:

- **Know your pavement**—"Do we have good procedures to determine how thick our overlays should be, other than: 'We need to cover up this number of square yards and we've got this much money to do it with? We need to refine our method of understanding the remaining life of the pavement—and therefore how thick a layer we should put on it—and how long that should last. It's a real challenge today that involves mix design and thickness design. What do we want to do? Is overlay the best thing? Should we use a seal under an overlay? The state of Texas puts a chip seal down before an overlay—and without milling. They think that gets them a lot of value, though I'm not sure. Texas has very poor-quality base courses, so if they don't keep their pavements sealed, they're going to have a lot of problems with that."



- **Choose the best alternative**—"If we want to evaluate a pavement's condition, more samples are always better than fewer samples. We have to determine remaining life and use that information to decide on an alternative. We need to get the right alternative, both from an initial-cost point of view and life-cycle-cost point of view. One maintenance option we should always consider is: Do nothing. A common problem is that the decisions are being made by non-engineers—in fact, by non-technically trained people."

- **Quantify green practices**—"We ought to know the amount of emissions that will result from our construction and maintenance operations. We can calculate the cost of emissions, energy consumption, and materials conservation."

Other issues

Epps concluded by commenting on the following:

- **Contracting methods**—"Are we going to continue to do projects the old way—with different people responsible for design, bid, and build? Or

Asphalt continued on page 5

Rohrbach Award recipient Rick Kjonaas:

Building 10-ton roads and relationships with truckers

When Rick Kjonaas was a county engineer in Minnesota and North Dakota, he replaced many bridges and rebuilt many highways. "In so doing, I became very protective of those roads and bridges," he says. "When you're in that position, it's easy to look at some of the really big trucks out there and think, 'They're damaging my roads!' It was only later that I realized the reason I was designing those roads was for those trucks," he says.

Kjonaas says he began to reflect on that larger purpose when he took the job as director of MnDOT's State Aid Office in 2001. "I began to pull together committees of county and city engineers to talk about the adversarial relationship that existed between the trucking community and the road-building community. I came to the conclusion that the road builders and the road users—the truckers—should be the greatest of allies. And the truckers should realize that, if the roads don't last, it's going to affect their business. Armed with that philosophy, I began an outreach to the trucking community and to the county and city engineers about better ways to design their roads and manage their systems."

Rick Kjonaas was presented the Gerald Rohrbach Distinguished Service Award at the 2013 TERRA Pavement Conference. Kjonaas was a county engineer for 25 years, first in Morton County, North Dakota, and then in McLeod County, Minnesota. For the past 12 years he has been the MnDOT deputy state aid engineer.

In his work for MnDOT's State Aid for Local Transportation Division, Kjonaas oversees the distribution of funds and the management of construction standards for all Minnesota counties and state-aid cities. The State Aid Division oversees the money that all counties and all cities with populations over 5,000 receive to maintain their roads and streets.

**BY LAW,
38%**

of gas tax revenue plus some miscellaneous revenue go to Minnesota counties and cities.

Asphalt from page 4

are we going more and more to design-build? Design-build is a very popular delivery system in some parts of the country today. And there are contracts that go a step further: design-build-operate. There are also public-private partnerships where we say, 'We're handing you this 30-mile section of roadway for 50 years. It will cost you a billion dollars, but you can make it back with tolls,'" Epps said.

"That leads to a conversation about warranties and guarantees. The warranty is a very powerful tool. It gives you a way out of the situation where a material supplier or contractor is meeting the minimum specification—but you're still not happy with what they're doing. But if the public agency wants to put the responsibility and risk on the contractor, then the public agency needs to give up control of design, material choices, and methodologies. By doing that and going

"The warranty is a very powerful tool."

—Jon Epps

**Building relationships with truckers**

Kjonaas has been very successful at building relationships with truckers. He was instrumental in getting MnDOT Operations and State Aid to co-fund truck weight education courses (more about the courses is available on Minnesota LTAP's website). And recently, he was instrumental in developing classes to show law enforcement personnel how they can help protect the state's roads.

