Vol. 26, No. 1 – June 2012

The Bridge

A quarterly newsletter from Michigan's Local Technical Assistance Program

Minimal impact

Amy Schoonover, P.E., director of public works for the City of Charlotte, used **cold in-place recycling** to rehabilitate short stretches of pavement on a busy residential street in downtown Charlotte. The quick turnaround, money savings, and minimal impact on residential and commercial traffic in the area all contributed to the success of the project.

Cold in-place recycling—a good choice even in tight spaces

By John Ryynanen, Editor; and Belinda Wirtanen, Technical Writing Intern
Center for Technology & Training

City of Charlotte

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Michigan's Local Technical Assistance Program

Since the mid-1970s, the Transportation Research Board of the National Academies (TRB) in Washington DC has sponsored several research studies that have proven the viability of cold in-place recycling (CIR) on long stretches of asphalt pavement on state highways and rural county roads. However, many wonder if CIR is a good treatment option for county and municipal roads where tight quarters, more vehicle and pedestrian traffic, and multiple obstacles (like driveways, manholes, gutters, and storm water drains) can complicate construction. According to Amy Schoonover, P.E. director of public works for the City of Charlotte, the answer is, "Definitely!"

Rebuild or recycle?

Schoonover recently completed two CIR paving projects on short stretches of road in the City of Charlotte. The projects rehabilitated 0.62 miles of Mikesell Street, and 0.55 miles of road that included sections of Hall, Washington, and McClure Streets. She chose CIR because it was less expensive and more convenient than other treatments. "The roads were rated a PASER 2 and 3; ordinarily, we would have removed and replaced the pavement, but we couldn't afford it," Schoonover explained.

A partial-depth mill and overlay, which probably would have been similar in cost and scope to the CIR, was not an option because of the poor condition of the pavement. "With a mill and overlay, we would have had extensive reflective cracking," she said.

Schoonover did not consider crushing and shaping the roads. "With a crush and shape, we would have ended up with three or four inches of material above the curb," she explained. "With all the hauling and regrading, it didn't make sense for us."

> "We already paid for the asset once, why not reuse it?"
>
> Amy Schoonover, P.E. – City of Charlotte

Tim Flanagan, manager of Flanagan Sales & Associates, told Schoonover about CIR. "It was affordable and it made sense to me, especially given the City of Charlotte's recycling culture," Schoonover said. The Charlotte Area Recycling Authority collects and recycles over 700 tons of waste every year, which is significant for such a small municipality.

"The more I thought about it, the better CIR looked. We already paid for the asset once, why not reuse it?" Schoonover said. She estimates that CIR saved the city 25% compared to removing and replacing the pavement.

Two phases of CIR

The CIR paving process involves two separate phases: the recycling phase and the wearing surface phase. The recycling phase starts with milling some or all of the existing hot-mix asphalt (HMA), and then crushing and screening it to create usable reclaimed asphalt pavement (RAP). A custom-designed asphalt emulsion is then added to the RAP to restore the strength and flexibility of the

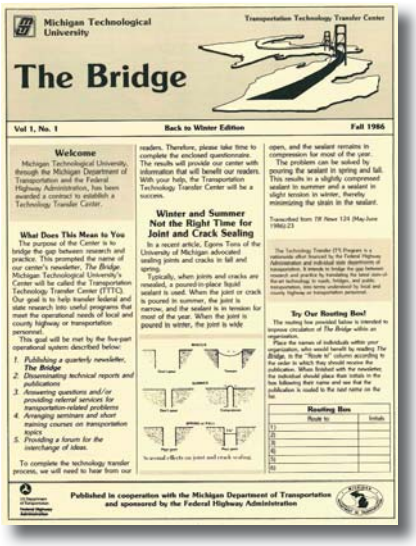
▶ Cold In-Place, page 4

Almost 27 years

Do you remember what was going on in the Fall of 1986? A quick Google® search refreshed my memory: Ronald Reagan was halfway through his second term as President, the average cost of a gallon of gas in Michigan was about 90 cents, email was just becoming popular, cell phones were (literally) huge, and Microsoft® was struggling to get people excited about their new "Windows" operating system ("Only $99!" Steve Balmer breathlessly exclaimed in a wildly annoying TV ad at the time). And by the way, "Google" was still over ten years from officially becoming a word in the English language.

