



# CROSSROADS

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WISCONSIN TRANSPORTATION INFORMATION CENTER – LTAP



*Crack sealing is most effective when applied early in a pavement life cycle.*

## Crack sealing: smart investment in tight times

**BUDGET TIGHTENING** is a familiar theme right now for local governments across Wisconsin. The impact of maintaining operations through several seasons of rough weather coupled with an economic downturn and ongoing levy limits means cutbacks in many areas.

Where cuts might affect road maintenance projects, it is important to consider cost vs. benefit. Crack sealing is a maintenance treatment that effectively protects a community's pavement investment at a low cost. According to the Federal Highway Administration, timely use of crack sealing helps "extend pavement life past the point where the cost-benefit of added pavement life exceeds the cost of the operation."

### Preventive maintenance

Tom Nelson, Professor of Civil Engineering at the University of Wisconsin-Platteville and an instructor for the Transportation Information Center (TIC) *Road Maintenance* workshops, likens crack sealing to sealing leaks in a roof **before** the contents inside a structure suffer damage.

"Like roof repairs, crack sealing is a necessary preventive measure that restores integrity to the road's surface and protects against worse consequences," Nelson says, noting it should be a proactive strategy rather than a stopgap.

Crack sealing is most effective when applied early in a pavement life cycle. The Pavement Surface Evaluation and Rating (PASER) system, used by local officials to

track road maintenance needs, advises crack sealing for pavements with ratings of 7 or 8. Generally, these pavements might exhibit intermittent transverse cracks, slight raveling or minimal signs of surface wear.

Sealing pavement cracks as soon as practical after they develop prevents water from entering the pavement base through the surface. Limiting moisture in the base helps maintain pavement strength. Sealing the surface also stalls additional deterioration of the surface crack.

Crack sealing combined with surface treatments is effective for

prolonging the road life of pavements with PASER ratings of 5 or 6 where longitudinal cracks are closer together and there is moderate to severe raveling.

### Plan with PASER

The PASER rating system is a valuable tool for planning ahead, says Bill Glatz, Jr., Project Manager for Wisconsin-based Fahrner Asphalt Sealers. He regularly helps local officials conduct the rating process, scouting stretches of pavement in the fall and again in spring to determine which ones are candidates for crack sealing.

"Any good, effective maintenance program begins with knowing your roads," Glatz notes. "Otherwise it's too easy to make bad decisions about which sections to treat and when crack sealing is the right treatment."

Scheduled crack sealing extends the life of a road system by more than 10 years if highway departments budget to keep the method as part of an annual maintenance plan, Glatz says. He estimates that at approximately \$2,500 per mile to seal cracks, departments can maintain 10 miles of road for what it costs to resurface a quarter-mile stretch of pavement.

Glatz and others note that certain types of cracks identified during a PASER evaluation do not lend themselves to crack sealing. Alligator cracking requires removing the pavement, strengthening weak base and subgrade material, and patching with new asphalt mix. It is not efficient or effective



*Crack sealing is a low-cost, essential road maintenance method that helps local officials get more out of every lane mile in their jurisdictions.*

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## Idea EXCHANGE

*“Getting better light was the primary incentive for installing the new fixtures.”*

# Illuminating improvement for equipment garages

**BANKS OF** energy-efficient lights brought an illuminating improvement to the Lafayette County Highway Department equipment facilities more than two years ago. The upgrade replaced 40 high-pressure sodium lights with 42 fluorescent fixtures that County Highway Commissioner Tom Jean says increase the brightness in the department’s main garage, storage garage and wash bay areas by two to three times what it was.

“Getting better light was the primary incentive for installing the new fixtures,” Jean explains. “When I joined the department in 2005, I was struck by how badly lit these work areas were—especially in winter when crews would arrive in the dark for a storm emergency and needed to get plows and trucks ready for action quickly.”

Mike Ritchie, who now manages the parts department for the County’s highway operations, worked as a mechanic back before the changeover. He says the old fixtures gave such dim, ineffective light, he and others needed to use multiple trouble lights to see what they were doing. These days, Ritchie reports,



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*Powerful fluorescent fixtures do a better job of lighting work areas in the main garage, improving productivity and safety.*

“The new lights make a world of difference, there’s no comparison. These fixtures come on instantly and every area is well lit.”

The “instant-on” feature is a big plus, agrees Jean. The old sodium lights took as long as 15 minutes to reach full illumination and light output decreased as the lamps aged. Those conditions definitely hampered workplace safety and productivity, he notes, especially in the winter months. To let more light in, even on frigid days, workers sometimes opened the big bay doors.

## Energy savings enter the equation

Reducing energy costs came into the picture as an added incentive when Jean started exploring a lighting upgrade for the garage, maintenance and storage facilities. He learned Lafayette County was conducting an energy assessment of all county buildings and decided to request a lighting audit from Wisconsin Power & Light Company (WPL), an Alliant Energy company. The findings resulted in a proposal for an energy-efficient replacement project implemented under a Shared Savings program sponsored by WPL for business customers in Wisconsin and Minnesota.

Through Shared Savings, WPL worked with Jean and his crew to evaluate their lighting needs and develop an improvement plan. WPL then financed the \$10,000 cost to purchase and install new fixtures. Troy Pittz, strategic accounts manager with WPL, estimates the department will see savings of up to \$1,000 annually.

The department repays the investment in installments that amount to a small increase in its monthly utility bill. “What we’re saving in energy costs is close to equaling half our monthly pay-



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*Lafayette County Highway Commissioner Tom Jean LEFT surveys new lighting in the county’s equipment facilities with Troy Pittz of WPL.*

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### Resource

[www.alliantenergy.com/sharedsavings](http://www.alliantenergy.com/sharedsavings)

Link to information about Alliant Energy Shared Savings program that helps business customers identify, finance and implement energy improvements.