In 2005, Kjonaas spearheaded an effort to have MnDOT's pavement management unit begin collecting pavement condition data on the county state-aid highway system. That program was so successful that he followed up with a program to have pavement thickness and strength measured on the county highway system using ground penetrating radar and falling weight deflectometers.

Kjonaas says there has been a lot of progress in bringing the county and city engineers into greater dialog and harmony with the trucking community. "Through these committee meetings, there has been incremental growth in the relationship. The counties have increased the strength of a system of farm-to-market roads to a 10-ton design—and they have actually had those roads tested to verify that the strength is there. That has given the trucking companies free access to those roads year-round,

which they need to do their work.

"At the same time, members of the trucking community have come to understand that, without spending much extra money, they can often carry bigger loads if they just order trucks from the manufacturers with the right number of axles and of the right length. The truckers are the primary consumers of pavement life, so they need to understand how much damage they can do by overloading a pavement. They also need to know that, once a road is destroyed, given the current economic situation, it will be themselves who will suffer the consequences."

Building a 10-ton statewide road network

Kjonaas has been instrumental in developing a statewide network of those 10-ton roads that is about twice as large as the state's trunk highway system. "That 10-ton system is critical to the Minnesota economy," he says. "So we have brought county and city engineers together to look at a statewide map of where the truck routes exist and where there are gaps—and to look at how those gaps can be filled. We've asked the local engineers and the trunk highway people to focus their dollars on strengthening those roads that are in critical corridors for the truck-

Truckers continued on page 7



- **Communicating with the public**—"Our industry has a great sustainability story to tell. We're reducing greenhouse gases, conserving natural resources, and reducing energy use in construction. But we're not letting the public know—except in bits and pieces here and there. As public agencies, we need to communicate with the public in a more consistent manner. And the words and graphics we use to explain these accomplishments are extremely important."

- **Communicating with agency leaders**—"For a number of years, there has been a change in leadership in our public transportation agencies. We see fewer engineers—more administrators and businesspeople. That makes the communication more difficult. We need simple language and good graphics—and short elevator speeches! And many of us are not doing a very good job of it." **LTAP**

—Richard Kronick, LTAP freelancer

to long-term design-bid-build-operate contracts, we will rapidly improve our technologies. The contractor that has a 50-year responsibility approaches things differently—in terms of design, pavement thickness, and construction. If they have an economic advantage to do things differently and they're convinced it's good technology, they will change quickly. There's less incentive to do that in today's design-bid-build environment. It's interesting that many of the contractors who can best move the technology forward are not the biggest guys. They're small and mid-size companies with ownership that's very close to the company. Big companies often have a hard time getting their arms around it."

TRAIL MAINTENANCE

INFORMATION SERVICES

Preventive maintenance strategies for trails

When it comes to recreational trails, the Minneapolis–St. Paul metropolitan area is rich with options. Some 38 paved trails ribbon alongside creeks, around lakes, over hills, and through wooded areas for more than 230 miles. These trails provide recreational opportunities for bikers, rollerbladers, runners, and rambblers. Trail use is growing rapidly, and the trail network is expanding to meet the demand.

Managing and maintaining those trails is an ongoing challenge for cities and counties. Three panelists discussed the issue at the annual meeting of the City Engineers Association of Minnesota in January.

Lessons learned

Water, tree roots, and wear-and-tear all take a toll on trail surfaces, said Stewart Crosby, senior landscape architect for Minneapolis-based SRF Consulting Group, Inc.

When it comes to research showing how to best to keep those trails in good repair, the road is less traveled. There is little research available on which products and maintenance strategies work best and are the most cost-effective, Crosby said. Instead, those who oversee trail maintenance for municipalities often end up choosing strategies based on what they know about road maintenance and repair.

