Local Technical Assistance Program

The Bridge

Linking Transportation Research and Practice

Vol. 23, No. 3 January 2010

Much more than a road project

Complete rebuild of Houghton's main street demonstrates the value of deep cooperation among stakeholders

By John Ryynanen, Editor, Michigan's LTAP

Construction projects through business districts cause headaches. Traffic delays, noise, limited access, and dirt everywhere work together to frustrate motorists, business owners, pedestrians and residents. In addition, funding uncertainties often lead to various levels of strife among those conducting the projects. But none of that happened in Houghton, Michigan this summer.

A major road reconstruction project modernized Houghton's underground utilities while turning back the clock on the look of the pavement, sidewalks and street lighting. The nearly $4.6 million historical reconstruction of US-41 was conducted by the Michigan Department of Transportation (MDOT) and funded through a diverse combination of sources. MDOT used some traffic and safety, and road preservation funds, and also secured funding through the Federal Transportation Enhancement program. The City of Houghton secured funding through Michigan's Vibrant Small Cities Initiative (VSCI), and a Rural Development loan. The project is an excellent example of how good leadership, clear communication and healthy cooperation among project stakeholders can minimize frustration for the public, and maximize returns on road improvement investments.

"Working together, we were able to smooth out a lot of the bumps. Everyone involved engaged in the process to make the project go as smoothly as it did."

Scott MacInnes – City of Houghton

Construction began in May and was completed in October. It involved removing and rebuilding the entire downtown Houghton streetscape, two blocks at a time. New water lines, sewer lines (sanitary and storm water), and electrical service was installed beneath a modern brick pavement surface and dark-toned concrete sidewalks and crosswalks. High-efficiency streetlights that look like they're from the 1930s completed the historical transformation.

Michael H. Babcock/Daily Mining Gazette

A biker catches big air in downtown Houghton this past summer. A major construction project closed the main street to vehicular traffic, but opened it for once-in-a-lifetime special events like a BMX race.

Houghton's half-mile long main street is home to 65 businesses and 380 full-time residents. Over 400 people commute there to work every day. MDOT, the City of Houghton, and the Downtown Houghton Merchants' Association used innovative communication and promotional strategies to minimize the social and economic impacts of the project. "The potential disruption to life and business in Houghton this summer was huge," Houghton City Manager Scott MacInnes said. "Working together, we were able to smooth out a lot of the bumps. Everyone involved – MDOT, the contractors, our busi-

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More inside

MichiganTech
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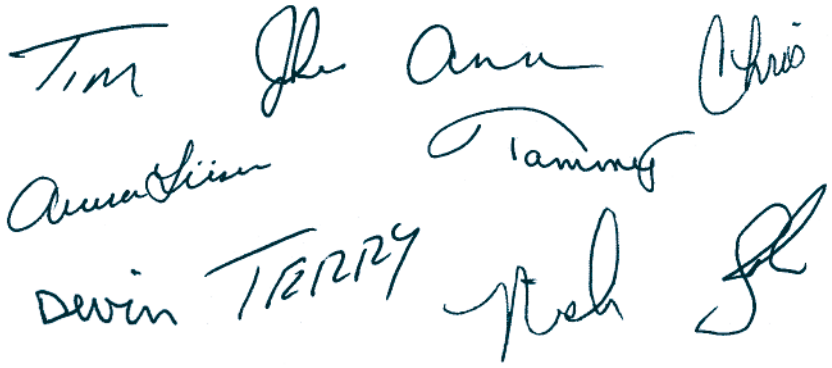
From our organization to yours

Everyone in the Michigan LTAP office wishes you the best as we begin this new year together. We look forward to serving you in 2010!



"Year's end is neither an end nor a beginning but a going on, with all the wisdom that experience can instill in us."

- Hal Borland, author (1900 – 1978)

The Bridge

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LTAP Steering Committee

The Local Technical Assistance Program (LTAP) is a nationwide effort financed by the Federal Highway Administration and individual state departments of transportation. It intends to bridge the gap between research and practice by translating the latest state-of-the-art technology in roads, bridges, and public transportation into terms understood by local and county highway or transportation personnel.

The LTAP Steering Committee makes recommendations on, and evaluations of, the activities of the Local Technical Assistance Program based on discussions at the Technology Transfer Interchange and Advisory Committee meeting. This meeting is held annually and is open to all rural and urban agencies, and individuals concerned with the transfer of transportation technology in Michigan.