*Through Shared Savings, WPL worked with Jean and his crew to evaluate their lighting needs and develop an improvement plan.*

ments," Jean says. "Eventually, those savings will cover the total cost of making these changes."

Along with the advantage of fixtures that use less energy and shed brilliant working light, the department expects to save on costs to maintain them. Nearly three years since installation, the original bulbs continue to illuminate the facilities at full intensity.

### Impact on operations

The impact of the upgrade on department operations is positive across the board, Jean says, from improved productivity and better safety to energy savings and minimal maintenance. And the partnership with WPL/Alliant Energy freed the county to make the improvement without waiting to align with a future budget cycle.

Success with the lighting project inspired Jean to pursue other programs to update windows and heating equipment in the highway facilities. "We need to be creative in stretching limited resources to provide our community with a continuing high level of service," he concludes. "This experience is proof to me we can do it." ■



Main and storage garages are two to three times brighter with the new energy-efficient lighting.

## Impact of deicers on concrete

### THE SOUTH DAKOTA

Department of Transportation and the Michigan Technological University Transportation Institute recently released findings from a five-year study on the long-term effects of deicers on concrete pavements. Noting the historical shift in winter maintenance practices away from solid chemicals and salt/sand mixtures to liquid solutions, the researchers set out to study the potential impact of these ice and snow control treatments on different pavement materials, in particular, Portland Cement Concrete.

Michigan Tech Researcher Lawrence Sutter and his team investigated the life-cycle performance of winter roads treated with concentrated solutions of magnesium chloride, sodium chloride and calcium chloride, and alternative liquid deicers. They then identified strategies to achieve good winter maintenance results while minimizing structural and surface damage on roads, bridges and culverts.

Sutter found generally that concrete pavement specimens exposed to concentrated solutions of calcium chloride or magnesium chloride under laboratory conditions showed surface scaling and corrosion of embedded steel elements. He also identified significant expansion and cracking during the freeze-thaw process that weakened the material. The same study demonstrated that high concentrations of sodium chloride did not cause deterioration.

The project published guidelines based on this research and other technical sources to give design engineers, material producers, contractors, officials



in charge of road maintenance and others information on how to prevent or minimize the effects of deicing chemicals on concrete pavements.

Strategies outlined in the guidelines start "first and foremost" with a durable design mix that has an effective air void system to protect the hardened concrete against freeze-thaw problems and deicer scaling. The second strategy emphasizes construction techniques that create a surface of well-consolidated concrete prepared to stand up to deicing. Along with adequate curing, the construction guidelines call for a 30-day waiting period before using deicers on new concrete.

The final recommendation focuses on reducing the harmful effects of deicing chemicals on concrete pavements with the periodic application of surface sealers (e.g., water repellants like siloxanes or silanes) to slow the penetration of moisture, coupled with a winter maintenance program that uses deicing chemicals at their lowest, effective concentration. ■

Learn more about this research and download the Implementation Guide at

[www.state.sd.us/Applications/HR19ResearchProjects/oneproject\\_search.asp?projectnbr=SD2002-0](http://www.state.sd.us/Applications/HR19ResearchProjects/oneproject_search.asp?projectnbr=SD2002-0)

## Research CORNER

*This occasional Crossroads feature reports on roads-related research from a variety of highly regarded institutions, highlighting topics and trends of interest to officials who manage and maintain local roads.*



*The researchers set out to study the potential impact of ice and snow control treatments on different pavement materials, in particular, Portland Cement Concrete.*



# Winter roads: juggling salt supplies and alternatives



More frequent plowing is a good alternative to salt use.

Local officials responsible for maintaining city streets, and county and town roads report paying between \$33 and \$180 per ton for their supplies.

**PUBLIC WORKS** and highway departments across Wisconsin watched warily last summer as the escalating price of road salt and questions of availability raised concerns about restocking their salt sheds. As supply issues faded, local governments secured the salt they needed to face another winter—although, in some cases, at a premium price.

**Crossroads** newsletter surveyed local officials participating in recent Transportation Information Center (TIC) workshops on winter maintenance and talked to others across Wisconsin to learn how they stocked up for the current ice and snow season. We also asked what alternative treatments they use or plan to try this year.

## Impact of a tough winter

States in the Midwest and Northeast battled tough winter storms last year that came early and stayed late. Record-setting snows blanketed parts of Wisconsin and Iowa.

Highway departments and private contractors nationwide used a near-record 20.3 million tons of road salt last winter. The Salt Institute reports that the heavy demand left supplies low at the source just when customers began requesting bids and increasing their bid amounts. The State of Wisconsin, for example, increased its bid amount this year by 351,000 tons.

Weather also affected usual availability of the commodity. The same winter storms that tapped out municipal salt stores combined with spring rains to cause flooding that delayed shipping on the Upper Mississippi River.

Despite rumors of shortages, all counties had access to salt supplies by October, according to Dan Fedderly, Executive Director of the Wisconsin Counties Association. "Cost rather than availability is the main issue now," he says.

The price paid per ton delivered in 2008 varied widely depending on bids and contract arrangements. Local officials responsible for maintaining city streets, and county and town roads report paying between \$33 and \$180 per ton for their supplies. Fedderly says counties purchasing road salt through the state contract paid \$55 per ton on average, a hike of 10 to 12 percent over last year.

Fedderly notes additional supplies will carry a higher price. "The biggest potential problem is another hard winter in areas where towns depend on the county for their salt needs and the county has less available late in the season to supply the locals at the lower price. It could stretch some budgets pretty hard."

