Local Technical Assistance Program

# The Bridge

*Linking Transportation Research and Practice*

Vol. 22, No. 2 August 2008

# Letting the envelope stretch

## Pavement is important for great racing at Michigan International Speedway

by John Ryynanen, Editor, Michigan's LTAP

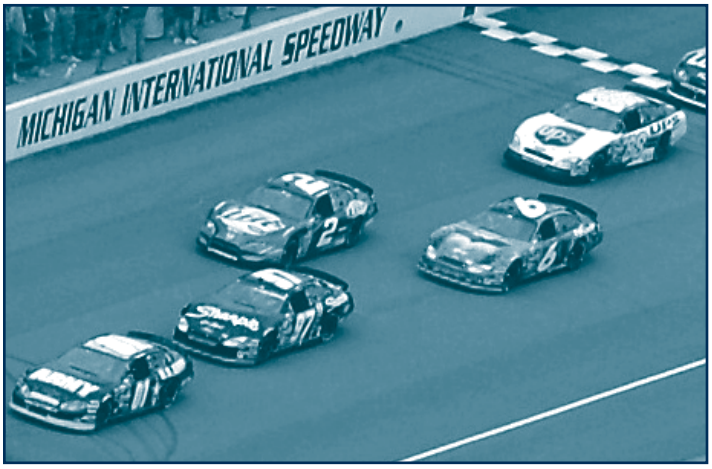
"The pros race right on the edge of control," Dan Salenbien, director of facilities of the Michigan International Speedway (MIS) explained as he drove me around the track (slowly) in his truck. "Our job as the maintenance team is to prepare the track so they can consistently approach that edge without crossing it." For the MIS maintenance team, safety is the top concern, just as it is with public road maintenance crews. But just about everything else about the pavement on the MIS race track is different and more intense than the pavement under our tires on public roads.

The differences begin with the end use of each pavement in mind. A NASCAR race car weighs about 3500 pounds. The heaviest vehicles allowed on a public road can weigh up to 164,000 pounds. The top speed of a race car at MIS is over 200 MPH; the top speed of a fully-loaded truck: a lumbering 50 or so MPH. With this in mind, public roads are designed to withstand heavy vertical loads. The pavement on the MIS track is designed to withstand extreme lateral forces. "The trucks used to pave the track are the heaviest vehicles that ever drive on it," Salenbien said.

### Flex and endure

To withstand the rigors of NASCAR racing, the pavement has to be flexible and durable. Especially in Michigan, where the temperature of the pavement can range from over 100 degrees Farenheit in the summer (during race season) to below zero in the winter, it's important that the pavement expand and contract with minimal cracking.

Consistent, predictable traction is an additional consideration for the pavement. "The track for our drivers is like a stage for performers. The drivers, like performers on stage, need to be able to go a certain speed and handle their cars a certain way to do what the fans come to see them do. If the track is too slick, unpredictable or inconsistent, the show's no good," Salenbien said.




(Photo courtesy of Michigan International Speedway)

*"Our job as the maintenance team is to prepare the track so the pros can consistently approach the edge of control without crossing it."*

Dan Salenbien – Michigan International Speedway

### Fortified with polymer and steel

Bob Harrington is a consultant for the International Speedway Corporation (ISC), which owns MIS and eleven other NASCAR-sanctioned tracks in the U.S. He shared two ingredients that provide the performance characteristics required of the pavement on the MIS track. "Styrene-Butadiene-Styrene (SBS) polymer additive for the binder and steel slag for aggregate produce pavement suitable for racing," he said. "The SBS polymer raises the softening point of the binder, and makes it more flexible; the slag provides traction."

See *Stretching the envelope*, on Page 4

### In This Issue:



MichiganTech
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## Go ahead, jump in!

It's a hot Sunday afternoon in early August. I'm at the beach with my family. This beach has a long break wall of boulders that extends hundreds of feet out into Lake Superior. My three older kids, Alina, Johnny, and Tyler love to jump off the boulders into the water. Tyler, my five-year-old boy with much more enthusiasm than fear, especially enjoys the activity. Tyler can't quite swim on his own so he wears a "trainer" that provides just enough buoyancy to keep his head above water. The trainer also protects him from the pain of smacking against the water when he jumps, which has emboldened him to jump from greater and greater heights.

Scrambling out over the rocks, the kids are giggling with excitement. When we get to the jumping-off spot, Tyler drops his towel, adjusts his trainer a little, and (wiggling to contain his delight) looks back at me for permission to jump the six or so feet into the refreshing cool of Lake Superior. I nod and start to say, "Go ahead," but he has already launched himself. His blond head disappears in a splash as I finish giving him permission.

I laugh out loud when he bobs to the surface, his mouth stretched into a wide grin, eyes dancing. He doggy-paddles furiously to reach the edge of the wall, and then realizes—as he always does—that he can't climb up by himself. Paddling furiously to stay close the wall, he says, "Ah Dad . . . can you lift me out?" He does this every time. He jumps in as soon as he possibly can, and then considers how to get out only after paddling back to the wall and realizing he's stuck

Admiring his enthusiasm for life (and his faith in me), I climb down and lift him onto a narrow rock shelf near the water's edge. As soon as his feet hit the warm rock he scrambles to his launching spot and jumps in again. I lift him out, he scrambles up and jumps again. And again and again and again.