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Roadside Alligators and Retread Tires

Researchers investigate causes of truck tire debris on nation's highways

By Joyce Daniels,
University of Michigan
Transportation Research Institute

For both casings and fragments, tire failure due to the retread manufacturing process was **under 15 percent**.

Oliver Page, UMTRI

In many states, the "roadside alligator" is a commonly sighted highway hazard. The name refers to tire debris, or rubber fragments and casings (whole tires), that frequently litter highways and interstates. A new report by University of Michigan Transportation Institute (UMTRI) researchers describes the likely causes of tire failure that result in debris and reveals important information about retread tires.

Oliver Page, assistant research scientist in the Transportation Safety Analysis Division (TSAD) and TSAD head John Woodrooffe led the research with assistance from UMTRI associate research scientist Daniel Blower and assistant research scientist Paul E. Green. The research, which appears in the current issue of *Transportation Research Record*, was sponsored by the National Highway Traffic Safety Administration (NHTSA) under a subcontract from Virginia Tech Transportation Institute.

The goal of the study was to determine whether the tire debris came from original equipment (new tires) or retreads. A retread tire is manufactured by bonding a new tread onto a used casing that is still in excellent condition.

"There's a public perception that if it's a retread truck tire, it's not as good," said Page. "That's not true. What we were trying to do is see if retreads were overrepresented in samples collected, and if they were, whether the probable cause of failure was due to manufacture/process issues."

To find out, Page and Woodrooffe coordinated the collection and analysis of approximately 86,000 pounds of tire debris and discarded tire casings from five sites in the United States during summer 2007. The sites—Gary, Indiana; Wytheville, Virginia; Gainesville, Florida; Taft, California; and Tucson, Arizona—were all located adjacent to major interstate routes with high commercial-trucking flows.

Oliver Page, UMTRI

Oliver Page, UMTRI

UMTRI researchers coordinated the collection and analysis of approximately 86,000 pounds of tire debris and discarded tire casings from five sites in the United States during summer 2007.

With the help of commercial haulers and the cooperation of highway maintenance workers, they collected a random sample of tire fragments and casings, totaling 1,496 items, from interstates and truck stops.

Researchers turned to a tire-failure-analysis consulting firm in Ohio to analyze the debris. The firm analyzed the individual fragments and casings and classified the probable cause of failure for each item, if known.

Overall, where tire status could be determined, original equipment accounted for 60 percent of the tire casings tested, and retreads accounted for 40 percent. Of the tire fragments analyzed, 21 percent were from original equipment, and 79 percent were from retreads.

Analysis of the debris found that road hazards, such as hitting a curb or sustaining a nail puncture, were the most common cause of tire failure for 38 percent of the fragments and 36 percent of the casings. Maintenance and operational issues accounted for 32 percent of the tire casing failures, while degradation from excessive heat was evident in 30 percent of the tire fragments examined. For both casings and fragments, tire failure due to the retread manufacturing process was under 15 percent.

"Results of our study suggest that the majority of tire debris found on the nation's highways is not a result of manufacturing or process deficiencies."

Oliver Page – University of Michigan Transportation Institute

"Results of our study suggest that the majority of tire debris found on the nation's highways is not a result of manufacturing or process deficiencies," said Page. The results have important policy implications, he added, noting that because tire debris is so visible, some states had begun initiatives to ban retreads, assuming that the retread tires accounted for the most debris.

Page and Woodrooffe presented the results of the research at the 88th meeting of the Transportation Research Board in Washington, D.C. in January 2009.

The full report, *Commercial Medium Tire Debris Study*, is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration (report number: DOT HS 811 060, and is available at http://hdl.handle.net/2027.42/61517.

Road project **from Page 1**

nesses, residents, even our police force and media outlets – engaged in the process to make the project go as smoothly as it did."

From simple beginnings

Communication among stakeholders started in early Spring of 2008. Andy Sikkema, manager of MDOT's Ishpeming Transportation Service Center met with City of Houghton officials to the discuss repaving the City's main street. "When I first talked to Scott MacInnes about the project, we were planning to do a simple mill and overlay through the downtown," Sikkema said. "But I didn't just walk in and tell him that's what we were going to do. Rather, I suggested it and then asked what improvements he thought needed to be made."