## Available—but at a price

Local governments contacted for this story that had existing contracts through the state or other agreement saw a moderate increase in the per-ton cost of road salt. The City of Milwaukee, in the final year of an independent three-year contract, purchased 55,000 tons at just over \$38 per ton with a guarantee of 25,000 additional tons at the same price. The 2008 price is a 5.6 percent increase over 2007. Milwaukee

Sanitation Services Manager Wanda Booker says last year her crews used the 25,000 tons and more to manage the city's 7,000 lane-miles of streets and cul du sacs.

The City of De Pere in Brown County purchases road salt under the state contract. They purchased 1,820 tons at \$33 per ton in 2008 versus \$29.50 per ton in 2007. Streets Superintendent John Heesaker says the city cut its order by 200 tons this year and plans to make up the difference by adding a natural sugar beet byproduct (Geomelt) to the mix.

Randy Eide, Director of Public Works for the City of Menomonie, says the \$56 per ton rate the city paid for salt on the state contract in 2008 was a 14 percent increase for them. "Those supplies should take us to April of 2009 after which we expect much higher prices," he observes, adding that he depends on Dunn County for additional salt in snow-heavy years and "they've been good about helping us if they can."

Purchasing road salt on a state contract they renew annually, the City of Appleton in Outagamie County paid \$38 per ton this year compared to \$33 per ton in 2007. Carl Schultz of the city's public works department says they committed to 5,000 tons with



A spreader loads up at one of six salt domes that serve the City of Milwaukee street crews.

an option to purchase 930 tons more at the set price.

The word from several local governments that sent out new requests for salt bids in the spring and summer of 2008 is that when vendors finally secured supplies, the price per ton was steeply higher. Examples include the \$180 per ton rate the Town of Stettin in Marathon County paid for a portion of its 2008 supply and Dodge County's \$160 per ton salt investment. The City of Ashland in northern Wisconsin—where snowfall last winter was below normal—paid \$82 per ton versus the \$43 per ton paid in 2007.

### **Strong argument for alternatives**

Over the last 40 years, winter maintenance professionals have tested and adopted various alternative strategies to reduce the use of road salt for ice and snow control. While several of these are seen as effective and environmentally sound, the cost of deicing materials and the investment in equipment needed to apply them made many local agencies hesitate to adopt alternatives. Recent price increases in road salt make a strong argument for considering these strategies.

Two of the most common alternatives—prewetting and anti-icing—use liquid salt brine to improve how road salt performs. Highway and street departments also use alternative chemicals and blends in prewetting and anti-icing to improve deicer performance in low temperature situations.

Prewetting is the process of adding a liquid deicing chemical to dry salt during application to speed up the melting process and limit salt lost when the dry material bounces off the pavement surface. Anti-icing prevents snow and ice from bonding on the pavement by spreading a small amount of a liquid chemical before a storm hits.

Mechanical removal is an “old fashioned” alternative that has gained a foothold in many communities. Agencies are changing policies to include more snow control with plowing, exploring different blade materials and plow configurations to make the method more effective.

A better understanding of the role abrasives like sand play in a winter maintenance program is another milestone in the evolution of snow/ice control strategies. While abrasives do not melt snow or ice, they effectively improve traction and reduce braking distances on packed snow and ice. Best practices today call for limited use of sand where low pavement temperatures render chemicals ineffective or agency policy establishes snowpack as an acceptable level of service for certain roads. The standard for adding salt to abrasives is to mix at a 2-4 percent by weight ratio to prevent abrasive stockpiles from freezing.

Ice and snow control operations that use salt or alternatives make best use of their resources by utilizing customized weather forecasts. Forecasts that include pavement temperature information also help crews time application of deicing chemicals and select the appropriate application rate.

### **Treating roads, educating the public**

As many local officials across the state rewrite snow removal policies and update highway and street operations to explore these and other treatment alternatives, they comment here on how they will handle the snows of 2008-09.

“Born of necessity,” says Dodge County Highway Commissioner Brian Field of his department's plans to experiment with mixes this year. The county is augmenting its 6,000 tons of road salt with 1,000 tons each of two products shown to work well at lower temperatures—IceSlicer, a mined



*Many Wisconsin communities are adding pre-storm anti-icing equipment to their winter maintenance programs.*

material made up of complex chlorides and trace minerals, and Ice Melter, a manufactured chloride mix. The \$150 price per ton for these deicers, once considered stratospheric, makes them competitive in a year when the county paid almost four times as much for road salt as they did in 2007.

Field says the other strategy he will follow is an active effort to educate the public about the county's efforts. This includes encouraging people to drive slower and stay off the roads in the worst weather.

De Pere's Heesaker says that besides testing the efficacy of a salt/Geomelt mix, the city plans to recalibrate its spreaders and look for ways to improve the application process. He adds, “Depending on the winter, if we really use less salt with this approach, we may cut back our salt order even more next year.”

Patrick Colgrove, Operations Manager for Ashland, says the high price of road salt prompted him to update the city's snow policy, including frequent plowing in lighter snowfalls. They also plan to experiment with prewetting, applying a magnesium chloride mix (purchased from Ashland County) on emergency routes, collector streets and higher traffic areas.

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## Winter roads: juggling salt supplies and alternatives

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*Utecht adds that Town leadership strives to be proactive about snow control policies and recognizes that reducing salt use is as much about the environment as it is about cost and availability.*

The Dane County Highway Department continues to treat all state highways it manages and most major county highways by prewetting with a brine solution produced in-house. They follow an anti-icing regimen—the pre-storm application of a liquid—for bridges on the Interstate and the beltline that bypasses Madison. Assistant Highway Commissioner Pam Dunphy says they might consider treating other stretches of roadway with anti-icing in future.