I hope Tyler never forgets how good it feels to launch himself; to take what he's given and stretch it as far as possible; to make the most of every opportunity and live wide open. I wonder what it would be like to have that kind of enthusiasm (and faith) as an adult?

## *The Bridge*

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## LTAP Steering Committee

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

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

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# Power's out! What happens at signalized intersections?

Adapted from Michigan State Police Traffic Services Section, Field Update #32.

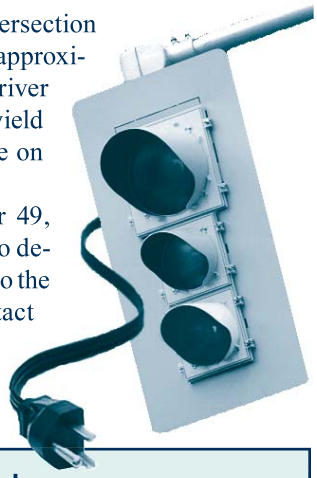
A number of factors must be taken into account when determining the appropriate course of action in response to the loss of power at a signalized intersection. MDOT has issued a memorandum for response to power outages involving traffic signals on state trunkline highways, which accounts for a variety of factors that can influence if, when, and how temporary traffic control devices may be posted. While the memorandum is not binding on county road commissions or municipal road authorities, many have adopted a similar position. Check with your local road authority for their policy prior to the occurrence of an event.

According to Michigan State Police (MSP) Traffic Services Section, when a signal loses power, the intersection becomes uncontrolled and reverts back to the basic right-of-way requirements found in MCL 257.649(1) and (2). It does not become a four-way stop, as is frequently reported in the media.

MCL 257.649 (1) and (2) reads:

(1) The driver of a vehicle approaching an intersection shall yield the right of way to a vehicle which has entered the intersection from a different highway.

(2) When two vehicles enter an intersection from different highways at approximately the same time, the driver of the vehicle on the left shall yield the right of way to the vehicle on the right.



MSP has adopted Official Order 49, Enclosure (9), to provide guidance to department members when responding to the loss of power at an intersection. Contact Sgt. Lance Cook, Vehicle Code Unit, for additional information.

**On the Web:**

*MSP Traffic Services Field Update Archive*
*MDOT Office Memo – Dark Signals*
*Section 257.649 of Michigan Vehicle Code*

For direct links to these resources and more, go to:
**www.MichiganLTAP.org/Bridge**

# Drunk Driving Audit shows 10-year low in alcohol and drug related deaths in Michigan

News release from Michigan State Police.

The 2007 Michigan Drunk Driving Audit reveals declines across the state in alcohol and/or drug related crashes and deaths, injury crashes and impaired driving arrests.

Fatalities resulting from alcohol and/or drug related traffic crashes dropped 13 percent from 440 in 2006 to 382 in 2007, and alcohol and/or drug related traffic fatalities were at their lowest in over 10 years. In fact, all fatal crashes involving a controlled substance were down in 2007, while the toal number of crashes increased about 2.8%.

The number of injury crashes involving alcohol and/or drugs also declined last year, dropping 4.5 percent from 5,455 in 2006 to 5,207 in 2007.

The Drunk Driving Audit, an annual report issued by the Michigan State Police, Criminal Justice Information Center, includes arrest activity by law enforcement agency for each county as well as crash, injury and fatality information by county. It is a collaborative effort among the Michigan State Police, the Michigan Department of State and the Michigan Department of Transportation.

"Despite continued declines in alcohol and drug related crashes, the fact remains that crashes involving drunk and drugged driving make up 35 percent of all fatal crashes," said Colonel Peter C. Munoz, director of the Michigan State Police. "For this reason, strict enforcement of Michigan's impaired driving laws will continue to be a focus for law enforcement."

In 2007, 49,867 alcohol and drug related driving arrests were made, a drop of nearly 3,500 from 2006. Of those arrests, 47,267 resulted in convictions of operating while intoxicated (OWI) or impaired driving. Although advertising campaigns for drunk driving enforcement have targeted young men, they continue to be the group most likely to drive drunk. Over three quarters of all those arrested for drunk driving were men.

**On the Web:**

*Michigan Drunk Driving Audit, 1999–2007*

For a direct link to this resource and more, go to:
**www.MichiganLTAP.org/Bridge**

***Stretching the envelope*, from Page 1**

NASCAR race tires are soft, and when they heat up they get sticky. Moving at 200 miles an hour, the contact patch where the tire meets the pavement is a violent place; ordinary asphalt pavement wouldn't last very long. "The speed and stickiness of the tires, the temperature of the pavement, and the lateral forces created by accelerating, braking, and cornering create a powerful scrubbing action," Harrington explained.