That is changing, however, as municipalities learn from each other and their own experiences managing—or not managing—trails, Crosby said. Some lessons have emerged.

- First, build it right the first time. Using proper construction techniques will reduce maintenance costs and prolong the life of the trail, Crosby said. A new trail should typically have a 6- to 8-inch base, topped by a 3-inch-thick asphalt surface—even thicker if utilities use the trail to access power poles or other equipment.
- Second, preventive maintenance is far more cost-effective than rebuilding a trail after the damage is done.

The three major causes of trail pavement failure, Crosby explained, are water and oxidation, traffic loading, and poor construction. Although building it right is essential, maintaining a trail with the appropriate sealant can reduce damage from water and oxidation and prolong the life of the surface, he said. Damage from trail loading can be minimized if

“A new trail should typically have a 6- to 8-inch base, topped by a 3-inch-thick asphalt surface—even thicker if utilities use the trail to access power poles or other equipment.”

—Stewart Crosby

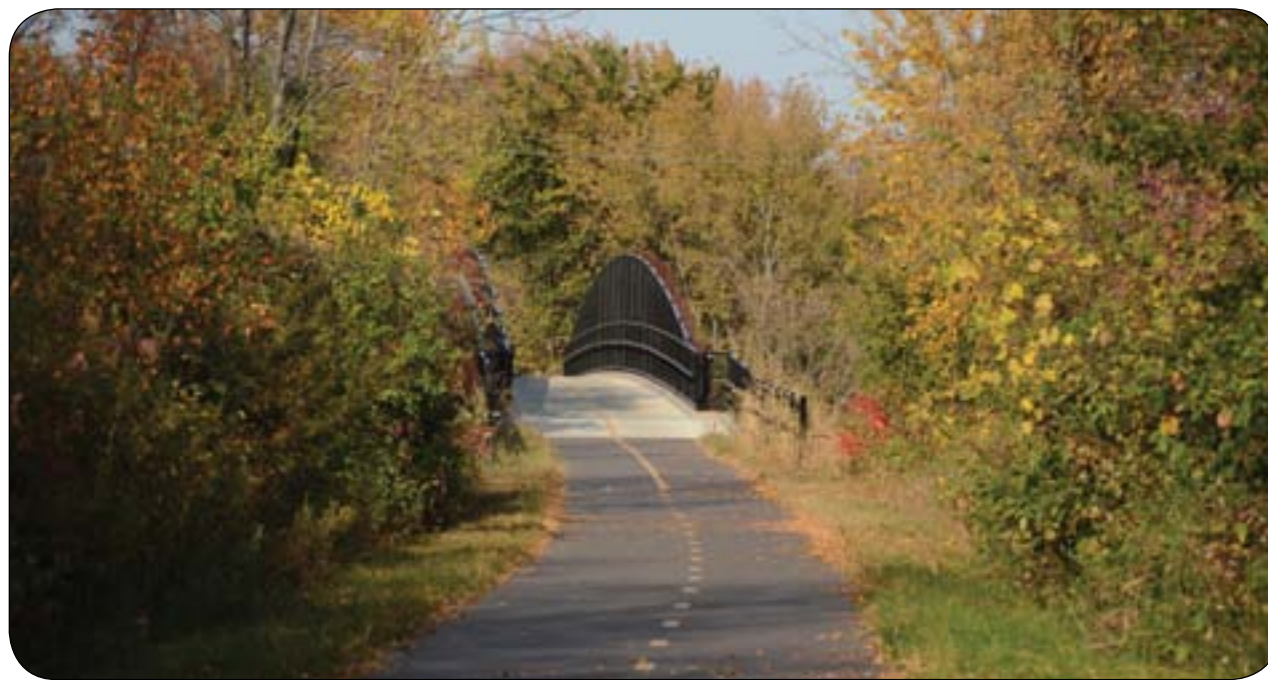


Photo courtesy SRF Consulting

maintenance crews take adequate precautions and keep maintenance vehicles off trails in the spring until the ground has completely thawed.

