

The Bridge

Linking Transportation Research and Practice



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An easy way to save money now

Hardfacing extends the life of metal wear components



By Enneesa Ewing, Technical Writer,
Center for Technology & Training

If you've ever had to replace the blade, chain, or bit on any of your household tools, then you've experienced the effects of metallic wear first hand. Wear on metallic parts is inevitable; minimizing or slowing that wear can save a lot of time and money. This is especially true for large-scale and high-priced metallic parts used in construction equipment such as end loaders, dozers and motor graders. A relatively simple way to increase the service life of components that engage the ground or move the earth is to employ hard surfacing.

Reducing wear

Hardfacing, also known as hard surfacing or hard coating, is the process of depositing extremely durable alloy (in the form of a raised weld pattern) to the areas of a metallic

part that routinely suffer wear. The hardfacing alloy (electrodes or wire) and its weld pattern will vary depending on the type of wear resistance the component needs. For example, a component may need added resistance to abrasion, impact, metal-to-metal adhesion, heat, corrosion or any combination of these forms of wear. "Hardfacing is simply a way to save the material you already have," said a United Association Local 85 Pipefitter. "If you have a tool edge that is constantly moving into or across the ground, hardfacing it will allow you to wear down the deposited hardfacing alloy before you wear out your utility."

See **Hardfacing** on Page 6

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Leading

Local road agencies in Michigan play a significant role leading roadway management and other efforts, not only in our state but also on a national level. For example, three representatives of Michigan road commissions hold positions of leadership on the National Association of County Engineers (NACE) Board of Directors:

Mark Craft, P.E., Engineer-Manager of Gratiot County Road Commission officially assumed the office of President at the 2011 NACE Conference in Minneapolis.

Jon Rice, P.E., Managing Director of Kent County Road Commission serves as Northeast Region Vice President and is also Chair of the Pavement Preservation Committee, and sits on other committees related to pavement preservation.

Luke Houlton, P.E., Engineer-Manager of Cheboygan County Road Commission serves as Michigan's Director on the NACE Board.

Michigan local road agencies also lead by example. **Heather Smith**, Assistant Engineer at Barry County Road Commission, won the 2011 NACE Project/Program Manager of the Year award. The project for which she was recognized established a new east-west all-season corridor in Thornapple Township. It involved building 4.25 miles of new road and two new bridges. Over the course of the project, which cost just under 12 million dollars and lasted eight years, Smith navigated through 14 different sources of funding while overcoming countless environmental and political challenges. Smith submitted the first of several applications for funding in 2003, and construction began in 2009. A ribbon cutting

ceremony and grand opening celebration in early July this year marked the official completion of the project.

Also leading by example, **Bryan Pickworth**, Road Maintenance Supervisor at the City of Farmington Hills, won one of three national *Excellence in Snow & Ice Control Awards* presented by the American Public Works Association (APWA) earlier this year. Pickworth was recognized for his work in implementing an anti-icing program that involves applying salt brine or a blend of salt brine to dry roadways before a snow or ice event. This practice prevents snow and ice from bonding to road surfaces which improves tire traction, makes plowing more efficient, and cuts down on salt usage.

In addition to leading by position and example, the men and women who build, manage and maintain our roads also lead quietly, behind the scenes. Walking around the room at Michigan LTAP workshops (especially the ones that involve mechanics and maintenance workers), I'm always impressed by the number of volunteer firefighter and first responder jackets, sweatshirts, and other articles of clothing I see. The next time you hear a fire truck roar down the road at 3:30 in the morning, chances are very good that at least a few department of transportation, road commission, or department of public works employees are among those responding to the emergency.

One more thing: if you watch any one of the people mentioned by name above, or if you spend any amount of time in a DOT, road commission, or DPW garage, you'll see a lot of smiles. These people really enjoy what they do. The rest of us are fortunate to work among them.