"If we shut the whole street down, construction would have been much faster, but that kind of impact on business is obviously not realistic, so we worked with the City and the business owners to strike a balance that worked."

Andy Sikkema – MDOT

Michigan's LTAP

Downtown Houghton businesses operated in the middle of a major construction project from April through October. Business owners helped organize special events and promotions to attract people downtown. Temporary wooden sidewalks allowed access to stores and provided an up-close view of the construction activity.

MacInnes recognized Sikkema's suggestion as an opportunity to upgrade more than just the pavement surface. "MacInnes came back with a much more comprehensive plan," Sikkema said. "It included replacing all the underground utilities and performing a complete storefront-to-storefront rebuild. From that point on, the City really took ownership. They worked with us to identify funding sources for everything, and then they worked with the merchants' association and individual businesses to gain support on the ground from the people who would be most affected by the work."

Opening the lines of communication

In early December 2008, MDOT held an open house meeting with City of Houghton officials, business owners and residents to lay out initial plans for the project. MDOT Delivery Engineer Alan Anderson presided. "The open house was a typical public meeting to announce an upcoming project," he said. "The purpose was to let people know what we were planning and to address general concerns."

Michigan's LTAP

Just before construction got underway in April, MDOT Local Delivery Engineer Alan Anderson provided interviews and information to the local news media.

Four months later, after several more meetings between MDOT, the City of Houghton, and project design engineer U.P. Engineers and Architects, MDOT hosted a final pre-construction public meeting in April 2009. "Initial planning was very smooth," Anderson said.

According to Sikkema, the pre-construction phase was so smooth that the project progressed much more quickly than usual. "Ordinarily on a project of this size, concept to construction would take about three years," he said. "We started ripping up pavement in May 2009, about one year after my first meeting with Scott MacInnes."

Maximum access was part of the contract

During sidewalk removal and utility placement, some buildings and businesses experienced service outages and were inaccessible. In the project contract, MDOT specified steps to maximize access for residents and businesses. For example, the contractor placed temporary wooden boardwalks immediately after removing the old sidewalks, they used fast-setting concrete at the entrances to buildings, and they placed new utilities and prepared them for service before disconnecting and removing the old utilities.

Sikkema explained that the project management part of construction is a balancing act between timeliness and impact on businesses. "If we shut the whole street down, construction would have been much faster," Sikkema explained. "But that kind of impact on business is obviously not realistic, so we worked with the City and the business owners to strike a balance that worked."

The Houghton City Council, the local Chamber of Commerce and merchants also teamed up to make sure the downtown remained accessible and inviting. In addition to closing a lane of road to allow angle parking, the partners put together a "Construction Cash" campaign to reward people for shopping downtown. The campaign involved randomly placing $1.00 coupons on parked cars. Each coupon was good for $1.00 off any purchase from participating merchants.

Construction creates unique opportunities

MacInnes said he was impressed with how everyone worked together to make sure the downtown remained active and accessible all

summer. "Our business owners were great. They saw this as a unique opportunity to do some things that otherwise would not be possible. They came up with some real creative ways to turn a construction zone into a place where business could be done."

Steve Krug, a Houghton restaurant owner and president of the Downtown Merchants' Association, was enthusiastic from the beginning. His restaurant, *The Lunch Bag*, is located almost exactly in the middle of the business district. "The City was phenomenal in how they approached this project," Krug said. "Scott MacInnes and the City Council came in real positive right from the start; they got a core group of businesses together and got us thinking about the possibilities instead of the problems. Things just took off from there."

Michigan's LTAP

The new street surface is made up of approximately 500,000 bricks, each of which was hand-placed onto a layer of rubberized asphalt cement adhesive over four inches of asphalt pavement. The joints between the bricks were filled with a sanded grout that contained a small amount of cement to prevent water infiltration.

"This is a major event in Houghton history," Krug continued. "Our basic strategy as a business community was to embrace and celebrate the construction instead of avoiding it." One of the ways businesses embraced the construction was through block parties every time a segment of the project was completed. "The original plan was to open streets to traffic as soon as they were completed," Krug explained. "But MDOT allowed us to keep completed segments closed for a couple of extra days so merchants could use them for special promotional activities."

