Timber bridge safety inspections improve with new techniques and equipment

Timber bridges are an important part of the U.S. roadway system, especially in rural areas: more than 50,000 bridges in the U.S. and more than 1,700 Minnesota bridges have wood or timber superstructures, while countless more have timber decking or substructure elements. In a recently completed project, researchers identified new advanced inspection techniques and equipment to help local agency inspectors evaluate their timber bridges. They also developed implementation strategies for the techniques, including training sessions across Minnesota.

Timber bridges continued on page 7
And the awards went to ...

**American Public Works Association – Minnesota Chapter**

**Director of the Year:** Mike Eastling, Director of Public Works, City of Richfield

**Supervisor of the Year:** Larry Cooper, MnDOT

**Superintendent of the Year:** John Harlow, Deputy Director of Public Works, City of Brooklyn Center

**Maintenance Employee of the Year:** Marc Booth, Maintenance II – Traffic Control Crew Lead, City of Brooklyn Center

**Project of the Year:** Cedar Grove Redevelopment Area. Agency: City of Eagan; designer: Bolton & Menk; contractors: Northwest Asphalt, Enebak.  

Nearly 16 years in the works, the project successfully reinvigorated the 65-acre area, requiring a complete and massive redesign of the area’s streets and utilities to accommodate the needs of a highly attractive, game-changing retail development.

**Environmental Stewardship Award:** CSAH 12 Improvements, Scott County and City of Prior Lake.  

Project Partners also included Spring Lake Township, Three Rivers Park District, residential developers, Prior Lake – Spring Lake Watershed District, Board of Water and Soil Resources, and Minnesota Public Facilities Authority.

The $9.2 million project reconstructed 2.6 miles of CSAH 12 from CR 17 to TH 13. Work included widening lanes, adding ADA-compliant sidewalks, and building curbs and gutters. Focused on water treatment and water quality, the project also installed new drainage systems to collect and treat stormwater runoff that discharges to the lake.

**Minnesota County Engineers Association (MCEA)**

**Outstanding County Engineer of the Year:** Doug Fischer, Anoka County Engineer

**Outstanding Service to MCEA:** Walter Leu, Retired, District 1 ISAE

**Highway Project of the Year:** Goodhue County, CSAH 24 Southeast Collector, Greg Isakson  

This new highway ties into the new U.S. 52/CSAH 24 interchange built on the south end of Cannon Falls and wraps around the southeastern side of the city. “Once the location of the new interchange was solidified in 2009, the county began the planning process to locate the southeast collector, but there was no urgency in completing this planning process due to the slow economy,” Isakson says. “Then in 2011 the interchange received a SAM grant and Mayo decided to build a hospital along the southeast collector just east of the U.S. 52 interchange, with an August 2014 opening date, and the urgency began.” “At this point, the county shifted gears, finalized an alignment, and jumped straight into final design,” Isakson continues. Besides a compressed delivery schedule, the project had several unique aspects, including trail blazing for 1.3 miles, a major soils issue, the purchasing of a forested farm in the middle of the project that provided both a borrow site and a disposal site for the unsuitable materials, the lowering of an 8-inch-high pressure gas main, and providing access for Mayo’s contractors building the hospital. “The construction costs came in a bit over $4,700,000,” he says. “It was an exciting project.”

**Special Project of the Year:** Jackson County Maintenance Facility, Tim Stahl

**Friends of Minnesota Counties:** Ron Bray, WSB & Associates

**Long-Range Transportation Program:**  

Fischer, Anoka County Engineer

**State Highway Project of the Year:** CSAH 12

**Highway Project of the Year:** Goodhue County

**Municipal Project of the Year:** Greenwood Street Corridor

**City Engineers Association of Minnesota (CEAM)**

**Municipal Project of the Year:** Greenwood Street Corridor


The Thief River Falls’ Greenwood Street Corridor is the culmination of nearly 60 years of planning by the city’s leaders to build a rectangular 1-mile corridor designed and built in a series of phases over six years. Segments include the Greenwood Street Bridge, which crosses the Red Lake River; turn lanes and signal light at the Highway 32 intersection; a roundabout at the Pennington Avenue intersection; and the Canadian Pacific Railroad Bridge and Greenwood Street Underpass. The project provides a vital east–west corridor and Red Lake River crossing that connects residential areas on the east side of the river with major employers Arctic Cat Inc. and Digi-Key Corporation, both of which are located across the river on the west side of town.

The corridor is already having a positive impact on the Thief River Falls community. The improvements support the rapid growth of the city’s long-time major employers, Digi-Key and Arctic Cat, and were key to Sanford Health Systems’ decision to develop a new medical center near the project.