Dunphy notes it is difficult to track the recent impact of these methods given two consecutive winters of severe weather. But Dane County's goal remains keeping salt use to a minimum while maintaining safe roads. The county is providing the brine solution it produces to nearby communities this season. The department also conducted an informational meeting on the alternative method last spring for local governments in Dane and surrounding counties.

Milwaukee introduced a salt brine/anti-icing alternative in 2005, using the blend primarily on bridge decks. Booker explains that under the right weather conditions and when the city outfits more trucks to handle the brine solution, they plan to use it more widely.

Meanwhile, tight salt supplies last year prompted Milwaukee to sand lightly traveled roadways late in the season as an interim alternative. "Last winter caused us to look at what we put down and how much road salt is necessary to maintain safe roadways," Booker says. "The department plans to keep monitoring salt use this season so we can manage our supplies effectively and still do the job."

### Proactive policies

Stettin was one local government that waited longer than usual for its regular salt vendor to come through with salt supplies at any price this year. Supervisor Gary Utecht says the Central Wisconsin

Township purchased only 150 of the 350 tons it hoped to stockpile at the vendor's premium price of \$180 per ton and later managed to buy an additional 200 tons at half the price from Marathon County. He is in talks with the county about joining the state contract in future.

Ongoing efforts this season to manage and reduce salt use include making greater use of pavement temperature sensors on trucks that help the drivers adjust application rates according to conditions. Utecht adds that Town leadership strives to be proactive about snow control policies and recognizes that reducing salt use is as much about the environment as it is about cost and availability.

This is the eighth year the City of Beloit is using liquid blends to treat roadways. Among the first local governments in the state to experiment with liquids, Beloit follows this approach on every street in every storm. It keeps road salt use to a minimum, says Public Works Director Christine Walsh, noting the community reduced its salt use by one third with alternatives. The city had salt to spare last year for other municipalities in the "southern snow belt" that ran short.

Beloit mixed its own treatment blend for the first time last season. Using a computer to keep the formula uniform, they developed a mixture consisting of 80 percent

salt brine, 15 percent Geomelt and 5 percent calcium chloride. Walsh says they apply a costlier 50/50 blend of brine and Geomelt in deep cold temperatures. Road crews also receive annual training on blends, application rates and equipment settings. "We want the drivers to understand our management philosophy on snow control, why we do what we do," Walsh says. "Since we can't increase the budget for time and materials, we need to do it right the first time."

Appleton uses a combination of plowing, salting, prewetting and anti-icing in its winter operations. This includes a salt brine blend the city began purchasing from Outagamie County two years ago. Schultz says all trucks in the winter fleet are equipped for prewetting, ready to apply salt brine or calcium chloride as conditions warrant. Last year, one third of the vehicles regularly went out with the brine solution. Schultz says his department sees real advantages in using this approach. It reduces the amount of salt needed for application, helps activate the salt quickly and minimizes or eliminates the need to re-apply. Managing its road salt supply in 2007 with this regimen, Appleton helped fill the temporary gap between salt deliveries for nearby townships when a storm caught them off guard.

Balancing safe winter roads with environmental cautions,



*A truck equipped for anti-icing applies a liquid blend on a Beloit city street as a preventive ice and snow control measure.*



Menomonie is also making an effort to reduce road salt consumption. The northwest Wisconsin city uses a combination of methods for ice and snow control. Eide says crews typically use straight salt on main connecting roads, and rely on plowing and sanding to manage secondary streets. In a snowy winter when it is hard to stay ahead of accumulation, Eide says they expect residential streets to get snow packed.

### Learn what works

Clearly, the push to test and try alternatives for treating winter roads has gained momentum

with local governments across Wisconsin in recent years. The reality of high-priced road salt hit home in 2008 as an incentive for adopting other methods. Many highway and public works departments now add "cost-saving" to a list of reasons that include alternatives that are effective, innovative and ecologically sound.

Local officials who want to learn more about these alternatives and how they work under different climactic conditions can request related fact sheets from TIC or download them from the TIC website. See a list of these and

other publications in the *Resources* section on page 11 of this issue.

TIC's annual series of *Winter Maintenance* workshops regularly address trends and treatments, and feature speakers with hands-on experience. Pat Colgrove from Ashland, who attended a recent session in the series, says the program gave him a chance to pick up valuable information about running a winter operation, but also to share his own insights. "The workshop really helps me connect with others who face the same challenges I do and stay in touch with the latest ideas." ■

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### Resource

[www.saltinstitute.org](http://www.saltinstitute.org)  
Website of the Salt Institute, a nonprofit salt industry industry association that reports on trends in salt use for winter roadway safety.

## Why not a sand/salt mix?

In a year when some local governments in the state paid a premium to stockpile road salt for their winter maintenance operations, many are asking: *Can't I stretch my dollar by mixing sand and salt?*

In fact, the assumption that sand-to-salt ratios of 50/50, 60/40, 70/30 or 75/25 are effective treatments is misguided. TIC agrees instead with research that shows mixing salt and sand (beyond the 2-5 percent salt needed to freeze proof sand stockpiles) does not improve the effectiveness of either material.

### Weigh the facts

Sand and salt work at cross-purposes. Sand improves traction when it is on top of ice or snow pack. In a salt/sand mix, as the salt begins to melt the snow pack, the sand sinks and mixes with the snowpack. Once the sand is gone from the surface, it does nothing to improve traction. Sand mixed with salt also reduces the melting effectiveness of the salt.