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Center for Technology & Training
Michigan Technological University
309 Dillman Hall
1400 Townsend Dr.
Houghton, MI 49931-1295

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Director Tim Colling, PhD., P.E.
Research Engineer II/Civil Engineer John Kiefer, P.E.
Research Engineer Melanie Kueber, P.E.
Editor/Technical Writer John Rynanen
Technical Writer Enneesa Ewing
Senior Software Engineer Nick Koszykowski
Office Manager Christine Codere
Office Assistant Devin Seppala
Office Assistant Tammy Kus
Student Intern Trevor Kuehl

Telephone 906-487-2102
Fax 906-487-3409
E-mail CTT@mtu.edu
Michigan's LTAP <http://www.MichiganLTAP.org>

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.

Kurt E. Zachary, P.E. 517-702-1832 FHWA

Local Program Engineer, FHWA

Bruce Kadzban 517-335-2229 MDOT

Local Agency Programs, MDOT

Ronald A. Young 989-731-8168 Michigan Counties

Engineer/Manager, Alcona County Road Commission

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Asset Management Leaders Recognized

Awards announced out at the 2011 Michigan Transportation Asset Management Conference

Carmine Palombo, transportation director at the Southeast Michigan Council of Governments (SEMCOG) and chair of the Michigan Transportation Asset Management Council (TAMC), opened the 2011 Transportation Asset Management Conference in May with a nod to local agencies. "I want to thank all of you for your passion and involvement," Palombo said. "Michigan's asset management program doesn't work without your participation." The program, which is based on collecting condition data for 37,500 miles of roads that are eligible for federal aid in Michigan, allows the TAMC to communicate more clearly with lawmakers when discussing road funding. Last year was the seventh year of data collection by state and local transportation agencies.

In 2009, the TAMC established an awards program to formally recognize individuals and organizations each year that exemplify the mission of the Council, which is "...to expand the practice of asset management in order to enhance the productivity of investing in Michigan's roads and bridges."

The winners are . . .

Ed Hug, SEMCOG transportation planner, won the Individual Achievement in Asset Management Award. Presenting the award, Palombo explained that Hug works with over thirty units of local government in Southeast Michigan to help them use road condition data to develop asset management plans. "He also demonstrates leadership through his involvement in data collection efforts, and by participating in regular meetings and training events," Palombo said. "We appreciate Ed's consistent and persistent efforts to promote asset management principles in Southeast Michigan and across the state."

Ottawa County Road Commission (OCRC) won the Organizational Achievement in Asset Management award. "Through their development of a comprehensive Strategic Improvement Plan, Ottawa County Road Commission has provided a great model for implementing asset management principles," Palombo said. "In addition to identifying transportation assets, the plan also helps identify improvement needs, determine sources of funding, and inform the public about the situation every step of the way. This is a great example of how to put all the pieces of the asset management puzzle together."

Presenter and award winner

Brett Laughlin, engineering director at OCRC, not only accepted the award on behalf of his organization, but also gave a presentation earlier in the day to summarize how they put together their asset management plan. Of particular interest in Laughlin's presentation was a statistic he shared to communicate the importance of using asset management principles to manage roads. "In the early 1990s we could resurface one mile of asphalt road in Ottawa County for 30 thousand dollars," he said. "Today that same mile of road would cost about 90 thousand dollars to resurface. Costs are going up, revenues are decreasing. An asset management plan helps us better manage our needs with the dollars we have."



Ed Hug (left), transportation planner at SEMCOG, accepts the 2011 Individual Asset Management Award from Carmine Palombo, chair of the Transportation Asset Management Council.




Brett Laughlin (center), engineering director at Ottawa County Road Commission and Dave Vander Kooi (left), Ottawa County Road Commissioner, accept the 2011 Organization Asset Management Award from Carmine Palombo, chair of the Transportation Asset Management Council.

A video recording of Laughlin's presentation and six others from the conference are available on the Michigan LTAP web site at: www.michiganltap.org/workshop/materials/2011TAM.

Getting involved

Palombo appreciates the exchange of information and ideas that takes place at the annual conference. "We have a bigger crowd every year and that means more agencies are doing more with asset management," he said. "But we want it to grow more."