> *"Our basic strategy as a business community was to embrace and celebrate the construction instead of avoiding it . . . from a business standpoint, we had a very, very good summer."*
>
> Steve Krug – Downtown Houghton Merchants' Association

To help coordinate communication between the City of Houghton, MDOT, the contractor, business owners and residents, MacInnes hired a full-time public relations specialist. Also, the City Council used a $10,000 downtown promotion grant to form a special events committee and to create special signage.

In addition to block parties to celebrate completed sections of streetscape, downtown events included an art festival , a "bike expo" in conjunction with national bike to work day in May, and live music on Thursday evenings all summer. "We had a lot of fun," Krug said. "From a business standpoint, we had a very, very good summer."

Good ideas for future projects

MDOT Development Engineer Rob Tervo was impressed with the cooperation among stakeholders and the creativity exhibited by the City of Houghton and downtown businesses to maintain traffic through the construction zone. "Everyone involved jumped in with both feet and committed to making the project work," Tervo said. "This was a great experience. We came away with good ideas for future projects." Temporary boardwalks to replace sidewalks, special promotions to attract people downtown and a liaison to coordinate communication among stakeholders and are all ideas that MDOT hopes to use again.

Showcase for careers in construction

The summer-long project also provided a unique opportunity to showcase careers in transportation construction to high school students from across Michigan. In July, Michigan Technological University hosted the first National Summer Transportation Institute (NSTI) to be held in Michigan. Funded by the Federal Highway Administration (FHWA) and coordinated through MDOT, the two-week program was designed to introduce young people to the many career opportunities in the field of transportation.

Chris Gilbertson, research engineer at the Michigan Tech Transportation Institute, helped organize tours of the Houghton job site for the 30 high school students who participated in the program. "The construction sequencing for the project was perfect for educational tours," Gilbertson said. "The students were able to see more than just a road being paved. They watched as utilities were replaced, and Marty Rajala, the MDOT inspector on the project, explained the significance of various types of bedding and subgrade materials and the importance of proper compaction. Walking from one end of the project to the other was like fast-forwarding through each stage of construction; beginning to end."

Michigan Technological University

As part of the National Summer Transportation Institute at Michigan Technological University, 30 high school students from across Michigan were given a guided tour the entire job site.

See *Road project* on Page 7

Chemical-free snow and ice control

Adapted from the Summer 2009 issue of *Crossroads*, a quarterly newsletter published by the Wisconsin Transportation Information Center.

Strategies to improve winter maintenance often focus on new techniques in anti-icing and deicing, and how alternative chemicals perform to keep roads passable and safe. Mechanical removal, or plowing, is rarely in the spotlight. Yet this routine method of snow and ice control is the most effective method with the least impact on the environment.

Many local governments are exploring ways to improve equipment and methods to maximize their storm response and cut back on salt use. One approach involves innovative blade designs and plow configurations that do a better job of clearing pavement.

The experience of highway departments in Wisconsin and Iowa demonstrate the impact of several alternatives—including rubber-wrapped carbide blades and multi-edge plows.

Blade performance impresses drivers

Monroe County, WI started using Joma blades on several trucks about eight years ago. The Joma system consists of carbide segments encased in rubber. William Pieper, Shop Superintendent for the county's highway department, says at first they used the blades only on main county roads because the new blades were more than double the cost of regular blades, $480 versus $216.

In exchange, he says, the Joma blades generally last three times as long, up to two years without full replacement in his experience. The rubber blades performed well enough that Pieper says Monroe County now uses them on additional roads and, last winter, they put the Joma blades on the wings.

He admits his first impression was "these will never work" because the blades were not a full piece of steel. "After we started to use them more, it was like an ugly car that grows on you," he says. "They work especially good on concrete pavements and the operators swear by them."

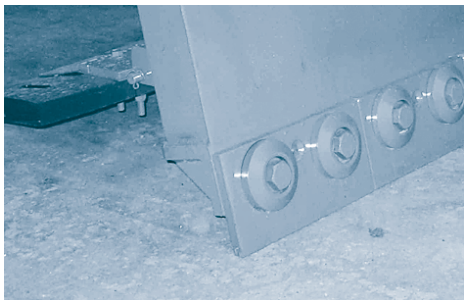
Patrol Section Leader Larry Rhea is one of those operators. He calls the rubber/carbide blades a significant improvement in winter maintenance equipment. The carbide component is strong, he says, and the rubber acts as a shock absorber, lessening the toll on equipment and sparing drivers fatigue-inducing vibrations. "After 10 or 15 hours out plowing, it really makes a difference," he notes, adding that mounted as they are in four-foot sections, the blades are more forgiving. They "flex" when operators plow across raised pavement markers, or sections of worn or wheel-rutted asphalt. As a result, the rubber/carbide blades leave less snow on the pavement and the county is using less salt on its roads.