In sports, Steve Yzerman was named captain of the Detroit Red Wings, Eric Hipple was guiding the Lions to an another underwhelming 7-9 season, and the Tigers were on their way to finishing third in the AL East.

Also in the Fall of 1986, the first issue of *The Bridge* was published (take a look, below). At the time, it was published through the Transportation Technology Transfer Center (TTTC) at Michigan Technological University in Houghton, which has since become Michigan's Local Technical Assistance Program (LTAP).


Michigan Technological University

Transportation Technology Transfer Center

The Bridge

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Welcome

What Does This Mean to You

Winter and Summer Not the Right Time for Joint and Crack Sealing

Try Our Routing Box!

Routing Box

Published in cooperation with the Michigan Department of Transportation and sponsored by the Federal Highway Administration

Since 1986, five different men (including Reagan) have led this country as President, gas in Michigan has gone up over 400% to $3.79, fifth graders are reading and sending emails on cell phones that are just a little larger than their hands, Windows® is everywhere (it still costs about $99), the word "Google" is now a noun AND a verb, and *The Bridge* is printed in full-color. You're holding the 101st issue.

As you get into this issue, please think about topics you would like us to cover in future issues, and then give us a call or send us an email with your ideas. We get loads of story ideas from the workshops and webinars that we conduct, and also from spending time with all of you at various events, but we're always looking for more.

One more thing: Did you notice the poster inside the fake front cover? It has our phone number, email address, and a QR code that's linked to our web site. Hang it up where everyone in your agency will see it. And be sure to let us know when you have an idea or when you need something.

Thanks for reading; please keep in touch!

Center for Technology & Training

Michigan's Local Technical Assistance Program

The Center for Technology & Training is part of the Michigan Tech Transportation Institute at Michigan Technological University in Houghton, Michigan. The mission of the CTT is to develop technology and software, coordinate training, and conduct research to support the agencies that manage public infrastructure. In support of this mission, the CTT houses Michigan's Local Technical Assistance Program, which is part of a national effort sponsored by the Federal Highway Administration to help local road agencies manage their roads and bridges. For more information, visit ***www.MichiganLTAP.org.***

The Bridge

The Bridge is published quarterly by the Center for Technology & Training (CTT) through Michigan's Local Technical Assistance Program at Michigan Technological University. Subscriptions are free of charge. To request a subscription, contact the CTT.

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The Bridge is printed with soy-based ink on recycled, acid-free paper (50% recycled, 10% post-consumer waste). 4000 copies mailed this edition.

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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.

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Road commissions upgrade lights and save money

Shaughn Kern, Technical Writer
Center for Technology & Training

Outdated metal halide light fixtures are stacked against the walls in the truck garage after Cheboygan County Road Commission upgraded to compact flourescents. They expect the new lights to pay for themselves in less than three years.

Center for Technology & Training

Why do many garages and warehouses settle for the sallow light and ceaseless buzz of antiquated mercury vapor and metal halide lamps? Most of us are aware of the benefits of modern workplace lighting: lower energy bills, better safety conditions, increased productivity, and others. The continued use of outmoded lighting is a reason familiar to all of us: upgrades cost money.

Nonetheless, a number of county road commissions in Michigan – Antrim, Cheboygan, Clare, Emmet, and Wexford, to name a few – have scrapped the old lights in their workshops and garages, replacing them with compact florescent fixtures. How can a road commission do this in such a difficult economy? Creatively. Between available grants and energy cost savings, lighting improvements generally pay for themselves in less than three years.