**Awards continued on page 3**

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**Steering committee update**

Mitch Rasmussen, the new chair of MnDOT’s State Aid Division, has replaced Julie Skallman as chair of the LTAP Steering Committee.  

Kent Enerx, director of public works/city engineer for the City of Hutchinson, has replaced Lee Gustafson on our committee. Enerx will represent the City Engineers Association of Minnesota.

Christopher Petree, the public works director of the City of Lakeville, has also become a member, representing the American Public Works Association – Minnesota Chapter.  

Many thanks to Julie and Lee for their years of dedication and service, and a big welcome to Mitch, Kent, and Chris! LTAP

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Contact us

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**Steering Committee**

**President:** Mitch Rasmussen, State Rep. Local Transportation Division, MnDOT

**Chair:** Kent Enerx, City of Hutchinson; City Engineers Association of Minnesota

**Vice Chair:** Bruce Nosbergen, Becker County, Chair, Minnesota MBB; Jeffrey Erler, City of Willmar; Minnesota LTAP Management Committee  

**Secretary:** Greg Isakson, Goodhue County, Minnesota County Highway Engineers Association  

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Laure McCann, Cargo, Inc; Transportation Studies  

Rogers Township, Minnesota Association of Township

Tom Peters, Office of Maintenance, MnDOT  

Ottawa Township, City of Lakeside; American Public Works Association – Minnesota Chapter

Rich Sanders, Park County, Minnesota County Engineers Association

 لقد قام المحتوى بالترجمة النصية للعربية، ولكن يمكن أن تكون هناك بعض الإلحاحات، أو الترجمات غير الدقيقة في بعض الأحيان. الرجاء مراجعة النص الأصلي للتأكد من الدقة.
OPERA Spotlight: Expanded Polypropylene Rings for Manhole Grade Adjustment

Project leader: Anthony Paron
Agency: City of Eden Prairie
Problem: The traditional method of adjusting the elevation of a manhole casting by using concrete rings has historically been prone to many problems. Concrete rings—along with the mortar used to install them—may crack and deteriorate. The casting subsequently settles, causing the road surface to become uneven. The deteriorated rings also allow stormwater to enter sanitary sewer manholes, increasing wastewater treatment costs. In recent years, the City of Eden Prairie began using hard plastic rings as a lighter, more versatile alternative. However, these rings may only be stacked vertically and cannot be offset.

Solution: Eden Prairie installed new polypropylene (foam) plastic manhole rings in its town center. These rings are lighter and more durable than concrete and offer more versatility than hard plastic rings, since they can be easily stacked or staggered when necessary. Because the foam rings are between two and five times as expensive as the concrete rings, depending on thickness, the city wanted to evaluate their performance under high-traffic conditions.

Procedure: The city began installing the foam rings in May 2014 on both sides of Prairie Center Drive, a four-lane street in one of Eden Prairie’s most heavily traveled areas. In total, foam ring installations were completed on more than 30 catch basins in need of major repair.

Results: The foam rings were much easier for the construction crew to install; it took less effort and significantly less time to position the assembly and make changes to match the grade line. Also, since the foam rings are not hollow-cast like the hard plastic rings, the adhesive used to bond one ring to another could be applied more liberally and quickly, and the face-to-face bonding area created a much stronger seal with less opportunity for failure in the future. Additionally, the rings could be stacked in a fairly extreme offset. One procedural lesson learned included using lower-cost hard plastic rings to build vertically upward as much as possible after the foam rings were used to achieve the required offset. Had foam rings been used throughout, the project cost could have easily doubled.

Approximate cost: $16,545
OPERA funding: $9,850
Implementation: The city will inspect the repaired structures annually to determine how normal Minnesota environmental conditions impact the life cycle of structures rehabilitated using foam rings.

Status: Complete LTAP

A two-minute video about the project is on the OPERA website.

New tool measures impact of heavy trucks

A new tool developed by the LRRB helps cities and counties assess how much increased heavy vehicle traffic affects local roads.

Researchers created an analysis method and corresponding spreadsheet tool that city and county engineers can use to calculate the impact of heavy vehicles on asphalt roads beyond what was planned in the original pavement design. The information will help agencies optimize services, such as garbage collection, for the least amount of damage. It will also help agencies better plan roads in new developments, as well as redesign existing roads that are nearing the end of their lives.

In the study, investigators developed two methods for calculating heavy vehicle impact:

- Calculate the additional bituminous material (and associated costs) that would have been required to construct the pavement had the heavy truck traffic been predicted when the pavement was designed.
- Calculate the portion of a pavement’s design life, measured in equivalent single-axle loads (ESALs), consumed by unexpected vehicles.