There are other costs of using a salt/sand mix to consider. It usually increases the overall application rate, so actual reduction in salt use and cost savings may be less than expected.

For example, in a change from applying salt at an application rate of 300 lbs per lane mile to a 75/25 sand/salt mix applied at 800 lbs per

lane mile, the salt component of the mixture is 200 lbs per lane mile for a 33 percent reduction. Assuming a salt price of \$60 per ton and a sand price of \$4 per ton in this scenario, material costs go down only \$1.80 per lane mile. Adjust the equation to a sand/salt ratio of 70/30 and the savings are \$0.68 per lane mile. And mixing two-thirds sand with one-third salt saves nothing in material costs over straight salt.

If the route is 10 centerline miles (20 lane miles) or more, it may take an additional trip to the yard to refill the sand/salt mix. The labor and equipment costs for this trip wipe out the nominal savings on materials. Add to that the resource outlay for sand cleanup in the spring and the cost of the mixture is higher.

The mix may vary and assumptions about continuous salting or spot salting hills, curves and intersections all factor in. But it helps to do the math before assuming salt and sand combined reduce costs.

### Save salt, meet conditions

Highway and streets departments that use sand to cut back on salt often designate lower traffic volume roads where sanded snowpack is an acceptable level of service. They plow the roads and sand hills, curves and intersections for traction. The approach assumes these roads will be snowpacked but passable.

There are other methods for cutting back on salt use without using sand.

- Put plow blades on the ground earlier in the storm and decrease salt application rate. Removing more snow means it takes less salt to melt the rest.
- Vary application rate within a route. Reduce salt use mid-block and apply normal rates at hills, curves and intersections.
- Try prewetting while reducing dry salt application rate 20 to 30 percent. More salt stays on the road with prewetting and it takes less salt to provide the same level of performance.
- Consider anti-icing— pre-storm application of liquid deicers to break bond between snow and pavement makes it easier to clean-plow using less salt.

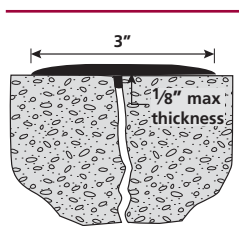
### Combine strategies

Stretching salt stores while maintaining winter roads in safe condition demands different strategies depending on weather conditions and road classification. Both salt and sand, used in the proper applications, are effective tools in a winter maintenance operation. Calculating the costs and carefully considering the value of each strategy is helpful in identifying the most cost-effective approach.

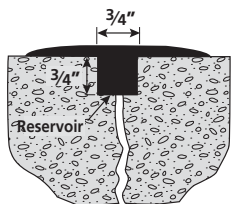
## Crack sealing: smart investment in tight times

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*It is best to do crack sealing in spring or fall. Avoid high summer temperatures that cause cracks to be at their narrowest.*



Simple overband



Standard recessed overband

Crack sealing methods vary based on the condition of the crack.

to crack seal closely spaced block cracking. Surface treatments like a chip seal, slurry seal or micro surfacing work well on block cracking if there is no significant raveling or spalling of the cracks.

### Review the process

Once crack sealing is an established essential road maintenance method, it is important to do the job right. TIC provides specifications on the crack sealing process in publications available to local officials. The basics include routing and cleaning cracks, placing the sealant and creating an overband finish.

These points highlight the process and cover some details that ensure good results.

- Use a router with a vertical spindle blade or radial cutters on a circular cutting head to cut a uniform and consistent sealant reservoir with vertical sides and a flat bottom.
- Configure the router so it is easy for the operator to follow straight or meandering cracks.
- Use an air compressor that prevents oil and water from entering the compressor hoses.
- Move the hot air lance at a speed that fully cleans and dries the crack without burning the pavement surface.
- Heat the sealant using an oil jacketed, double-boiler type kettle with agitation and recirculation system that delivers the sealant to the applicator wand at the recommended temperature.

- Coordinate hot air lance and sealant application work to minimize the time the crack remains open before sealing. *Rule of thumb is to run the sealing operation no more than 150 feet or five minutes (closer spacing is better) behind the hot air lance operation to keep the routed crack from cooling and condensing with moisture before sealing.*
- Fill the crack with sealant from the bottom up to avoid bridging and leaving voids.
- Overfill the cracks slightly and use a squeegee tool to create an overband one-inch wide on each side of the routed crack. *A narrow v-shaped or u-shaped squeegee works well.*
- Create an overband that is thin and feathered at the edges to minimize potential for pullout of the sealant during winter snowplowing operations.
- Allow sealant to cure before opening to traffic. *If necessary, dust the sealant with fine sand or cover it with single-ply tissue paper to prevent tracking.*

### Choose best time, best materials

Sealing applications typically specify the use of a hot pour petroleum-based, rubber-modified product that meets the requirements of ASTM D6690. Under D6690, Type I is equivalent to the previous D1190 standard and Type II is equivalent to the previous D3405 standard.

It is best to do crack sealing in spring or fall. Avoid summer temperatures that cause cracks to be at their narrowest. When that happens, it is hard to fill with enough sealant to bridge the crack as it opens wider in cold temperatures. Extreme low temperatures also have a negative effect on the process. Crack sealing in winter when cracks are at their widest means excess sealant will form a small bump along the crack when temperatures warm up. The crack is well sealed, but ride quality suffers.

The specifications recommend crack sealing when weather conditions are dry and the pavement temperature is above 40°F. Do not seal when it is raining or rain is in the forecast. Follow the manufacturers temperature and weather recommendations.