Maintenance products

When it comes to maintaining the trail surface, there are a variety of products on the market. Jerry Geib, research operations engineer for MnDOT's Office of Materials and Road Research, outlined some of the products and the pros and cons of each.

Fog seal, a diluted asphalt emulsion without aggregate, is effective for waterproofing trail surfaces and concealing micro cracks. It should be applied every four to six years and works best if the trail is in good condition. Although it dries quickly—in as little as 30 minutes—on a hot, dry day, fog seal can take hours to dry on cloudy or humid days and in shaded areas.

Seal coating or chip seal (applying an asphalt emulsion followed immediately by an aggregate cover) is durable, fast, cost-effective, and long-lasting, but it isn't the answer for every trail, Geib said. Rollerbladers, in particular, complain that seal-coated surfaces are too rough. Loose rocks can create problems for other users, too, until excess is swept off the trail. Maintenance should use the smallest aggregate—1/8 inch or less for multi-use trails.

Slurry seal and microsurfacing are used less often but may be good options for some locations, Geib said. Slurry seal has a longer drying time than other products. For heavily used trails and trails with multiple entry points, it can be difficult to keep traffic

Minnesota's nationally recognized regional park system contains more than

25,000 MILES

of city, county, and state-owned recreational trails.

off the trail until it is completely dry. Microsurfacing reduces drying time, but it is more expensive than slurry seal, and the heavy equipment needed to apply the chemical sealant isn't well-sized for trails.

A new, proprietary bio-based microseal product is both quick-drying and clear. It can be applied over striping and it won't discolor or kill vegetation, but the product is significantly more expensive than fog seal, Geib said.

Maintenance schedule

Although selecting the right product for the right location is important, developing and implementing a regular maintenance schedule is also key to extending trail life, said panelist Eric Nelson, a civil and stormwater engineer who oversees the management of 27,000 acres of parks and trails for Hennepin County's Three Rivers Park.

Before 2000, trail management wasn't as much of a priority for the park district, and as a result, many trails saw significant deterioration. Rebuilding those trails has been a long and costly process, he said. Now the district takes a more proactive approach, employing GIS to evaluate all trail surfaces every two years and maintaining a database of trail conditions for use in short- and long-range planning. Over time, Nelson said, one thing has become clear: truly effective trail maintenance takes time and money.

More information

For more information on trail maintenance, visit these websites:

- Minnesota Local Road Research Board: lrrb.org
- Minnesota DOT Office of Materials and Road Research: dot.state.mn.us/materials/research.html
- National Center for Pavement Preservation: pavementpreservation.org

Minnesota LTAP also offers classes that cover chip sealing, HMA maintenance, and slurry and microsurfacing. **LTAP**

—J. Trout Lowen, LTAP freelancer

THE SHELF

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

Best Practices: Culvert Replacement (Ohio DOT)

This DVD focuses on best practices for replacing culverts.

Evaluation of the Safety Edge in Iowa: Phase II (Iowa DOT, FHWA)

This report documents the evaluation of Safety Edge projects and results in Iowa and includes an array of conclusions and practical recommendations.

Pavement Edge Treatment (Washington State DOT)

This report explains projects built with four different devices that allow vehicles leaving the roadway to have a gentler slope to navigate when remounting the pavement.

Guide to Concrete Overlays of Asphalt Parking Lots (CP Tech Center, Iowa State)

This guide helps select, design, and construct successful concrete overlays on existing asphalt parking lot pavements that serve multifamily residential, public, or commercial buildings.

Polyester Polymer Concrete Overlay (Washington State DOT)

This report details a trial application of polyester polymer concrete to determine possible repair strategies for pavement damaged from extensive studded tire wear.