“Before this project, there wasn't an easy way for an engineer to determine how much a specific truck was going to decrease the life of a road,” says Deb Heiser, engineering director, City of St. Louis Park. Whereas previous research has calculated the impact of extremely heavy vehicles over the short term (typically the course of a construction project), this project calculates the impact of long-term increases in traffic from vehicles that are heavy, but still mostly within normal legal weight limits. The tool can be used for a single street segment or an entire road network. Users can also compare current situations with proposed ones to evaluate the impact of potential changes in heavy traffic levels. LTAP

(Adapted from an article by Shannon Fiecke, MnDOT & CTS Crossroads blog, Jan. 29, 2015)
Maureen Jensen is well-known in Minnesota’s pavement engineering community. Beginning in 2006, she was the manager of MnDOT’s Road Research Section. Jensen is currently on mobility to MnDOT’s Office of Freight and Commercial Vehicle Operations, as the assistant director. At the 19th annual TERRA Pavement Conference on February 12, Jensen discussed issues related to freight shipment in Minnesota.

Jensen began with statistics on what is being hauled and how it is being hauled—nationally and at the state level. Figure 1, based on 2010 figures, shows how freight gets where it’s going, nationally, measured in ton-miles. Though railroads account for the biggest share of ton-miles, trucks actually carry the majority of freight when measured in tons or the number of trips, she said.

Figure 2 presents shipping data for Minnesota, measured in tons. Again, Jensen pointed out that most freight moves in trucks.

Next, using 2012 data from the FHWA Freight Analysis Framework, Jensen showed figures for what is being hauled in Minnesota. Agricultural products and other foodstuffs account for a little more than one-third of all freight. Raw materials such as metallic minerals, coal, and gravel make up another 27 percent. However, Jensen said these figures are provisional and do not include current levels of crude oil. She also showed freight tonnage predicted for 2040. For example, cereal grain shipments are projected to grow from 149,000 tons in 2012 to 266,000 tons in 2040, and coal and animal feed tonnage is projected to nearly double. “I really hope these numbers are wrong,” Jensen said, “because I can’t imagine our networks will handle a doubling of freight amounts.”

Another part of the problem is a lack of data on where the trucks are. “We have good information on the interstates, U.S. routes, and Minnesota routes,” Jensen said. “But most of the system is composed of local routes, and we don’t have good data on them.”

Crude-by-rail

Moving on to railroads, Jensen said Minnesota has the eighth-largest system in the nation and that rail traffic is growing. She compared the amounts of coal and crude oil moving through the state: “The amount of coal shipped, which previously was the bread and butter for freight rail, has gone down. It’s been replaced by oil coming out of North Dakota. Right now, of the billion barrels of oil produced daily on the Bakken, trains carry 80 to 90 percent. The rest goes by pipeline.”

Pipelines could be carrying about a third of the oil—but rail offers more flexibility in terms of desitination. “When the Bakken was first developed, the key destination was Oklahoma,” Jensen said. “Then it went to Louisiana. Now most of it is going to East and West Coast refineries. Oil is probably going to continue to go by rail—and that affects all the other commodities we want to ship.” She added that frac sand for the Bakken, 90 percent of which comes from Wisconsin and goes through Minnesota, also moves by rail and will continue to increase.

Jensen also discussed crude-by-rail safety issues: “Of course the big concern is about accidents; Bakken crude is highly volatile. Last year the Minnesota legislature required us to do a study and funded $2 million to improve safety at a few prioritized locations. That’s going on now. Our Office of Freight also hired additional track inspectors who work with the Federal Rail Administration. Also, North Dakota passed a law decreasing the allowable volatile gas pressure; that goes into effect April 1.”

Other freight rail issues

“We have serious issues with rail congestion,” said Jensen. “We had a record grain harvest last year in addition to all the Bakken oil; the railroads are operating at capacity. They have plans to expand their capacity, but that leads to other problems. The railroads are regulated at the federal level, and they’re not known for dealing well with local community impacts.”

Truck freight issues

Jensen covered several issues impacting trucking companies and the public:

• There’s a truck driver shortage; experienced, trained drivers are retiring and are not being replaced.

• Minnesota is ranked 24th in the nation in congestion for trucking; that congestion adds to the cost of goods.

• Rough pavements damage goods and increase fuel consumption.

• There are inconsistent size and weight restrictions among states, between the state of Minnesota and local jurisdictions, and among the local jurisdictions. An ongoing study is looking at how to coordinate between the state and the counties and cities.

• Truckers need up-to-date information on road conditions, construction, and weather. There is currently no way to provide them with real-time data.

• Under MAP 21, an FHWA study is being conducted to evaluate increased truck size and weight limits. The report was due to Congress in November 2014 but has not yet been released.