Black Cat Blades

Joma blade, from Black Cat Blades

Valley Blades

Polar Flex, from Valley Blades

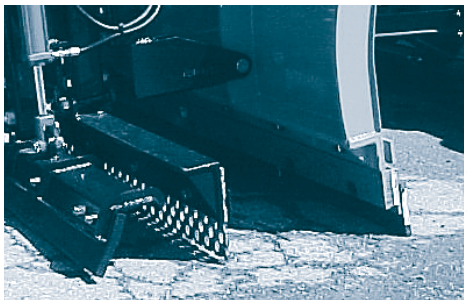


Iowa DOT

Iowa DOT's in-house design

Iowa DOT

Iowa DOT's stacked carbide blades



Monroe Truck Equipment

Multi-blade system from Monroe Truck Equipment

Routine maintenance

Because carbide wears tougher than steel, Pieper sees the county reaping the benefits over time despite the higher cost of Joma blades. "We keep them out there longer without the need to replace and maintenance on them is routine, like other plowing equipment." Thanks to minimal cylinder vibration, he adds, there is less pin wear.

The blades bolt on in sections, making it easier to replace damaged sections or ones that wear unevenly without waste. The only difference Pieper sees is that the bushings inside the mounting holes tend to wear and slide out as the blades wear. To protect against failure in the field, his crews run a steel blade behind the rubber blade—mounted three inches higher—for support and as a guide.

The benefits outweigh the drawbacks, Pieper says, and he is satisfied with their work-around.

Rhea, who has 21 years of experience behind the plow, says the Joma blades take training to use correctly. "Drivers need to follow appropriate equipment handling to get the most out of them," he adds. "The best blades out there won't last if driven too hard or too fast over pavements."

Prototype comparison

The Iowa Department of Transportation (IaDOT) experimented last year with the Joma system and another blade of similar design by Valley Blades called Polar Flex. IaDOT technicians also developed and tested a prototype design of their own using one-foot carbide sections and rubber. Dennis Burkheimer, Winter Operations Administrator for IaDOT, says their tests indicate that the system of rubber-encased blades in one-foot blade segments is effective for cleaning roads with one pass. And, as in Monroe County, the IaDOT operators

appreciate the quieter blades and how they adjust to the contour of the roadway.

Life-cycle performance was good, Burkheimer says. His crews did not wear through a single set of the commercial blades last winter. They plan to expand use of the blades next winter and do more extensive testing.

The IaDOT prototypes also wore well. Burkheimer reports they used the blades all winter and wore them down about a quarter-inch. He estimates these will last an additional one to two years. "Since we made them in-house, however, we don't have a good idea of cost for the blades if they were produced by a manufacturer."

Cost, of course, is a major consideration. Burkheimer says IaDOT goes through more than 2,000 standard carbide blades each winter season at a unit cost of about $600 to outfit the department's 11-foot plows. IaDOT's annual budget for blades currently totals over $1.2 million.

"We typically get about 1,000 miles of wear out of each set," he notes. "We also started stacking the carbide blades on the plows, which allows us to get maximum life out of the blade without damaging the moldboard or having to change them out before they're completely worn."

The $3,000 price of the rubber/carbide Polar Flex blades includes a holding system that should last the life of the plow. Crews replace the one-foot sections as they wear and the rubber cushioning after about three changes of blades.

Burkheimer considers the rubber/carbide design a serious option for IaDOT's winter operations but is not sure which system makes the most sense. "This winter, we plan to do side-by-side testing of the Joma, the Polar Flex, our own design and standard carbide blades to get more data to help with our decision."

One pass, multiple blades

Another idea IaDOT is testing for improved plow performance is multi-edge blades. The department has run trials with plows that have a scarifying blade positioned behind the main carbide blade and a third blade made of a rubber material mounted behind the moldboard. Each blade works independently, with the operator choosing the blade or blade configuration that suits conditions.