Investment pays off quickly

Recently, Wexford CRC replaced 42 of the 400 Watt Metal Halide fixtures in their truck garage and repair facility. The cost of the replacement project was just under $10,400. To help pay for the upgrade, Wexford received $5,000 in incentives from Consumers Energy, and they expect to save about $5,500 per year on energy costs. According to Alan Cooper, manager at Wexford CRC, "Our first bill in January after the installation was completed was almost $600 less than the January before. With the incentives and the energy savings, the lights paid for themselves in less than a year."

Results like these tend to be the rule rather than the exception. In 2010, Emmet CRC used grants through Consumers Energy and Great Lakes Energy to upgrade the mercury vapor lighting in their garages to compact fluorescent lighting. They were reimbursed for about one-third the cost of the upgrade, realized a cost savings of 70%, and two years later these lights have paid for themselves. Similarly, last year Cheboygan CRC replaced their metal halide and old style florescent lights, with just over 50% of the cost covered by grants from Consumers Energy; the rest of the new lighting is expected to pay or itself through energy savings within two to three years.

Benefits beyond money

Saving money is not the only benefit of upgrading a facility's lighting. Brian Gutowski, engineer-manager of Emmet CRC said the lights have actually made his mechanics and drivers more efficient. "Our mechanics appreciate how bright the garage and repair shop is," he said. "And our truck drivers are able to enter the garage, turn the lights on perform their pre-trip inspections without having to wait for the lights to warm-up. And everyone in the garage has also noticed how nice it is not to hear the constant buzzing of the light fixtures."

More savings

Replacing fixtures is not the only way to save money on lighting. Cheboygan CRC took their savings a step further by installing occupancy sensors in the truck parking areas and lunch rooms. Before the upgrade, these lights were on from morning to night, now they're only on when in use—75% less than before. Occupancy sensors, like new lights, can be partially covered by grants, which are often available through the same companies that provide grants for new light fixtures.

Upgrade assistance

So where is all of this grant money coming from? A number of cooperatives help Michigan road commissions upgrade their lighting.

▶ Lights, page 6

Cheboygan County Road Commission estimates that occupancy sensors in truck garages and lunch rooms has cut light usage by 75 percent.

Center for Technology & Training

Cold-In Place (from page 1)

old asphalt binder and produce the desired mix properties. Finally, the "rejuvenated" mix is windrowed, reapplied with a conventional paver, and then compacted. The entire process takes place on-site without heating the material, and with a single train of machinery.

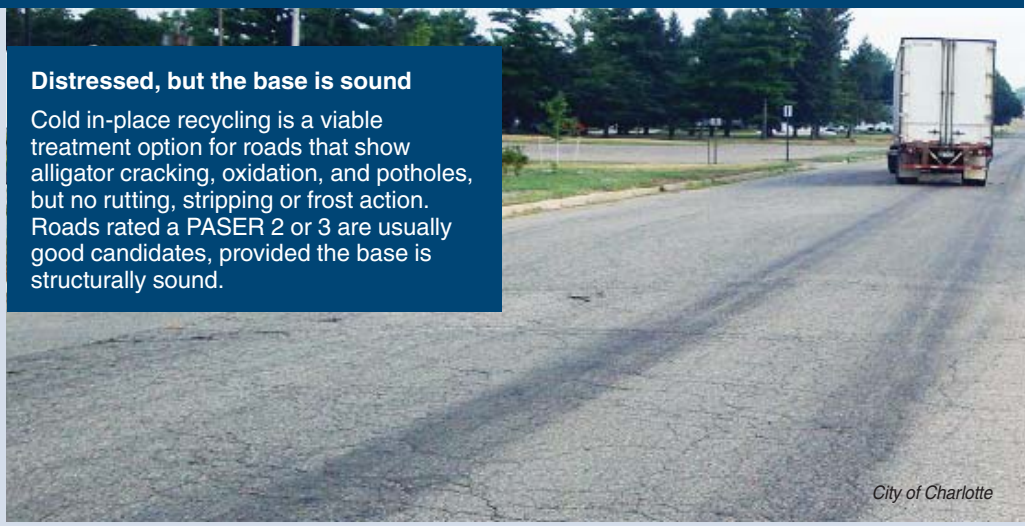
The last phase of a CIR project involves applying a wearing surface. According to Tom Wood, research project supervisor for the Minnesota Department of Transportation (MnDOT), the wearing surface can be anything from a heavy fog seal for very low-volume roads to an HMA overlay for roads that experience a higher traffic volumes. "CIR asphalt is stable, but porous and susceptible to abrasion," explained Wood. "The purpose of the wearing surface is to protect the CIR from moisture and wear."