MnROAD low-volume road study

Jensen described the first phase of a study on the low-volume loop at MnROAD: “We looked at what happens when you run an 80,000 lb. truck and a 102,000 lb. truck on separate lanes, keeping the ESALs the same. You might be surprised to learn that the more frequent loading by the 80,000 lb. truck led to more fatigue cracking, faulting, and rutting. We didn’t see any difference in ride or low-temperature cracking. So even though we like to talk about ESALs, we really need to look at load spectra. What’s on each of those axles and how many times are they going over the pavement?”

Questions for the future

Jensen ended with questions: “How do we get the data needed to really understand how trucks are impacting our roads—data on truck weight in particular? That’s especially important if we’re going to have bigger, heavier trucks. The data we have tells us axle violations are more common than gross weight violations. With bigger trucks and less experienced drivers, will that increase? The other thing studies have shown is that overloaded trucks tend to have additional safety violations—more than vehicles that are not violating weight restrictions. So what should the enforcement look like? The State Patrol and county sheriffs have data on their enforcement actions. But we haven’t pulled that data together as a guide to help us find effective enforcement techniques.”

—Richard L. Kronick, LTAP freelancer

Conference materials online

Presentation slides are available from the Transportation Engineering and Road Research Alliance (TERRA) Pavement Conference at terraroadalliance.org. TERRA sponsored the conference in cooperation with CTS, the U of M Department of Civil, Environmental, and Geo-Engineering, the Minnesota Local Road Research Board, the City Engineers Association of Minnesota, the Minnesota County Engineers Association, MnDOT, Minnesota LTAP, the American Public Works Association – Minnesota Chapter, and the Minnesota Street Superintendents Association. LTAP
Pavement stripping and patching: What causes stripping under chip seals?

Chip sealing is a common pavement maintenance practice intended to extend the life of hot-mix asphalt (HMA) pavement. But for many years now, paving engineers have had a problem with deterioration of the pavement layer ½ inch to 1 inch underneath chip seals, just two or three years after application. This decay is seen most often in urban areas on curb-and-gutter streets and on pavement that was older when it received its first chip seal. Tom Wood of the Minnesota Department of Transportation (MnDOT) Office of Materials & Road Research explained the issue in a presentation at the American Public Works Association – Minnesota Chapter 2014 Fall Workshop.

Wood said that what starts as a pinhole or blister in the paved surface grows to the size of a small pot-hole over a couple of years, at which time the chip seal completely separates from the asphalt pavement. The delaminated area further deteriorates and creates an ongoing and expensive maintenance problem.

This complex phenomenon, known as stripping, was the subject of a recent research project sponsored by the Minnesota Local Road Research Board (LRRB). The main objectives of the study were to figure out what causes pavement stripping and to develop methods of determining which streets are prone to this problem.

During some initial testing, MnDOT researchers observed a high variability in the pavement density of core samples taken from streets with stripping issues. This led the team to consider density variability part of the stripping problem. From this hypothesis, researchers developed a theory that the higher air voids in less-densely-compacted pavement makes it easier for water to travel through the asphalt mix, and the combination of high permeability and moisture under the pavement could make the mix more prone to stripping.

To test their theory, they ran a series of air void and permeability tests on samples of pavement mix that historically had not had stripping issues and that had been compacted to contain 7, 10, and 14 percent air voids. Both field and laboratory test results confirmed that HMA pavement stripping after chip sealing is caused by areas in the pavement with high air voids and low density. Specifically, the team found that compacting pavement to the right density—typically 7 percent air voids in the lab or 92 to 93 percent field density—is important for preventing moisture damage that can lead to stripping.

Most Minnesota cities, many of which experience stripping problems, use simple comparison methods during new construction, Wood pointed out. When executed properly, these methods should yield good pavement density. However, these methods can be difficult to administer, requiring inspectors to ensure that all areas of a pavement receive the proper number of rolling passes at the proper temperature. This is especially challenging on streets with variable widths, curves, and utility cutouts, he explained.

Instead, MnDOT currently recommends using specified density construction methods in which core samples are taken randomly from pavements to verify that proper density has been achieved. The agency also recommends chip sealing streets early in their life. If the pavement density varies more than 6 lbs. per cubic foot as measured with a nuclear density tester, the pavement could possibly strip and may not be a good candidate for chip sealing.

These research efforts also showed that streets could be fog sealed with a light application of asphalt emulsion. This would stop water infiltration into the paved mat but would allow water vapors to escape similar to the way TYVEK® wrap works in home construction.

MnDOT is currently working to develop a faster-curing fog-seal emulsion that allows vehicles to drive on it just four minutes after application versus the current 30- to 35-minute cure time, Wood added. “When we get to that point, I think on true residential streets without steep hills fog sealing may be a viable option to chip sealing on streets with high variability of density.”