### Maintenance mainstay

While the routing and sealing procedure outlined here is a best-practice approach to getting long life and high performance from a crack-sealing project, local governments need to use the material and equipment that fit their budgets. They also need to evaluate their roads regularly and use that data to plan three or four years out, applying limited resources to effective and timely treatments. Crack sealing is a smart investment in both tight and prosperous fiscal times. It is a maintenance mainstay that effectively slows surface deterioration and provides additional years of useful pavement life.

Local officials involved in implementing pavement projects can learn how to recognize surface problems early and apply the right treatment at one of the TIC's *Road Maintenance* workshops in March. See details in the *Calendar* listing on page 12. ■

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Crack seal process, LEFT to RIGHT, involves routing the crack, cleaning it, filling with sealant and shaping an overband, allowing the repair to cure, and blotting excess sealant with layer of fine sand or tissue.



# Make roadways safer

**CRASH STATISTICS** and the experience of many local governments suggest preventive efforts can make local roads safer.

Wisconsin saw nearly 118,000 crashes on its streets and highways in 2006. Fifty-nine percent of those crashes occurred on roads maintained by Wisconsin local governments. There were 659 crashes that resulted in 712 fatalities. Half of these occurred on county, city, village and town roads. Rural roads accounted for more than 76 percent of the fatalities—a deadly distinction.

Driver error or impairment get the blame for many crashes and rightly so. Individuals driving under the influence, going too fast, being inattentive or using bad judgment are serious problems. But while careless drivers con-

tribute greatly to the statistics, every vehicle crash involves a chain of events. Roadway characteristics often are a factor in that chain.

Local officials who build, maintain and operate local road systems have a responsibility to identify safety deficiencies and take action to correct those deficiencies.

## Low-cost measures make a difference

*Common sense* is one of the most important line items in county or municipal budgets. Many local governments report a significant reduction in the number of crashes on their roads after making sensible, low-cost safety improvements—in some cases, reducing crashes by one third.

Improvements include changes that alert motorists or give better

guidance on sections of road that are difficult to negotiate at night, in the rain or at highway speeds. Routine maintenance of pavements, shoulders and rights-of-way help keep roads in safe driving condition. Proper signage and appropriate and visible pavement markings also make travel safer.

The four scenarios outlined here present typical roadside hazards and the low-cost ideas for correcting them.

### 1— Obstructed STOP sign

Traffic signs are useless if motorists cannot see them in time to react. The most crash-critical example is the STOP sign. Be sure all STOP signs are visible and recognizable from a distance that allows drivers time to react.



Warning sign prepares motorists to stop safely at hidden intersections.

*Continues on page 10*



## Plan for road ratings and workshops

### TRACKING PAVEMENT

conditions is critical to managing Wisconsin's local road system. The biennial pavement rating process comes up again in 2009. It requires local officials responsible for local roads to rate them and submit results to WisDOT before December 15, 2009. Local governments will receive a packet of information from WisDOT in May that outlines the pavement rating process and important submission dates.

The road ratings process is one aspect of the long-term view local officials need to take in evaluating the overall condition of the roadway system they manage. What trends do they see in system performance? Is it getting better, staying the same or deteriorating?

Along with timely pavement inspection and required data collection, the ratings program offers local officials a chance to consider alternative maintenance strategies, update their three-

five-year plans, or consider a much-needed improvement project. As fuel and material prices stress county and municipal budgets, exploring cost-effective maintenance strategies can help extend useful pavement life.

### Ratings workshops return

The Transportation Information Center (TIC), in partnership with WisDOT, offers its *Using PASER and WISLR to Manage Your Roads* workshop program again in 2009. The workshop addresses all aspects of the inspection, ratings and submission process. Participants learn the basics of pavement management, and how to read and use ratings to develop effective road maintenance policies and programs.

Presenters cover how to use the PASER pavement evaluation and WISLR database tools successfully. This includes making the most of WISLR's mapping (GIS) tools.

TIC will run eight identical PASER/WISLR workshop sessions around the state in March and

early April. See *Calendar* on page 12 for details of time and location.

Susie Forde, Chief of Data Management for WisDOT and a workshop leader, says she and Kelly Schieldt, Statewide Local Roads Coordinator, plan to expand their presentation this year to include the use of mapping features in WISLR. "We want to get local officials familiar with what WISLR can do to help them streamline their records and better analyze the condition of their pavements," Forde explains.

### Hands-on training

Feedback from 2007 workshops indicated local officials want more hands-on training in using WISLR and PASER—something that goes beyond the regular workshops. Forde and TIC Director Steve Pudloski say plans for 2009 include piloting two hands-on training sessions in May to test this concept. Look for updates on these sessions in mailings and on the TIC website. ■

*"We want to get local officials familiar with what WISLR can do to help them streamline their records and better analyze the condition of their pavements."*

### Contact

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## Make roadways safer

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*A sharp drop of more than two inches along the edge of a road creates a serious hazard if a motorist swerves out of his or her lane.*

The safe distance varies with the speed of the road. At 55 mph, a vehicle needs 495 feet to slow to a reasonable stop; at 35 mph, the distance is 250 feet. If a hill or curve blocks the view, place an advance warning sign with the message STOP AHEAD. Trim any vegetation that obstructs warning or STOP signs and position them to comply with the Manual on Uniform Traffic Control Devices (MUTCD). View the sign at night to see if it is easy to recognize and, if not, replace it with a new retroreflective STOP sign.

### 2— Fixed object close to road

Fixed objects make up 21 percent of all crashes and trees account for 15 percent of all fatal crashes. Owners of land adjacent to a right-of-way that has trees and other woody vegetation might object to a clearing project, but creating a separation between



*Large tree on the right, close to road, creates a crash risk.*

the edge of the road and any substantial vegetation increases road safety. Use reasonable judgment and notify nearby property owners well ahead of taking action. Trees growing close to the road, especially on curves, hills and high-speed roadways, present a serious hazard. Make sure all signposts are breakaway and mailboxes mounted on crash-worthy supports. Remove private signs and fence posts from the right-of-way. If it is not possible to remove a fixed object that is close to the road edge, install an object marker to warn motorists.