To learn more about asset management in Michigan, including how to submit a nomination for a future asset management award, go to the TAMC web site at www.michigan.gov/TAMC.

A fall session of the Asset Management Conference is scheduled for October 26 in Escanaba. Complete details will be distributed in early September. 

Managing roadside trees to reduce danger to motorists

Reprinted with permission from the Spring 2011 issue of *Moving Forward*, a quarterly newsletter published by the Pennsylvania LTAP center.

Low-hanging branches, diseased or dead limbs, and trees too close to the road are some of the natural hazards facing motorists. To reduce the danger of trees in the right-of-way and to lower liability risk, county road crews and public works departments must know how to effectively manage trees and keep them from becoming roadside dangers.

"Agencies will also want to reduce their exposure to lawsuits that may occur as a result of a tree failure or some real or imagined negligent act," says Scott Diffenderfer, a board-certified master arborist with Good's Tree Care, Inc., in Harrisburg, PA.

A properly designed roadside tree care plan should include provisions for tree maintenance, tree risk analysis, and tree removal. An effective tree management program should include the following best practices:

Regularly inspect trees, document your findings, and follow up with action. Tree inspections should be an important part of an agency's tree management program. After recording your findings, it is important to follow up with the most appropriate action, whether it is removing dead or diseased trees and limbs or trimming low-hanging branches and cutting down trees that are too close to the road.

"By taking these small steps toward developing a tree risk plan, your agency will minimize its exposure to risk," says Diffenderfer.


Properly prune and trim trees. Trees respond better to selective and well-planned pruning rather than blanket cutting with a boom or flail mower. Such blanket treatment can damage the trees and may lead to disease, insect infestation, and even tree mortality, says Diffenderfer.

"Proper trimming may ultimately be cheaper for your agency since trim cycles can last longer than boom mowing," he says.

Keep your workers safe. Everything about roadside tree care has an associated hazard or safety concern, says Diffenderfer. To minimize risk, employees should be properly trained on equipment safety and traffic control. (See "Safety Tips" sidebar, right.)

Consider your budget. The most cost-effective roadside tree program can be developed in-house by agency staff and managed as part of the road crew's work schedule. If the budget allows, a consulting arborist can offer a range of expert services from assisting with the preliminary steps to fully developing and managing the plan. Other options are to seek consulting help from volunteers in the community who have experience with tree management or to establish a shade tree commission to implement and manage a tree care plan.

Finally, before a tree management program can be implemented, it is important to make sure your local elected officials are on board and have agreed to the breadth and depth of the plan.

"If done right, the cost for annual roadside tree maintenance will drastically reduce over the five- to seven-year period for which a plan is typically designed," says Diffenderfer. "Ultimately, the savings for reducing any risk associated with right-of-way trees cannot be overlooked." 



Safety Tips for Chain Saw Operators

Whether you're cutting down a tree too close to the road or clearing a limb that fell across the roadway during a storm, local agency road crews must make safety a top priority. Here are some safety tips from a professional tree feller:

Become familiar with the chain saw and keep it in optimum condition. Know how your chain saw works, what it sounds and feels like, and what it's designed to do. Be sure the chain saw is properly sharpened and tensioned, and if it's not performing properly, get it adjusted or repaired. "A dull saw chain means more work pushing and often pulling on a saw to get the task accomplished," says Tim Ard of Forest Applications Training, Inc. "Workers fatigue, their productivity is reduced, and most importantly safety is compromised."

Wear personal protective equipment. Workers should always wear safety goggles, a hard hat, earplugs, and closed, protective shoes when operating a chain saw. Nonslip gloves are also recommended.

Learn how to sight to place the tree where you want it. An operator should use the felling sights on the chain saw to aim the tree's fall. Stand behind the sight line, and aim the tree toward the target before you start the face notch cut.

Keep the wood hinge attached to the falling tree. The hinge provides the cutter extra reaction time and control in a variety of sawing scenarios. "Many incidents, fatalities, and injuries occur when saw operators cut the hinge off and stay with the tree too long as it falls," Ard says.