He noted that additional research is needed to study the effect smaller gradation mixes have on permeability, to examine and track how air voids change and likely increase over time, and to determine the causes of temperature segregation in HMA. Each of these factors, when better understood, can lead to less-expensive, longer-lasting HMA paved roads.

Download Stripping of Hot-Mix Asphalt Pavements Under Chip Seals (full report 2013-08; technical summary, 2013-08-TS) at lrrb.org LTAP —Nancy Stege, LTAP freelancer

Three views of pavement management

The TERRA Pavement Conference on February 12 included three presentations on pavement and asset management—one with the view from MnDOT, one from counties, and one from cities.

MnDOT and the FHWA

Dave Janisch, MnDOT’s pavement management engineer, highlighted issues that MnDOT has with some federal pavement management requirements. MnDOT samples the roughness of the first 500 feet of each mile of road and uses that to represent the surface of the entire mile. But MAP-21, the federal transportation funding law, will require MnDOT to record the roughness of every foot of National Highway System (NHS) roads. Janisch pointed out that this will require a ten-fold increase in labor.

FHWA has historically required MnDOT to report the roughness of just one direction on divided roads and let that represent the roughness of the highway. “But said Janisch, “one side may be new concrete while the other side is 30-year-old asphalt.”

MAP-21 also changes the criteria for roads based on population. “According to MAP-21, a road in a highly populated area can be two or three years older but can be given better than the ‘poor’ rating than a road in the country,” Janisch said. “I think, if the road is rough, it’s rough. However, we do understand that, because you tend to drive slower in urban areas, a road may measure rougher, though it doesn’t feel as rough to you in your car.”

Finally, Janisch showed that, with current funding levels, MnDOT will not meet some federal roughness targets for ‘poor’ roads in future years. Furthermore, the calculations that led to that conclusion were based on MnDOT’s existing methods. “So now we need to re-look at everything,” Janisch said. “We need to use LRRB in the future years. Will we see more or fewer ‘poor’ roads based on the new criteria? Also, though the projects we have planned will make the roads smoother, they may not satisfy the MAP-21 requirements?” He concluded that federal requirements are now under review by the states, and final decisions are yet to come.

Key to counties’ success: public education

A few years ago, Freeborn County Engineer Sue Miller was concerned. With available funds dwindling and a deteriorating county highway system, she mentioned in a county board meeting the possibility of unpaving asphalt roads. The response was immediate: “A board member told me that if I ever said that word unpave again in a public meeting, I would no longer be gainfully employed!”

The growing list of problems on county highways prompted Miller and other Minnesota county engineers to take action. They obtained an LRRB grant to improve communication with their boards and county citizens—and to keep their highways paved. After a three-year project involving five counties and county citizens—and to keep their highways paved.

Asset management for cities

Mike Rief and Andrea Azary are consulting engineers for WSB & Associates. They help cities implement asset management systems. Rief stressed the importance of non-technical communication. He noted that additional research is needed to study the effect smaller gradation mixes have on permeability, to examine and track how air voids change and likely increase over time, and to determine the causes of temperature segregation in HMA. Each of these factors, when better understood, can lead to less-expensive, longer-lasting HMA paved roads.

Download Stripping of Hot-Mix Asphalt Pavements Under Chip Seals (full report 2013-08; technical summary, 2013-08-TS) at lrrb.org LTAP —Nancy Stege, LTAP freelancer

Like Miller and West, Azary and Rief emphasized the importance of non-technical communication. Azary said they educate councils by providing pictures of varying levels of pavement distress, labeled with Overall Condition Index numbers that escalate as condition gets worse. “Then we ask, ‘Where do you want to maintain your level? Are you more comfortable with 65 or 76?’”

—Richard L. Kronick, LTAP freelancer
Communications

Workplace professionalism: make it a daily part of your life

Public works professionals play a vital role in keeping communities running smoothly and safely. From maintaining roadways and parks and operating public transit to making sure drinking water is safe and handling countless other duties necessary to protect public safety and enhance the quality of life for all residents, these professionals provide essential services to their communities. According to Jim Grube, one of the most important parts of this work is dealing with the public and doing so in an ethical manner that protects municipal resources from misuse and abuse.

Grube, director of transportation and county engineer with Hennepin County, made his remarks in a presentation at the American Public Works Association – Minnesota Chapter 2014 Fall Workshop. In their simplest form, ethics are the moral standards we rely on when making decisions, Grube said. They define what’s right and wrong, and outline the types of behaviors we should not engage in. “Our jobs [in public works] make a big difference in the lives of the people we serve… so ethical responsibility must be a real concern for us. I think the best thing we can do as public servants is to make our personal mottos be simply to always do the right thing.”