Wood is a widely-recognized asphalt pavement expert; he is well-known in the Local Technical Assistance Program (LTAP) community nationwide, and he has conducted several different asphalt maintenance training courses through Michigan's LTAP.

Shortening the train

On projects that involve long stretches of pavement (such as interstate highways and rural county roads), a complete CIR paving train can be used. A complete train includes a tanker truck for injecting the asphalt emulsion; a milling machine; a crushing, screening, and mixing trailer; a windrow loader; a paver; and a heavy roller (see *Multi-unit Recycling Train* on page 5).

To accommodate the short stretches of pavement in the City of Charlotte, the recycling contractor, Dunn Company out of Decatur, Illinois, used a single-unit recycling train, which combined the milling and emulsion mixing into one process, and then laid down a windrow of treated cold-mix asphalt. They used a windrow loader and paver to place the asphalt. Schoonover was impressed with the operation. "Dunn used a high-tech machine to make CIR work for us," she said. "The milling drum cut in a downward direction instead of upward, which prevented chunking of the pavement and enabled them to achieve the necessary gradation." The machine also included a digital metering device for controlling the flow of emulsion into the milling and mixing chamber. "Milling and mixing happened in one unit; we wouldn't have had room for the full-length train," Schoonover said.



City of Charlotte

Distressed, but the base is sound

Cold in-place recycling is a viable treatment option for roads that show alligator cracking, oxidation, and potholes, but no rutting, stripping or frost action. Roads rated a PASER 2 or 3 are usually good candidates, provided the base is structurally sound.

Restoring the old asphalt

Blending the RAP with either foamed asphalt or an engineered asphalt emulsion is a key step toward a successful CIR project. On some projects, it is necessary to also add a chemical stabilizer such as calcium chloride, magnesium chloride, lime, or fly ash. Stabilizers improve structural capacity, increase moisture resistance, or modify some other physical characteristic of the finished pavement.

The projects in Charlotte both used an engineered asphalt emulsion—a blend of asphalt globules suspended in water by the use of surfactants. Jason Wielinski, P.E., research engineer at Heritage Research Group in Indianapolis, designed the emulsion based on the composition of core samples taken before milling the roads. "In CIR, the emulsion is part of a performance-based mix design in which the RAP and emulsion blend must meet specific performance tests, including short-term and long-term stability, resistance to moisture, and resistance to raveling." Wielinski said. "The emulsion type and application rate are based on meeting these performance goals."

The emulsion application rate is usually between 2.2 and 2.6 percent of the mass of the RAP. The rate on Mikesell street (3.8 percent) was notably higher than usual because the milling included all three inches of existing HMA pavement and 1/2 inch of the uncoated base. The Hall-Washington-McClure project required 2.8 percent emulsion.

Neither of the Charlotte projects required stabilizers. Wielinski explained that typical CIR projects, which involve milling only the existing HMA pavement, usually do not require them. "When a recycling project involves full-depth reclamation, more fines are introduced into the RAP because the milling is deep into the base," he said. "When you have high fines in the RAP, that's when you might need additional stabilizers."

If necessary to improve the RAP, stabilizers are typically spread on the existing pavement before milling.

Independent quality assurance

To ensure quality throughout the project, the paving contractor hired an engineering consultant to conduct independent testing at various points in the recycling and placement process. While milling and mixing, the consultant verified material gradation and emulsion addition rates. After the CIR was placed, the consultant specified rolling patterns and oversaw density testing to verify compaction.