Plan an escape route. Developing an effective retreat route involves clearing debris and other obstacles in the area, removing low-level branches, preparing an escape path opposite the direction of the fall and at a 45-degree angle, and then using it. "Injuries and fatalities are often caused because saw operators or onlookers are not far enough away from the stump of the tree when the tree or its limbs are falling," Ard says. "Plan your retreat path thoroughly."

For more detailed safety information, please visit the OREGON® Blount Inc. web site:

www.oregonchain.com/pro/service/precautions

Working Together to Improve Roads and Bridges

MDOT aims to help local transportation agencies use Context Sensitive Solutions

by Brad Peterson, L.L.A., Landscape Architect and CSS Coordinator – Michigan Department of Transportation

The Michigan Department of Transportation (MDOT) has embraced the Context Sensitive Solutions (CSS) approach to project delivery as a way of delivering on its mission to “provide the highest quality integrated transportation services for economic benefit and improved quality of life.” To encourage CSS at all levels of transportation delivery, MDOT actively promotes partnerships with local governments, state agencies, businesses, and community groups. This effort provides local transportation agencies access to MDOT staff for CSS assistance throughout project development, construction, and maintenance activities. In the end, CSS creates transportation solutions that more thoroughly meet the needs of more transportation stakeholders.

The CSS approach that MDOT shares with local agencies consists of three fundamentals: Stakeholder Engagement, Flexibility, and Effective Decision-Making. Within the Department, CSS

fundamentals have been a part of staff training since 2005. As a companion to the formal training, MDOT is currently working on tools to assist staff in the region offices to address local community needs and to help build partnerships.

MDOT staff in Lansing and in the the Region offices are available to assist local transportation agencies with stakeholder engagement activities for their projects. are available to assist local transportation agencies to conduct stakeholder engagement activities for their projects. The major issues facing project managers are:

- When should I start the engagement process?
- How do I identify all stakeholders?
- What professional expertise do I need? Special skill sets?
- What kind of engagement is needed on my project and how do I make this determination?
- How do we maintain a consistent stakeholder engagement process statewide, while remaining flexible enough to respect local context and concerns?

See CSS on Page 7

Context Sensitive Solutions in Action

After



“...we built a modern highway bridge that preserves the aesthetic established by the bridge that stood for nearly 100 years.”

Lloyd Baldwin, MDOT Historic Preservation Specialist

The M-32BS Bridge over the Thunder Bay River in Hillman, MI, was built in 1922 from Michigan State Highway Department plans. The concrete camelback through-girder design was developed by C.V. Dewart, the department's first professional bridge engineer, and was improved upon by C.A. Melick, Dewart's successor. This bridge type was popular through the 1920s but was virtually eliminated from the engineer's toolbox by the early 1930s.

The bridge was proposed for replacement beginning in the mid-1990s. Years of harsh environmental conditions were taking their toll. In addition to deterioration, the overall design was also problematic. The narrow deck width

caused problems for large trucks, and the thick camelback girders and railings created sightline issues for motorists on adjacent side roads.

Since the bridge was eligible for inclusion on the National Register of Historic Places (NRHP), alternatives other than replacement had to be considered. Locals expressed fondness for the camelback design, but overwhelmingly wanted a new bridge. Ultimately it was determined that replacement was the most prudent and feasible alternative because widening was structurally impossible. Also the engineers were not confident that new concrete would bond sufficiently with the existing concrete.

The recommended design incorporated the serpentine look of the camelback but

provided open railings that enhanced the riverine setting and improved sight lines for motorists. “Village residents were active in public meetings to voice concerns and discuss options,” said Michigan Department of Transportation Historic Preservation Specialist, Lloyd Baldwin. “They also selected the final design.”

“I was very impressed by the community's involvement and leadership,” Baldwin continued. “With their help we built a modern highway bridge that easily accommodates vehicles and pedestrians, enhances views of the surrounding area and preserves the aesthetic established by the bridge that stood for nearly 100 years.”