Burkheimer observes that some combination of multiple blades effectively removes more snow and ice from the road in one pass because the second or third blades move anything left behind by the main blade. As a result, it takes less deicer to achieve bare pavement.

Last year, IaDOT also tested a plow with only the rubber blade on melted snow and slushy material. They have tried different slush blade designs, either deploying the blade by rotating the moldboard or by raising and lowering it.

Iowa was one of five states, including Wisconsin and Minnesota, that joined in a study last year of the effectiveness of multi-edge plows. The ongoing study is sponsored by Clear Roads, a multi-state cooperative research group which funded purchase of five multi-edge prototype plows from four different manufacturers featuring conventional, slush and ice blades. Burkheimer says his group left the ice blade off the prototype they received because it did not measure up. They plan to modify the blade and use it in their tests this winter.

Material improvements

As local street and highway departments work to keep costs in check, adopting new materials and methods is necessary to sustain an effective winter maintenance operation. Improvements in materials and innovations in equipment like rubber/carbide blade systems and multi-blade plows are examples of new ideas that can help.

For more information

On the Web

Black Cat Blades, Ltd.
www.blackcatblades.com

Clear Roads pooled fund project
www.clearroads.org

Monroe Truck Equipment
www.monroetruck.com

Valley Blades, Ltd.
www.valleyblades.com

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Police approve and participate

All the activity downtown could easily have been perceived as a safety and security nightmare from a law enforcement perspective. But Houghton Police Chief John Donnelly not only approved of the plans, he and his officers participated in some of the activities. "For the bike expo, we mobilized officers on bikes with bags full of City of Houghton promotional items," Donnelly said. "We also organized bike races between our officers and the kids."

The Houghton Police Department also collaborated with MDOT and the Houghton City Council to make room for more parking and more people downtown. The streets that are open to traffic during construction had one lane closed to accommodate angle parking, and MDOT agreed to let the city move the "Road Closed" signs as needed to open the street for activities and celebrations. "We wanted to keep the downtown open and accessible, and we wanted it to be a fun, inviting place all summer. We absolutely recognize the connection between a healthy business climate and a safe, secure place for people to be. It wouldn't have done anybody any good to keep people away," Donnelly said.

Spirit of teamwork

Summing up his experience planning and overseeing the project, MDOT's Sikkema praised the spirit of teamwork and cooperation that made it work. "One of the keys to the success here was that everyone involved took the time to understand the project from each others' perspective. We all worked together real well."

Editor's Note*: The Daily Mining Gazette in Houghton published several terrific stories about different aspects of the streetscape project. To read the stories, go the the Daily Mining Gazette Web page (www.mininggazette.com), and then search local news for "streetscape."*

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Events and Resources

Workshops and Conferences

2010 Certified Inspector of Sediment and Erosion Control (CISEC)
Feb. 2-3 – Kalamazoo

44th Annual County Engineers' Workshop
(Open to Counties, Cities and CRAM affiliates)
Feb. 23-25 – Mount Pleasant

PASER Training
Mar. 2 – West Branch; 3 – Big Rapids; 4 – Lansing; 16 – Kalamazoo; 17 – Brighton; 18 – Saginaw

Fundamentals of Hydraulic Systems for Heavy Equipment
Mar. 9 – Prudenville 10 – Mason; 11 – Troy; 12 – Kalamazoo

Aggregate Refresher Course and Recertification Test
Mar. 9-10 or 11-12 – Houghton

Density Control Refresher Course and Recertification Test
Mar. 10-11 – Houghton

Michigan Bridge Conference
Mar. 23-24 – Big Rapids

Webinars

Winter Maintenance Series
Jan. 19 – Assessing Materials and Methods
Jan. 28 – Winter Operations for Municipalities
Feb. 8 – Winter Operations Audits
Feb. 18 – Anti-icing and Pre-wetting

Books

Sign Retroreflectivity Guidebook
For small agencies, federal land management agencies, and tribal governments.
(Call the LTAP office to request a copy free of charge)

NOTE
Michigan's LTAP is currently finalizing plans for a series of Sign Retroreflectivity Workshops and Webinars to be held in April. Watch for details in the next issue of *The Bridge*.

For more information, call 906-487-2102 or visit www.MichiganLTAP.org.