Avoiding urban obstacles

One of the reasons people are hesitant to use CIR in urban areas is because of the various obstacles in the roadway; manholes, water valves, driveways, and other utility and geometric features can seriously disrupt a recycling operation. For the projects in Charlotte, the paving contractor (Michigan Paving & Materials Company out of Lansing) removed all manhole castings and water valve boxes in the roadway and covered them with metal plates, which they installed below the reach of the milling/mixing machine. Temporarily lowering the utility fixtures allowed the recycling contractor to complete the CIR process without interruption.

Finishing touches

After the recycled pavement was placed and compacted, the paving contractor adjusted the utility fixtures to finished grade. They then topped the CIR pave-

▶ continued on next page

ment with a ¾-inch ultra-thin overlay designed to meet Michigan Department of Transportation (MDOT) low traffic volume specifications.

One additional adjustment that impressed Schoonover involved accommodating the ¾-inch overlay without paving over the existing gutter pans on each road. To achieve the correct finished elevation on Mikesell street, the recycling contractor increased the crown such that the recycled material at the curb was low enough to accommodate the overlay. On the Hall-Washington-McClure section the contractor milled and removed a four-foot swath of pavement from the center of the roadway before beginning the CIR process. They spread the RAP in a nearby gravel parking lot, and they used the milled section as a buffer for the rest of the project. As with the Mikesell project, after the CIR process the pavement was low enough to accommodate an overlay.

"It was great to see how the two contractors worked together on the scheduling; the entire project went very smoothly," Schoonover said. "As a bonus, a private parking lot where the contractor was permitted to park their equipment received a fresh layer of RAP, which is less dusty than the gravel that was there."

Minimal disruption

In total, the milling and recycling took three days; all roads were open to traffic each evening. The utility adjustments by the paving contractor took almost a week, but the adjustments didn't disrupt traffic significantly. The week between the placement of the CIR and the application of the overlay allowed the CIR to cure more thoroughly. The final overlay required one day to complete.

With CIR pavement, most of the moisture in the recycled material is removed by compaction; any remaining moisture evaporates over time. According to MnDOT's Wood most projects aim for two percent moisture content before adding a wearing surface, but he prefers to specify that the moisture content be within two percent (above or below) what it was before beginning the recycling process. "If the existing pavement is at five percent, or if you suddenly get a lot of rain or humidity you might never get below two," he explained. "It's better to set the desired moisture based on what's in the pavement to begin with."

Beyond saving money

The cost savings that originally motivated Schoonover to try CIR have since been eclipsed by other benefits. "Looking back and considering the potential impact on businesses in the area, time saved was the biggest benefit." Schoonover explained. "The entire CIR process only took three days, and the ultra-thin took one more; if we had chosen to remove the pavement, haul it away, and reconstruct the roads, businesses would have been impacted much longer."

Success from every angle

For Charlotte, implementing CIR has proven to be successful financially, technically, and from a public relations point of view. The pavement is performing well, the city saved money, and the community has shown a great deal of support for the projects. "We received more compliments than complaints, which is rare for a paving project," Schoonover said. "On the City of Charlotte's Facebook page, I was surprised to see the positive comments about recycling pavement. People didn't realize it was possible; they got pretty excited."

In addition to positive recognition from residents of the city, the project garnered regional, state, and national recognition. In December 2011, the Southwest Michigan Chapter of the American Public Works Association (APWA) awarded the City of Charlotte the APWA 2011 Branch Award for Project of the Year for a transportation project less than $500,000. At the State APWA conference in May 2012, the project was awarded the Michigan Chapter APWA Project of the Year Award for transportation projects less the $1,000,000. Then in March of this year, Schoonover was awarded the Charles R. Valentine Award for Excellence in Cold In-Place Recycling by the Asphalt Recycling and Reclaiming Association.

"I certainly appreciate the recognition," Schoonover said. "But this is a cool process no matter what. I'm just excited we've been able to use it."

For more details about CIR, including comparisons to other in-place recycling processes, see *More information about in-place pavement recycling*, on page 7. ■

Multi-unit recycling train

A typical cold in-place recycling train consists of a tanker truck for injecting additives (1 above); a milling machine (2); a crushing, screening, and mixing trailer (3); a windrow loader (4), a paver (5) and a heavy roller (not shown). The CIR projects in the City of Charlotte used a single-unit recycling train, which combined the milling and mixing processes.