### 3— Sharp curves

Curves are a major factor in crashes on rural roads, particularly when speeds are high, the road is narrow and trees line the outside of the curve. Signs that warn and guide drivers along these stretches—especially at night—are the best low-cost solution.

Options include warning signs with an advisory speed plaque, delineators, chevrons and pavement marking along the center and edge of the road. On high traffic roads, establish and mark a NO PASSING zone. Provide a paved shoulder, a 4:1 ditch slope and remove trees in the right-of-way on the outside of the curve to allow a recovery area for motorists that veer off the road. Remove vegetation on the inside of the curve if it obstructs motorists' view.

### 4— Edge drops

A sharp drop of more than two inches along the edge of a road creates a serious hazard if a motorist swerves out of his or her lane. At high speeds especially, the vehicle might leave the road and roll over. Edge drops often occur because of unstable and soft shoulders. They are common on the inside of a curve or where



*This severe edge drop poses a serious driving danger.*



*A bank of chevrons delineate a crash-prone curve.*

vehicles pull off the to park, enter or leave a driveway, and stop at a mailbox. It may take more than routine shoulder maintenance to reduce trouble spots. Stabilizing or paving the shoulder on curves, on hills and along stretches of road with many driveways is a good solution. Temporary edge drops that happen before crews restore the shoulder after a road-resurfacing project also pose a problem. An effective immediate fix on new construction is a tapered section called the "safe edge" that reduces crash risk before crews complete their work on the shoulder.

### Help getting started

The TIC's *Highway Safety* workshop series in February focuses on solutions for making local road systems safer. See the *Calendar* on page 12. TIC also offers its *SAFER Manual*, a practical guide to reviewing and improving local roadway safety, and fact sheets on signing and pavement marking.

Local governments with a stretch of road that has above-average crash statistics can contact TIC for help in addressing the problem. A safety circuit rider—one of the experts leading TIC's safety outreach program—will gather crash data on the road, walk the road with local officials and suggest changes to improve safety. To participate, fill out the form on the facing page or contact TIC at [tic@epd.engr.wisc.edu](mailto:tic@epd.engr.wisc.edu) or 800-442-4615. ■

## Publications

*Using Salt and Sand for Winter Road Maintenance*, TIC Bulletin #6, 4 pp., 2005. Available from TIC. Basic information and practical tips on using deicing chemicals and sand.

*Pre-wetting and Anti-icing*, TIC Bulletin #22, 8 pp., 2005. Available from TIC. Techniques for winter maintenance.

*The SAFER Manual*, Safety Evaluation for Roadways, 40 pp., 1996. Available from TIC.

## Web sources

*The Pavement Preservation Checklist Series Crack Seal Application* lists important field checks to assure good performance.

[www.pavementpreservation.org/toolbox/links/ppcl01.pdf](http://www.pavementpreservation.org/toolbox/links/ppcl01.pdf)

*Field Manual for Crack Sealing in Asphalt Pavements* provides practical field-focused advice on effective crack sealing of asphalt pavements. Produced by the Center for Transportation Research The University of Texas at Austin.

[www.utexas.edu/research/ctr/pdf\\_reports/0\\_4061\\_P3.pdf](http://www.utexas.edu/research/ctr/pdf_reports/0_4061_P3.pdf)

*The Rural Highway Safety Clearinghouse* at the University of Minnesota features publications that discuss solutions to rural road safety issues.

[www.ruralsafety.umn.edu/clearinghouse/topics/engineering.html](http://www.ruralsafety.umn.edu/clearinghouse/topics/engineering.html)

*Low-Cost Treatments for Horizontal Curve Safety* is one of several useful publications available at the FHWA Roadway Departure Safety site.

[http://safety.fhwa.dot.gov/roadway\\_dept/](http://safety.fhwa.dot.gov/roadway_dept/)

*Intersection Safety Strategies* briefly describes strategies for improving safety at unsignalized and signalized intersections. Brochure available from FHWA.

[http://safety.fhwa.dot.gov/intersections/lintsafestratbro/intersection\\_guide12.pdf](http://safety.fhwa.dot.gov/intersections/lintsafestratbro/intersection_guide12.pdf)

*Minnesota Snow and Ice Control Field Handbook for Snowplow Operators* reviews tools, best practices, and limitations for snow and ice control in upper Midwest.

[www.mnltap.umn.edu/pdf/snowicecontrolhandbook.pdf](http://www.mnltap.umn.edu/pdf/snowicecontrolhandbook.pdf)

*Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel* is a helpful for developing a systematic, efficient practice.

[www.fhwa.dot.gov/reports/mopeap/leapcov.htm](http://www.fhwa.dot.gov/reports/mopeap/leapcov.htm)

*Manual of Practice For Anti-icing of Local Roads* from the New Hampshire LTAP center.

[www.t2.unh.edu/pubs/manofpractice.pdf](http://www.t2.unh.edu/pubs/manofpractice.pdf)

*Anti-icing tables* from the New Hampshire LTAP center that include details on recommended anti-icing application.

[www.t2.unh.edu/pubs/manofpractice\\_1.pdf](http://www.t2.unh.edu/pubs/manofpractice_1.pdf)

## DVD/VHS/Multimedia

Timely resources new to the TIC collection or related to topics in this newsletter.