While ethical challenges can crop up in any workplace, their significance is heightened when they occur in the public sector. “We want the public to acknowledge the knowledge and work the people we do and we make, so we have to connect with them at a basic level. How many times have you performed work that generated hostility among the public? Almost everything we do upsets somebody. Still, we need to maintain integrity and honesty in our dealings with the people we serve. When we do, even if they are not happy with the outcome, at least they can admit we had an ethical, open approach.”

This points to the notion that ethical behavior is as much an organizational issue as it is a personal issue and has everything to do with the actions of the leaders, Grube maintained. Leaders must not only define their organization’s core values, but also practice them always. “The ability for any group to achieve a goal or mission depends upon the ability of the leaders to inspire others to join, to commit, and to move a cause forward,” he said. “When employees think that a person in power within their organization lacks honesty or integrity, they are less likely to contribute their best to even the most worthy effort. As leaders, we must take a personal responsibility to do right by our employees as well as the public.”

A person’s ethical actions can change over time, Grube continued, which follows the adage, “when you know better, you do better. One important facet of any relationship—work, or otherwise—is a willingness to honestly recognize that some sort of change is in order when what actually happens does not match what is expected to happen. “As we gain more experience in our lives, the line separating right and wrong can move,” he said. “Ethical actions occur when we learn from our experience and make honest adjustments in how we approach issues and bring expected outcomes and reality together.”

Overall, public works professionals do phenomenal things in spite of any faults, he added, particularly when their organizations incorporate values, ethics, honesty, and integrity in all they do. “These are powerful words that need to be part of our everyday vocabulary. To know them and make them a part of our daily lives will lead to our success. When we do this, we find that our future is bigger and brighter than our past.”

—Nancy Strege, LTAP freelancer

Safety

Reducing fatal crashes on U.S. 14

The Minnesota Department of Transportation (MnDOT) and law enforcement agencies are taking major steps to lower the abnormally high number of fatal crashes on one stretch of U.S. 14 in southern Minnesota. So far, the results are significant.

This was the topic of one session at the 2014 Toward Zero Deaths Conference, held November 13–14 in Duluth. Representatives from MnDOT and the Minnesota State Patrol discussed how they combatted the high number of fatal head-on crashes on Highway 14, a rural, two-lane highway spanning from New Ulm to Mankato. According to MnDOT engineer Scott Thompson, data collected from 2006–2010 indicate that paired to other two-lane highways in the state with similar traffic volumes, crashes that occurred on Highway 14 were nearly three times more likely to result in a fatality or a serious injury.

Previously, MnDOT officials had implemented low-cost improvements to combat the crashes, including rumble strips on the centerline and shoulders, warning beacons at intersections with a sustained history of crashes, intersection lighting, and driver feedback (“Your Speed Is...”) signs. However, fatal crash rates on the roadway were still unusually high.

After conducting a road safety audit on the highway, MnDOT officials found that the crashes were mostly a result of driver behavior. “And big decisions we make, so we have to connect with them at a basic level. How many times have you performed work that generated hostility among the public? Almost everything we do upset somebody. Still, we need to maintain integrity and honesty in our dealings with the people we serve. When we do, even if they are not happy with the outcome, at least they can admit we had an ethical, open approach.”

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—Nancy Strege, LTAP freelancer

Flagging handbook, video teach how to stay safe in work zones

“ ...we need to maintain integrity and honesty in our dealings with the people we serve.”

—Jim Grube

To you, the flagger: REMEMBER—Your job is the most important one on the crew. The lives of all individuals in the work space depend on YOU!”

This is the introduction to the Minnesota Flagging Handbook, updated by MnDOT in 2014. It follows the guidelines of the 2011 edition of the Minnesota Manual on Uniform Traffic Control Devices, including its latest update.

The illustrated handbook gives basic guidelines regarding flagging operations. It covers equipment, flagging position, flagging situations, procedures, nighttime flagging, flagging at intersections, and proper conduct. A checklist for flagger training is also included.

MnDOT also created a supplementary flagger training video—Flagging Operations and Procedures 2014 (18:35 minutes). Both the handbook and the video are available at dot.state.mn.us/constr/wzs/flagger.html. LTAP

—Lexi Gusto, LTAP intern

zone, the initiative has been successful, reducing fatal and serious injury crashes by 100 percent and cross-centerline crashes by almost 50 percent, Thompson said.

The third phase, constructing the four-lane highway, will begin in spring 2015 and is expected to conclude in 2017. Overall, the four-lane expansion project is expected to cost $44 million. LTAP

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

Optimal Timing of Preventive Maintenance for Addressing Environmental Aging in Hot-Mix Asphalt Pavements (MnDOT, December 2014)
This report considers the proper timing of preventive maintenance by identifying how environmental aging affects asphalt material properties and preservation treatments.