Roadtec, Inc.

New lives for old signs

By Trevor Kuehl, Assistant Technical Writer
Center for Technology & Training

Center for Technology & Training

Think about recycling efforts that you have encountered in the past. What comes to mind? Many people imagine an extensive supply chain for picking up large piles of old materials; huge warehouses for sorting and storing materials; and high-tech processing facilities with cutting-edge technology for cleaning, resurfacing, and repackaging.

In reality, many recycling efforts are small, localized, and targeted at specific types of materials. Local road agencies, where costs are climbing and funding is dwindling, are hotbeds for innovative examples of low-key material recycling and reuse.

After cutting the sign blank to size, they straighten it (if necessary), power wash the surface to remove the old vinyl and adhesive, and then lay out and cut new vinyl material for the background and legend. To finish it off, they use an iron-working machine to cut a radius on each corner and punch mounting holes. "If you don't have access to an iron-working machine, you can use simple hand tools like a drill and grinder to produce similar results," explained Putnam. He purchased an iron-working machine with the money he saved from the first year of recycling signs.

> There's no elaborate scientific process for identifying a sign for recycling. If an old sign still has a piece of usable material in it, we cut it up and put it to good use.

New from old

The Montcalm County Road Commission (MCRC) has devised a simple and effective system for reusing street signs. Three years ago, the MCRC purchased metal-working equipment to break down and reuse old sign blanks. "Because of the rising cost of buying new material, our sign shop decided to start recycling old signs," said Rob Putnam, Supervisor of the Montcalm County Sign Shop.

To outfit his shop, Putnam purchased a five-foot hydraulic metal shear and a roller to place vinyl on sign blanks. Total cost: about $1300. With the new tools, the MCRC makes over 250 signs using blanks from old ones.

"The process is quite simple," said Putnam. "We simply cut up large old signs to make new signs that are smaller."

Just over half the cost

Using their new tools and sign blanks scavenged from old signs, the MCRC sign crew has produced speed limit signs, do not pass signs, and road name signs. And they've saved a good amount of money. According to Putnam, a 9-inch by 36-inch road name sign on new material would cost $12.00. "Using recycled material, we've been able to get the cost down to $7.00 per sign," he said. "In an average year, we make about 250 road name signs. We save a significant amount of money by cutting up old signs."

No science involved

To get started with any recycling effort, Putnam advises starting simple; signs are a great first step. "There's no elaborate, scientific process for identifying a sign for recycling," he said. "If an old sign still has a piece of usable material in it, we cut it up and put it to good use." ■

Lights (from page 3)

Consumers Energy works with individuals and businesses to implement energy efficient solutions. On their website (www.ConsumersEnergy.com), you can review and choose upgrades, and begin the application process for installing energy efficient lighting. The website also provides a list of contractors trained in installing such systems. An agency can also choose to install the systems themselves or they can hire their own contractor.

Another noteworthy program is the Great Lakes Energy Cooperative (www.michigan-energy.org), which offers a list of 12 service providers who offer energy optimization programs. To find a program, go to Michigan Energy's website, choose a service provider in your area, select the "Commercial and Industrial Services" option, and fill out a prescriptive lighting application.

Finally, through Efficiency United (www.EfficiencyUnited.com), road commissions can access energy advisors who can guide a participating utility's customers through their Commercial & Industry Energy Rebate Programs. Efficiency United works with 18 different utility companies in the Lower Peninsula and in the western two-thirds of the Upper Peninsula. Visit their website to see if your utility company is included in their suite of energy efficiency programs. ■

The place to go for bridge preservation

Federal Highway Administration

A new online toolbox developed by the Federal Highway Administration (FHWA) means that bridge preservation resources are now just a click away.

As state and local transportation departments contend with aging bridge inventories, increases in traffic and congestion, and funding challenges, adopting strategies for bridge preservation as part of overall management of bridge assets is more vital than ever.