Hardfacing from Page 1

Saving money

Washtenaw County Road Commission (WCRC) has been reaping the benefits of hardfacing for several years. According to Maintenance Supervisor, Bob Berger, the WCRC employs hardfacing on their road grader's tool bit holders and their underbody scrapers with great results. "Hardfacing extends the life of our ground extending tools," Berger said. "This is essential for us because in Washtenaw we use limestone for our roads which is extremely hard when compacted. Even though the hardfacing wire is guaranteed to extend a part's life by a factor of one or two, we've found that applying hard surfacing to our tool holders has extended their working life by five to ten times." For WCRC, that increase in service life translates into significant cost savings on tool replacements. "It's definitely much less expensive," said Berger. "Especially when you consider it costs \$2500 to replace one set of tool holders, and only \$165 for the wire that can hardface three sets."

If you want to know what kind of savings hardfacing could have for your applications, an easy way to calculate cost-effectiveness is to use Postle Industries' step-by-step *Economics of Hardfacing* guide. In addition to factoring in labor and materials costs, their guide also considers other possible costs like flux, shielding gas, power, and overhead to give you an accurate total estimate. The guide also contains various examples and explanations that can help you determine whether hardfacing is a good option for a given component.



A hardfacing tip from a pro

"After determining the location and pattern for hardfacing, the most important thing is to make sure you spread out your beads as you apply them. If you apply hardfacing beads too close together you're going to overheat the base metal, which will change the metal's properties and ruin it."


Tom Cook, Welding Instructor

You can view or download this guide and other useful hardfacing information from Postle's website: www.postle.com.

Getting started with hardfacing

Hardfacing can be deposited through various welding processes, but keep in mind that due to base metal and alloy heat ranges, welding positions, and area coverage, not all processes work for every hardfacing job. The most commonly used hardfacing processes are Shielded Metal Arc Welding (SMAW), also known as stick welding, and Gas Metal Arc Welding (GMAW or MIG).

If you are thinking about getting started with hardfacing, but you're not sure where to start, take a look at one of the many hardfacing guides available online. Welding consumable manufacturers and distributors often have their own guides to correspond with their unique alloy specifications. One guide that explains hardfacing concepts and techniques in-depth is the Afrox Hardfacing guide. Other guides like the Stoodly Hardfacing guide, the Lincoln Hardfacing guide, and the Navy Welding Materials Handbook may also be helpful. If you have any questions about hardfacing, your hardfacing alloy supplier or manufacturer can often help.

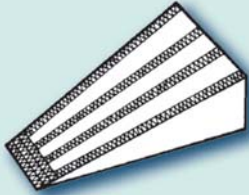
Although hardfacing techniques and processes vary with the unique conditions of each hardfacing job, the result is often the same: a component more resistant to wear that can reduce part replacements, premature repairs, and unnecessary equipment downtime. 



Attendees of an Advanced Maintenance Welding workshop at Muskegon County Road Commission gather around as instructor Tom Cook (white shirt) prepares to demonstrate a welding technique. Sessions of the LTAP-sponsored workshop were also held at Clare and Livingston County Road Commissions in early June. Vinnie Dahlberg (inset, right), a mechanic at Livingston County Road Commission appreciated Cook's practical teaching style. "This was great hands-on training," Dahlberg said. "The tips and tricks that Tom shared were based on years of real-world experience. You can't get this kind of training in a classroom or from reading a book."

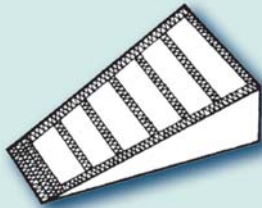
Hardfacing Techniques and Patterns

Parallel Stringer Beads



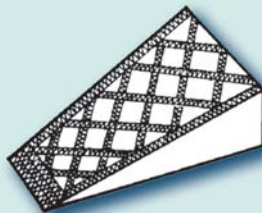
For coarse or rocky conditions, stringer beads are deposited parallel to material flow to protect the utility by allowing large abrasives to ride along the top of the hardfacing beads without coming into contact with the base metal.