*Managing Pavement Edge Drop-offs: To Improve Safety and Reduce Tort Liability*,

U.S. Department of Transportation (DOT)/Federal Highway Administration (FHWA), 2006, #18810, CD. Safety issues, construction and maintenance practices and research findings relating to pavement edge drop-offs from the 2/04 and 1/05 sessions in Washington D.C. Includes video, PowerPoint presentations, PDF-documents and drawings.

*Road Safety Audits: A New Way of Doing Business*, U.S. DOT/FHWA, 2006, 13 min., #18927, DVD. Examines concept of road safety audits, how to build a roadway safety audit team and conduct road safety audits.

## RESOURCES

Print copies of listed publications available free from TIC while supplies last. Download electronic copies for some items at: <http://tic.engr.wisc.edu/publications>.

Video, CDs, and DVDs loaned free through county UW-Extension offices. Print copies of the current TIC Lending Library Catalog were distributed in July 2007. Also look for titles on the TIC website.

### TIC website

<http://tic.engr.wisc.edu/>

### Request a Safety Circuit Rider visit

NAME OF LOCAL GOVERNMENT \_\_\_\_\_ COUNTY \_\_\_\_\_

CONTACT NAME \_\_\_\_\_ TITLE \_\_\_\_\_

TELEPHONE \_\_\_\_\_ EMAIL \_\_\_\_\_

Specific location of safety Opportunity for Improvement (OFI). For intersection, name of both intersecting roadways or streets. For road segment, name of road and spot locator from known intersection.

\_\_\_\_\_

\_\_\_\_\_

Describe traffic safety OFI: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Fax back to (608) 263-3160. Mail back to TIC, 432 North Lake St. Madison, WI 53706.

## CALENDAR

continued from page 12

### Independent Study

*Project Management 100: The Basics, Plus Important Insights* #K205. Enroll anytime.

### Other Events

*Pesticide Applicator Certification* Training manuals and other resources for Wisconsin Commercial Pesticide Applicator certification available online at the University of Wisconsin Pesticide Applicator Training Program web-site, <http://ipc.wisc.edu/pat>, or contact Rose Scott: 608/262-7588 or [PAT-program@facstaff.wisc.edu](mailto:PAT-program@facstaff.wisc.edu)

**CROSSROADS** provides information on roads and bridges for local officials. Published quarterly by the Wisconsin Transportation Information Center (TIC)—part of the nationwide Local Technical Assistance Program (LTAP)—with assistance from the Federal Highway Administration, WisDOT, and the University of Wisconsin-Extension. For permission to reproduce articles or graphics, please contact us.

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11



# FEEDBACK

Please fill out this form and fax or mail (in separate envelope) with the mailing label below.

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Other

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Mailing list change/addition  Information/resource request  Idea/comment

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# CALENDAR

## TIC Workshops

Details, locations and registration forms are sent to *Crossroads* recipients prior to each workshop. Find additional information and online registration at: <http://tic.engr.wisc.edu/workshops/listing.lasso>

**Work Zone and Flagger Safety** Learn how to apply Wisconsin standard practices and other guidelines for good work-zone traffic control and ways to improve communication between departments. Fee: \$45

Jan 13 Eau Claire	Jan 23 Barneveld
Jan 14 Hayward	Mar 31 Eau Claire
Jan 15 Tomahawk	Apr 7 De Pere
Jan 16 Stevens Point	Apr 8 Waukesha
Jan 21 De Pere	Apr 9 Barneveld
Jan 22 Waukesha	

**Highway Safety** Review signing & marking basics. Good sign installation and maintenance practices. Identify roadside safety hazards, and understand and use crash information to improve the safety of local roads. Fee: \$45

Feb 19 Barneveld	Feb 25 Cable
Feb 20 Waukesha	Feb 26 Eau Claire
Feb 23 De Pere	Feb 27 Tomah
Feb 24 Tomahawk	

## Using PASER & WISLR to Manage Roads

Learn to evaluate and rate your local roads, and submit ratings (due Dec 15, 2009) to WisDOT. Includes tips on implementing WISLR database and mapping tools successfully. Fee: \$45

Mar 10 Eau Claire	Mar 30 Tomah
Mar 11 Stevens Point	Mar 31 Rice Lake
Mar 12 De Pere	Apr 1 Tomahawk
Mar 13 Waukesha	Apr 2 Barneveld

**Road Maintenance** Learn to recognize problems early and apply the right methods to stretch budgets and maintain good local roads, streets and highways. Fee: \$45

Mar 16 Tomah	Mar 20 De Pere
Mar 17 Eau Claire	Mar 23 Pewaukee
Mar 18 Hayward	Mar 24 Barneveld
Mar 19 Tomahawk	

## TIC On-site Workshops

Save time and travel costs by bringing instruction to your shop or office. Schedule training that is convenient and tailored to your specific needs. On-site workshops let you train more people for the same cost or less, including

staff from other municipal departments, nearby communities, and businesses you contract with. Contact TIC early to book the program and date you want. On-site workshops include:

- Basic Surveying for Local Highway Departments
- Basic Work Zone Traffic Control
- Flagger Training

## UW-Madison Seminars

A limited number of scholarships are available for local government officials for Engineering Professional Development courses held in Madison. For course details, go to <http://lepd.engr.wisc.edu> or call 800-462-0876.

### JANUARY 2009

- 20-21** Improving Public Works Construction Inspection Skills #K098
- 21-23** Foundation Engineering and Design #K417
- 22-23** Maintaining Asphalt Pavements #K117

### MARCH 2009

- 9-10** Municipal Engineering Fundamentals for Non-Engineers #K338

### APRIL 2009

- 6-8** Repair of Concrete #K651

Calendar continues on page 11