"A successful bridge program incorporates both preservation and replacement," said Anwar Ahmad of FHWA. Focusing only on replacing deficient bridges while putting off preservation needs will be inefficient and costly in the long term, as this will allow bridges in good condition to deteriorate. Preservation treatments generally cost much less than major reconstruction and replacement activities.

The Bridge Preservation Toolbox (www.fhwa.dot.gov/bridge/preservation) serves as a compendium of bridge preservation-related information and strategies. The information is structured under four main categories: Legislation and Policies, Bridge Management, Bridge Preservation Treatments, and Research and Development.

"The initial content of the Toolbox highlights some of the great work that has been done by the bridge community. We will make every effort to update the content as new material becomes available," said Ahmad.

The Bridge Preservation Treatments section features information on preservation and maintenance methods and procedures, including repair methods and protective systems.

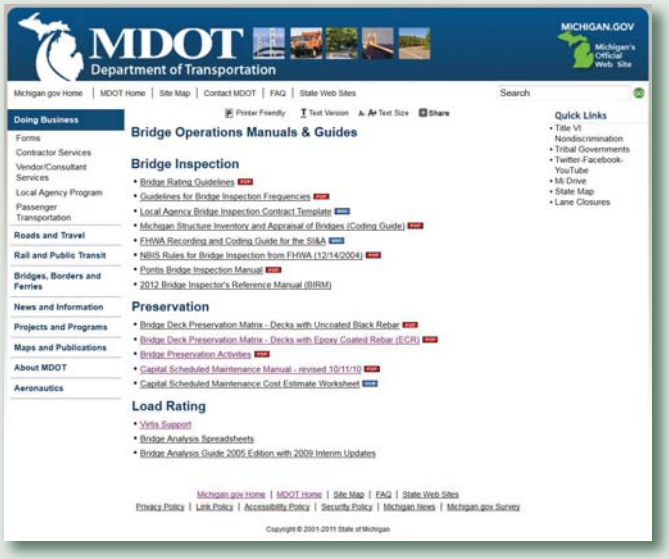
Visit the Legislation section to find the latest on Federal, State, and local laws and bridge preservation-related policies. Also featured are background information on bridge preservation terminology and links to State and Federal guides, including FHWA's Bridge Preservation Guide (Pub. No. FHWA-HIF-11-042). Included in the FHWA guide is a framework for establishing a Systematic Preventive Maintenance (SPM) program for bridges. An SPM program can be implemented at the network-wide, highway system, area-wide, or regional level. Federal-aid funds may be used for SPM on highway bridges located on public roads regardless of whether a bridge is eligible for replacement or rehabilitation.

Bridge Management resources cover such topics as condition assessments, performance measures, strategies, cost data, deterioration trends, and life-cycle cost analysis. In addition to guidance from FHWA, resources include reports and information from Arizona, Massachusetts, Nebraska, North Carolina, Virginia, and other States.

In the area of Research and Development, users can find technical presentations, details on standards and specifications, National Cooperative Highway Research Program reports, and information on training opportunities.

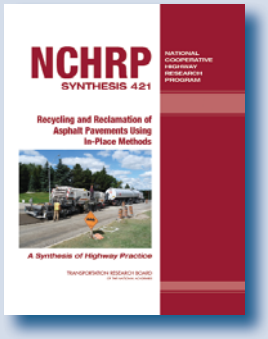
Visit the Bridge Preservation Toolbox at www.fhwa.dot.gov/bridge/preservation. For more information on bridge preservation resources, contact Anwar Ahmad at FHWA, 202-366-8501 or anwar.ahmad@dot.gov. ■

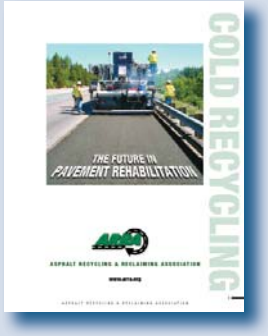
Manuals and Guides for Bridge Operations



The Michigan Department of Transportation *Bridge Operations Manuals and Guides* page, which appears as a resource in FHWA's online Bridge Preservation Toolbox, includes links to supplemental bridge operations sites, and documents that you can download for help and guidance about bridge inspection, preservation, and load rating.