Perpendicular Stringer Beads



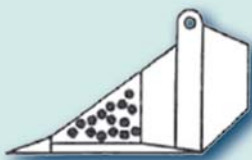
For fine or sandy conditions, stringer beads are deposited perpendicular to material flow so that fine sand can become trapped between the hardfacing beads. Sand passing over this sand won't cause wear to the base metal.

Waffle/Crosshatch/Diamond



For conditions where abrasives are both fine and coarse (sandy and rocky), stringer beads can be deposited in a waffle pattern that takes advantage of the protection provided by both parallel and perpendicular stringer bead applications.

Dot



For less critical wear areas (like the side or rear of a bucket) on base metals that are susceptible to overheating, dots can be deposited over a wide area. This allows fine material to compact between the dots while large abrasives ride over them.

Herring Bone



Herring bone and other flow patterns can be deposited on parts that can be better protected by increasing the speed and/or direction in which material will flow over the component.

Illustrations courtesy of Postle Industries Inc.

CSS from Page 5

To address these issues, MDOT released *Guidelines For Stakeholder Engagement* in February 2009. An internal interdisciplinary team assembled the guidance and presented it to the CSS Steering Committee, which is comprised of representatives from MDOT and 19 other local, state, and federal organizations. The Steering Committee provided valuable input while learning about MDOT's commitment to CSS and how it can be used in decision-making at all levels of project delivery.


The resulting document provides suggestions and techniques to engage stakeholders early and often during project development. The document is structured to allow flexibility in engagement approaches to best suit diverse customer needs, while maintaining a consistent process for implementation statewide.

The *Guidelines For Stakeholder Engagement* document addresses:

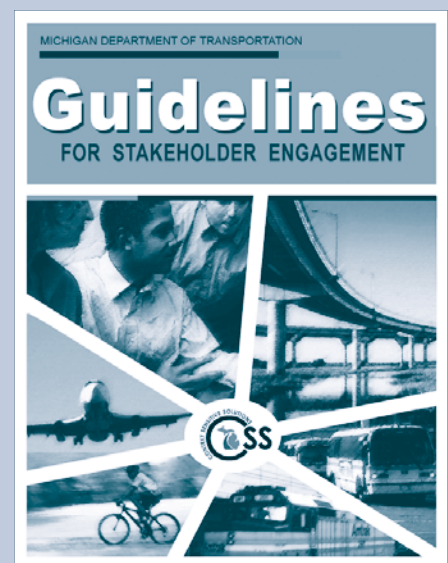
- Why outreach to stakeholders is important.
- Key concepts of how to implement stakeholder engagement.
- How to determine the level of effort appropriate to the scope and scale of the project.
- When and how often engagement should take place.
- Identifying stakeholders and types of engagement techniques.
- How to follow-up and evaluate stakeholder satisfaction.

The success of the *Guidelines For Stakeholder Engagement* document initiated an effort by MDOT and local agencies to create a companion document focused on how to help local stakeholders engage MDOT on transportation issues. This effort is currently underway and is anticipated to be completed later this year.

MDOT originally intended to release the document in late 2010, but the momentum of the Complete Streets initiative nation-wide has required reviewing the material to ensure that it adequately and accurately addresses those requirements.

For more information about the Complete Streets initiative, see www.completestreets.org. For more information about CSS or getting assistance from MDOT, contact Brad Peterson at PetersonBr@michigan.gov. 

FOR MORE INFO



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**Local Technical Assistance Program
Michigan Technological University
309 Dillman Hall
1400 Townsend Drive
Houghton, MI 49931-1295
906-487-2102**

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Thin Pavement Overlays

Tuesday, August 30

Paving with Warm Mix Asphalt

Tuesday, September 6

Sub-Grade Stabilization with Class C Fly Ash

Tuesday, September 22

For more info: www.MichiganLTAP.org/workshop

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that we promote most events exclusively through our email list? If you have not been receiving workshop announcements, or if you're not certain we have your email address, please send an email (with "email update" in the subject line) to ctt@mtu.edu.

Success is a lousy teacher. It seduces smart people into thinking they can't lose.

Bill Gates