Study of the Regulatory Issues Affecting Truck Freight Movement in the Midwest (Iowa State University, December 2014)
This report investigates regulatory issues that may affect or limit freight movement—such as weight enforcement and vehicle dimensions—in Iowa and other Midwest states.

This report summarizes the findings of Mechanistic-Empirical Pavement Design Guide (NMDPG) implementation and identifies input data needs and research steps of NMDPG implementation.

Cracking Behavior of Structural Slab Bridge Decks (Ohio DOT, January 2015)
This report discusses the cracking behavior of continuous span structural slab bridges in order to address bridge deck cracking issues and the service life of concrete bridges.

Analysis of Aggregate Pier Systems for Stabilization of Subgrade Settlement (Ohio DOT, December 2014)
This report investigates the applicability of vertical column support systems to improve subgrade and reduce settlements for existing roadways in Ohio.

Effective Implementation of Ground Penetrating Radar (GPR) for Condition Assessment and Monitoring of Critical Infrastructure Components of Bridges and Highways (Maryland State Highway Administration, January 2013)
This report explains the use of ground penetrating radar (GPR) in assessing the condition of critical infrastructure components and identifies potential improvements in GPR data analysis.

Visualization of Technical Data for Hazard Mitigation and Disaster Response (TRB’s National Cooperation Highway Research Program, 2013)
This report evaluates the tools and techniques used for mitigating geotechnical hazards and responding to geotechnical disasters such as landslides, rockfalls, settlement, sinkholes, and other events.

Investigation of Best Practices for Maintenance of Concrete Bridge Railings (Louisiana State University/ Louisiana DOT, January 2013)
This report documents the causes of biofilm contamination of concrete surfaces and practices implemented to prevent and clean biofilm.

Feasibility of Reclaimed Asphalt Pavement (RAP) Use as Road Base and Subbase Material (Virginia DOT, January 2013)
This report investigates the state of practice with using reclaimed asphalt pavement material for road base and subbase applications.

This report discusses the cracking behavior of continuous span structural slab bridges in order to address bridge deck cracking issues and the service life of concrete bridges.

The Shelf

Timber bridges
Current bridge inspection procedures are mostly limited to visual inspection of the wood components, along with ‘sounding’ with a hammer and coring to confirm suspected damage areas,” says Brian Brashaw, director of the Wood Materials and Manufacturing Program at University of Minnesota Duluth’s Natural Resources Research Institute (NRRI).

“Currently, Visual bridge inspection procedures are mostly limited to visual inspection of the wood components, along with ‘sounding’ with a hammer and coring to confirm suspected damage areas,” says Brian Brashaw, director of the Wood Materials and Manufacturing Program at University of Minnesota Duluth’s Natural Resources Research Institute. (NRRI). “These techniques have generally been adequate for advanced decay detection, but they are not adequate when the damage is in the early stages or is located internally.”

To address these challenges, a team led by NRRI researchers identified advanced inspection technologies for timber bridges that could be used effectively in Minnesota. These technologies included moisture meters to identify areas susceptible to timber decay, stress wave timing to locate and define areas of decay non-invasively, and resistance microdrilling to confirm and quantify bridge element decay.

“When used by experienced inspectors, this equipment offers the potential to locate and quantify the extent of decay that is present in bridge elements, often before it reaches an advanced stage,” Brashaw says.

The project also included several activities to put the research findings into practice. The team developed standard inspection protocols, integrated the results into MnDOT’s bridge data management software, developed a new timber bridge inspection manual, and held outreach training across Minnesota for more than 150 inspectors and engineers.

Finally, the research team completed an economic assessment on the use of advanced inspection technologies for timber bridges. “We quantified the possible extension of the timber bridge life cycle before replacing the bridge or posting weight restrictions, and we found that using these advanced inspection techniques and equipment does provide a positive return on investment,” Brashaw says.

“The project helped put advanced inspection tools in the hands of our inspectors,” adds Bruce Harbargen, the county engineer in Beltrami County. “The tools are now available, and the inspectors have the knowledge on how to use them. Timber bridge inspection has been significantly improved.”

MnDOT has purchased three sets of the recommended inspection equipment for use by bridge owners to conduct timber bridge inspections. NRRI will manage the equipment use and provide support to inspectors across Minnesota.

The Minnesota Local Road Research Board and the Iowa Highway Research Board provided financial support for the project. The research team included the Minnesota Department of Transportation Offices of Bridges and Structures and State Aid for Local Transportation, Iowa State University’s Bridge Engineering Center, the USDA Forest Products Laboratory, the National Cooperative Highway Research Program, and HDR, Inc.