Use of Reclaimed Asphalt Pavement in Concrete Pavement Slabs (University of Florida and Florida DOT)

This report evaluates the feasibility of using reclaimed asphalt pavement as aggregate replacement in concrete.

Performance Contracting for Construction: A Guide to Using Performance Goals and Measures to Improve Project Delivery (FHWA)

This newly updated guide walks through the process for using performance contracting on a typical reconstruction or rehabilitation project.

GRS Bridge System Pilot Project (WisDOT)

This video highlights a pilot project using geosynthetic-reinforced soil in an integrated bridge system (GRS-IBS) on a low-volume state trunk highway bridge in northwest Wisconsin. The video discusses the research that led to the project, the lessons learned from the implementation of the technology, and the future use of the system through the FHWA Every Day Counts initiative.

Sample Guide Specifications for Construction of Geosynthetic Reinforced Soil-Integrated Bridge System (FHWA)

Agencies can use the sample specifications

as a basic template for developing their own standard specifications for GRS-IBS, incorporating local experiences and practices where applicable.

Evaluating Pedestrian Safety Improvements (Michigan DOT)

This study evaluated the impact of new pedestrian countermeasure installations on pedestrian safety to assist in informing future pedestrian safety initiatives.

Non-Motorized User Safety: A Manual for Local Rural Road Owners (FHWA)

This manual provides a concise toolbox of resources and information for addressing non-motorized safety concerns and provides evaluation methods for locally implemented initiatives to address the safety of non-motorized users.

Design Guidance for High-Speed to Low-Speed Transitions Zones for Rural Highways (TRB)

This report presents guidance for designing the transition from a high-speed rural highway to a lower-speed section, typically approaching a small town. It also provides design guidance for selecting geometric design, traffic control device, pavement surface, and roadside treatments for transitioning from high- to low-speed roadways on rural highways.

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**

Best Practices for Emergency Rerouting (Michigan DOT)

This report lays out a statewide manual to support regions in updating or establishing a documented set of practices for maintaining emergency rerouting plans. **LTAP**

Truckers from page 5

ing industry. I think the local engineers have done a wonderful job of building momentum behind that 10-ton road system and convincing local decision makers to concentrate their dollars on that system. At the same time, we've shown the truckers that it's to their advantage to comply voluntarily with the load limits."

Kjonaas also has invited bridge designers to some of the classes so the designers have up-to-date information on the configurations available in today's trucks and the types of loads the truckers want to carry. "I have asked both sides to understand the other's point of view," he says. "And that's beginning to happen."

Kjonaas says experience has taught him that no road authority—state, city, county, township—has the funds to do everything it wants to do with its road system. And that's why he believes the idea of a 10-ton system is so important: "By helping the engineers see it as a statewide system, we help to make sure there is no duplication of investment. You don't want to build a county road if there's already a trunk highway that can accomplish the same purpose. So, for the benefit of the Minnesota taxpayer, you strategically plan your investments."

Better truck loading and permitting

Another Kjonaas initiative, executed over the past 10 years, has been to help agencies and truckers better manage truck loading and permitting. "One of the best things that has happened," he says, "was a statewide truck-weight study. It was led by MnDOT, but the trucking community and the counties and cities were heavily involved. They looked at the statutes and were able to suggest changes so truckers are not coming to the legislature every session with requests for special exemptions. That study came up with a set of recommendations that the legislature has seen fit to implement gradually over a period of time."

Kjonaas says there is still progress to be made on load limits. "The load limits in Minnesota are lower than those in our adjacent states, and this is causing a problem for the trucking community. It's going to require further communication. But I'm hopeful that there will be improvement. Another issue we're looking at is the cumbersomeness of the permitting process. The law requires a trucker who wants to move a load in excess of the legal limit—such as a wind generator turbine—to get a permit from every road authority they intend to travel through, be it a township, a city, a county, or the state. The trucking community is asking for development of a 'one-stop shopping' permit, and a committee has begun looking into that. It's a very reasonable request, though not easy to accomplish when you want to maintain local control by all the agencies. But with the technology that's available now, we can probably make some progress on it. We need a few more years of positive dialog and understanding on both sides; working together, it's something that Minnesota needs to accomplish."