More information about in-place pavement recycling





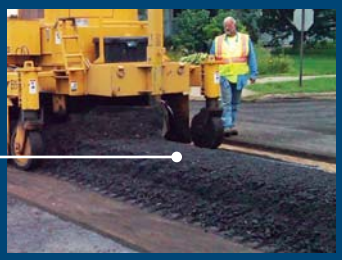
Visit the Michigan LTAP web site for links to three resources that provide more information about in-place pavement recycling, including an overview of the current state of practice, comparisons of the different types, project checklists, and more.

www.MichiganLTAP.org/Bridge/26-1

The Bridge

Bridging the gap between research and practice since 1986

Vol. 26, No. 1 – June 2012



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Upcoming Events

(details at www.MichiganLTAP.org)

Workshops and Conferences

Safety Analysis using the AASHTO Highway Safety Manual

July 17-18 – Lansing

July 24-25 – Gaylord

HEC-RAS 4.1 Training

July 31 - August 2 – Dearborn

Troubleshooting, maintaining, and repairing air brakes

August 21 – Iron Mountain

August 27 – Mancelona

August 28 – Saginaw

August 29 – Ann Arbor

August 30 – Kentwood

Bridge Load Rating

September 11-12 – Big Rapids

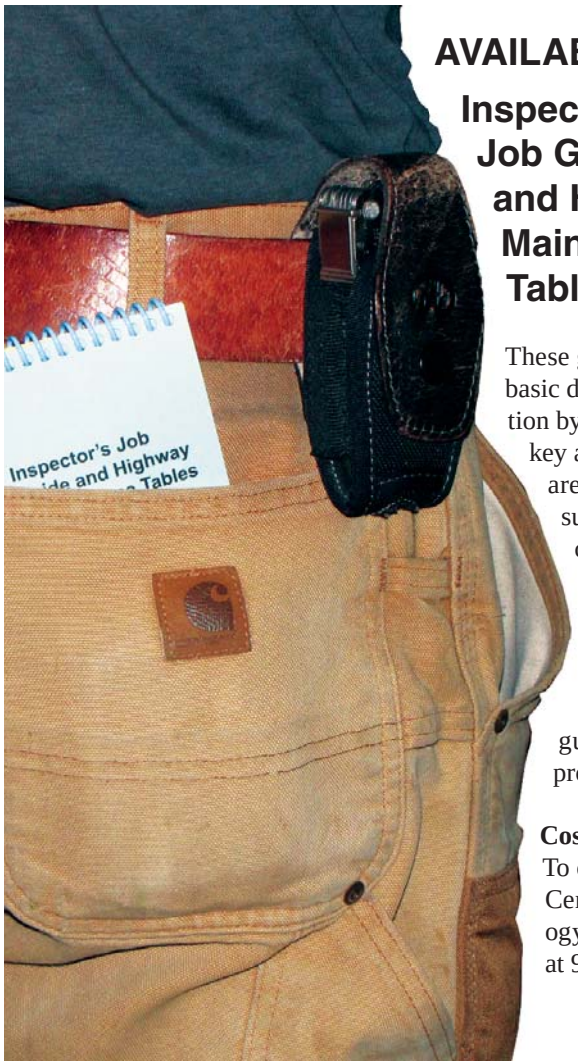
Michigan Winter Operations Conference

October 16-17 – Lansing

Webinars

Local agency experience with the Safety Edge℠

July 25 – 10:00 to 11:00 AM



AVAILABLE NOW

Inspector's Job Guide and Highway Maintenance Tables

These guides cover the basic duties of inspection by reference to key activities. They are designed to be supplemented by contract documents, specifications, special provisions, instructional manuals, and guidance by the project engineer.

Cost: $4.00
To order, contact the Center for Technology & Training at 906-487-2102.