—Megan Tsai, CTS freelancer

A stress wave timer locates bad areas on a bridge by using probes to measure the time it takes for sound to travel through the material. A decayed piling will have a time that is more than double that of a sound piling.

The word from the field
“The new inspection equipment can really help local agency inspectors evaluate timber bridges. Goodhue County inspectors found two questionable structures during their routine inspections last fall, and asked that we have the structures analyzed by a consultant because the inspectors were unsure of the load-carrying capacity of the piles based on their exterior condition. Instead, I contacted Brian, and he lent us a stress wave timer and a resistance drill. With these two tools our inspectors were able to ascertain the lack of decay inside the piling. This alleviated their concerns about the load-carrying capacity of the piles, thus saving us the cost of hiring a consultant to perform the structural analysis.” —Greg Isakson, Goodhue County

A resistance microdrill determines how much good wood is left in a piling or timber element by drilling a bit into the wood and measuring the resistance.

Minnesota LTAP is planning to offer timber bridge inspection training later this year. Stay tuned for updates!
Calendar

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

American Public Works Association—Minnesota (APWA-MN) Chapter Spring Conference
May 6–8, Brainerd Lakes area

Minnesota Roadway Maintenance Training and Demo Day (1 RS elective credit) LTAP
May 13, Rosemount

CTS Transportation Research Conference
May 20–21, St. Paul

Truck Weight Compliance Training (1 RS elective credit) LTAP
Starting again in fall

Toward Zero Deaths Annual Conference
Oct. 29–30, St. Cloud

Online training (Anytime, anywhere!)

Culvert Design and Maintenance (1 RS required credit) LTAP

Sign Maintenance and Management for Local Agencies (1 RS required credit) LTAP

Gravel Road Maintenance and Design (1 RS required credit) LTAP

Work-Zone Safety Tutorial LTAP

Turfgrass Maintenance (1 RS elective credit) LTAP

Roads Scholar credit
You can earn credits in Minnesota LTAP’s Roads Scholar (RS) program by attending LTAP and CTAP workshops and other cosponsored events. To learn more or enroll in the program, visit mnltap.umn.edu/roadsscholar.

LTAP workshops
LTAP workshops, along with events cosponsored by Minnesota LTAP, are marked with an LTAP at left. Check the web for details and to register online: mnltap.umn.edu/training. To be added to our print or electronic mailing lists, e-mail mnltap@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. Each CTAP workshop earns 0.5 RS elective credit. For more information or to schedule classes, call the CTAP instructor, Kathy Schaefer, at 612-625-5608. LTAP

Why take online training?

- Learn at your own pace—any time, any place.
- Reduce travel costs.
- Become familiar with online learning formats.
- Learn to use the computer for other education purposes.

For more information or with questions about the courses, please visit the Minnesota LTAP website—mnltap.umn.edu—or contact Kylie Bivins at bivins@umn.edu or 612-625-5608. LTAP

Find the hidden answer…and win an online course registration!

Welcome to a fun new feature of the Exchange! Puzzle answers are taken from articles in this issue and from our new online courses. When you finish, the letters in the shaded boxes, moving from bottom to top, will spell out a Minnesota “spring training” manager. E-mail the answer to us at mnltap@umn.edu by May 15, 2015.

We’ll hold a drawing to pick five lucky winners of a free registration for one of our online courses—up to a $75 value! The winners and the answers will be posted in July. LTAP

Spring Training
Across
1. Barbecue apparel … or an end piece of a round pipe
2. Moral standards
3. Toward Zero _____
4. How often sign inspections should be conducted
5. Concrete slurry applied at high velocity
6. Demo Day 2015 location
7. When agencies are required to have a sign assessment or management method in place
8. Time when a culvert must convey water, freely and efficiently
9. Type of saw … and the most common shape for culverts
10. Most commonly used sign panel substrate in Minnesota
11. Area of land that drains to a culvert
12. Type of saw ...
13. When agencies are required to have a sign assessment or management method in place
14. Number of sign types required by the MN MUTCD
15. A Germanic tribe that sacked old Europe … and a cause of sign damage

Down
1. Barbecue apparel … or an end piece of a round pipe
2. How often sign inspections should be conducted
3. Toward Zero _____
4. Time when a culvert must convey water, freely and efficiently
5. Type of saw … and the most common shape for culverts
6. Most commonly used sign panel substrate in Minnesota
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8. Type of saw … and the most common shape for culverts
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10. A Germanic tribe that sacked old Europe … and a cause of sign damage
11. Area of land that drains to a culvert
12. Type of saw ...
13. When agencies are required to have a sign assessment or management method in place
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