Kjonaas is proud of all that's been accomplished. "I just had the right job and the right background to facilitate some of that happening," he says. "But I was in the background all the time—not in the front. The public, the trucking community, and the highway engineers are the ones who have maximized the benefit to the citizens." **LTAP**

—Richard Kronick, LTAP freelancer

TERRA publishes fact sheet about porous asphalt

A new fact sheet provides an overview of this innovative pavement technology, including details from a TERRA-initiated study about the performance of porous asphalt in cold climates. Porous pavement primarily has been used in parking lots, recreational areas, and low-volume roadways, but is attracting attention as a tool in addressing environmental issues. Download the fact sheet at terrroadalliance.org.



Porous asphalt test cell on the MnROAD low-volume road

Photo courtesy TERRA

Truck-weight compliance resources

The Truck-Weight Education Program addresses concerns from state, county, city, and township transportation authorities. It promotes voluntary compliance to reduce damage to public roads and highways from overweight vehicles. The program website—mnltap.umn.edu/truckweight—has many useful resources, including:

- A clickable, county-level Minnesota state map for finding basic county-level truck weight information, including restrictions for bridges and seasonal loads
- A schedule for upcoming Minnesota Truck-Weight Compliance Training workshops
- Links to key resources for state and national information on load restrictions, permits, and regulations
- Sample truck-weight calculations
- Training videos *Roads and Loads: Finding a Balance* and *How Heavy Is Too Heavy* **LTAP**

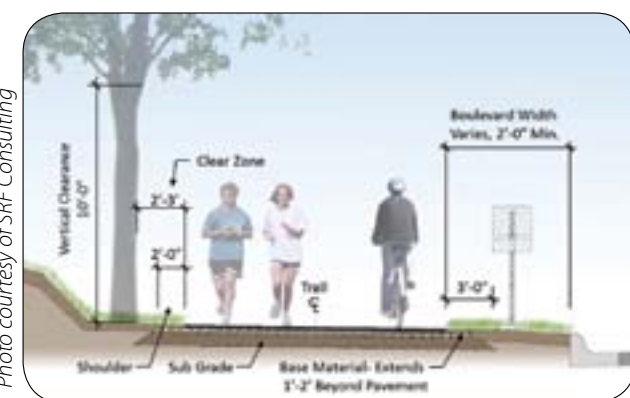


Photo courtesy of SRF Consulting

Resources for maintaining your trails

The Minnesota Local Road Research Board—lrrb.org—has developed the following materials related to trail maintenance:

- *Preventive Maintenance for Recreational Trails* final report (2009-25) and technical summary (2009-25TS). This project evaluated the effectiveness of available pavement preventive maintenance techniques for recreational trails and established which treatment methods and sealants best balance trail preservation with acceptable surface conditions for the widest variety of trail users. Results show that pavement preservation treatments normally used on streets and highways can be successfully modified for use on recreational trails.
- A maintenance activity schedule. This Excel spreadsheet lists nearly 50 activities—in categories such as pavement, vegetation, and amenities—and the optimal frequency to conduct them.
- An inspection template for a typical paved trail. This Excel spreadsheet helps users plan and record their trail maintenance. It includes categories such as tree/brush trimming, rain gardens, pavement markings, and lighting.
- PowerPoint presentation (2011RIC05). This PowerPoint is based on the research and was used in several workshops. It walks users through the use of the maintenance schedule and template. **LTAP**

TRAINING AND EDUCATION

Calendar

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

CTS Transportation Research Conference

May 22–23, St. Paul

Gravel Road Drainage Webinar (0.25 cr) LTAP

May 29, 1:00 – 2:00 p.m. CST

Motor Grader Operator Training (2 cr) LTAP

Various dates and locations around the state.
Contact Mindy Carlson, 612-625-1813

National Rural ITS Conference

Aug. 25–28, St. Cloud

AirTAP Fall Forum

Sept. 26–27, Minneapolis

Toward Zero Deaths Annual Conference

Nov. 14–15, St. Cloud

APWA-MN Fall Workshop: Winter Maintenance Supervisory Training (1 cr)

Nov. 20, Brooklyn Center

From Line to Leadership (Hennepin Technical College)

TBD

Snowplow Simulator Training (0.5 cr) LTAP

Fall TBD

Truck-Weight Compliance Training (1 cr) LTAP

Fall 2013 through spring 2014

LTAP Workshops

LTAP workshops, along with events cosponsored by Minnesota LTAP, are marked with an LTAP. Check the web for details and to register online: mnltp.umn.edu/training. To be added to our print or electronic mailing lists, contact Minnesota LTAP at mnltp@umn.edu or call 612-625-1813.

CTAP workshops

Circuit Training and Assistance Program (CTAP) workshops bring LTAP services to 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)
- Snowplow Controller Hands-on Workshop (0.5 cr)
- Work-Zone Traffic Control and Flagger Training (0.5 cr)

For more information or to schedule classes, call the CTAP instructor, Kathy Schaefer, at 651-366-3575, or e-mail Kathleen.Schaefer@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. To learn more or enroll in the program, visit mnltp.umn.edu/roads-scholar. LTAP

ONLINE TRAINING

Gravel Road Maintenance and Design—Online (1 cr) LTAP

Anytime, anywhere!

Work-Zone Safety Tutorial—Online LTAP

Anytime, anywhere!



Local concrete flatwork specifications and webinar online

An April 16 webinar shared highlights from the *Minnesota Concrete Flatwork Specifications* guide developed by the Minnesota LRRB and Minnesota LTAP.

The guide provides specs for local agencies and the concrete industry to follow as they move through the life of a local concrete project. It is intended to be used separately from the MnDOT specifications, except for the use of the existing approval process developed and maintained at MnDOT for any products and certifications.

The document allows contractors more control over mix design and construction inspection quality control; items such as joint layout will become the responsibility of the contractor. Acceptance of the concrete will be based on concrete strength from concrete cylinders built on the job site. This specification will allow, at the engineer's choice, the option to use bridge-quality aggregates, concrete smoothness, and maturity testing for concrete strength.

Watching the webinar is worth 0.25 Roads Scholar elective credit. The webinar and the specs are both on our website. LTAP



Gravel road webinar, online training

Minnesota LTAP is offering a webinar on May 29 from 1:00 to 2:00 p.m. about gravel road drainage, maintenance, and design. In the webinar, three gravel road experts will share their knowledge of and experience with the importance of properly designing and maintaining a gravel road for effective drainage. The webinar will be archived for later viewing.

In addition, Minnesota LTAP continues to offer an online course—Gravel Road Maintenance and Design. It provides a high-quality training option at a low cost, and it counts as one required credit in the Roads Scholar Program. The course was developed by Minnesota LTAP in partnership with the LRRB. LTAP



Tutorial from page 1

tool for those who are new to working in a work zone, such as summer hires, and for other staff as a reminder of the basic critical actions and awareness they need to work safely," she says.

The tutorial teaches the basic concepts of the work-zone area and the fundamentals of work-zone safety. It also addresses many of the hazards inherent in road and street work—and how to minimize these dangers to keep motorists, pedestrians, and employees safe.

The training includes a slide presentation, pictures, video, and a question/answer section to check comprehension of the material. It is based on a version developed by the Cornell Local Roads Program and includes new video shot in Minnesota. Try it yourself at mnltp.umn.edu.

Minnesota LTAP also offers traditional classroom workshops on work-zone safety. LTAP