Ordinary asphalt cement becomes brittle as it ages and softens at high temperatures; the scrubbing action caused by NASCAR racing would strip it away and loosen the fine aggregate in the pavement. Once the asphalt cement and fines are depleted, progressively larger aggregates can come loose. If left unchecked the entire surface of the pavement can loosen and become scaly. This phenomenon, called raveling, is common on public roads with older pavements and at intersections and sharp curves.

"Compared to ordinary asphalt cement, SBS modified asphalt withstands higher temperatures before softening – over 180 degrees," Harrington explained, "and it doesn't oxidize and become brittle, so paving with it creates a surface that is much less prone to raveling."

Steel slag is a by-product of steel making. When used as an aggregate in pavement, it's highly angular in shape and has a uniformly rough surface texture. Unlike crushed stone aggregate that can become smooth as it wears (this appears as polishing in the wheel paths on public roads), steel slag maintains an angular shape and rough texture because it fractures to reveal fresh sharp edges instead of eroding smoothly. Crushed granite provides similar performance characteristics; it is used in areas of the country where steel slag is not available.

## Quality control is crucial

The MIS track was last paved in 1994. The four-inch asphalt layer, placed over an existing four inches of asphalt with a milled surface, was paved in two lifts. The first lift is 2-3/4 inches thick, and uses a 3/4-inch crushed stone mix. The second lift (the wearing course), is 1-1/4 inches thick and uses 3/8 inch blast furnace slag mix. Both lifts use SBS polymer modified asphalt.

MIS was the first track in the country to use SBS polymer. Today all ISC tracks use it. "It's significantly more expensive to pave with polymer modified asphalt," explained Harrington, "But it's the only way to get the performance we need out of the pavement."

The actual paving operation was exactly like that on a public road, except the contractor conducted a softening point test. "The softening point test ensures that the mix includes the right amount of SBS polymer so we get exactly the pavement we need," Harrington said.

The 18-degree banking on the corners at MIS is the limit for paving without additional support for the equipment. To pave the 33-degree banked corners at the Talladega Superspeedway in Alabama, which was completed in 2006, Harrington explained that the paving team had to tie the paver to a specially modified dozer located outside of the track wall to keep it from sliding down the bank. To deliver hot mix asphalt to the paver, the team used a shuttle buggy, a conveyor, and a crane (see photo, next column).

## What about cracks?

While polymer modified asphalt cement is more durable and retains greater flexibility than ordinary asphalt cement, it doesn't completely eliminate the thermal cracking that occurs as pavement ages. Just as on public roads, crack sealing at MIS is an important maintenance activity. To seal cracks, the MIS team uses the same material as public road crews, but the method is much more involved.

"Maintaining consistent traction is a top priority," Salenbien explained. "Unlike on public roads, where the cracks are filled until the sealer overflows onto the pavement surface, we have to be careful to keep the sealer below the pavement surface so it doesn't compromise contact between tire and pavement; there isn't much room for error at 200 miles per hour." This method is referred to as reservoir and recess crack sealing. Most public road crews use an overband (or cap) method (see *Crack Sealing*, next page).

Sealing cracks using the overband or cap method costs about $4000.00 per lane mile of road. According to Harrington, sealing cracks with the reservoir and recess method costs about $2.00 per linear foot of crack.


(Photo courtesy of Robert Harrington, LLC)

*Unlike paving the 11-degree banked corners at the Michigan International Speedway, paving the 18-degree banked corners at the Talladega Superspeedway required a complex operation of cranes, conveyors, and custom-designed support equipment.*

## Clean up and repair

When a driver exceeds the margin of error during a race, quick action is required of the maintenance crew to clean up the resulting mess. Most often the crew simply tows the disabled car or cars off the track and picks up loose debris. Occasionally fuel, oil and other liquids spill onto the track during a crash, or some part of a wrecked car takes a chunk out of it. In these cases, the crew uses specialized cleaning and repair materials to return the track to race-ready condition.

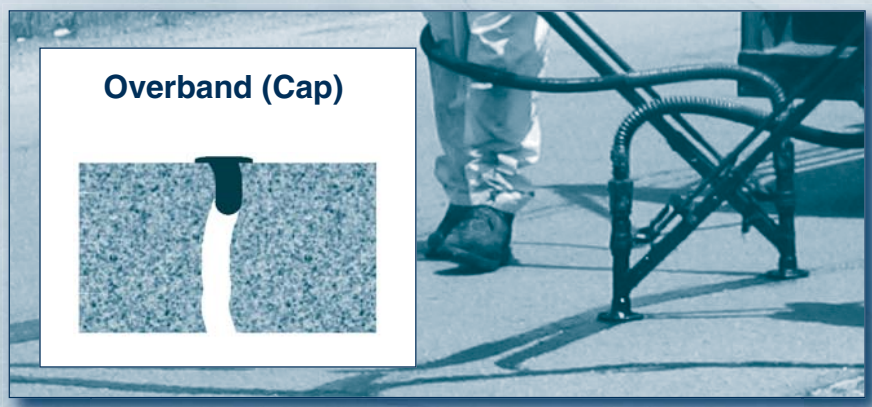
To remove liquids from the track, they spread a clay-based dry sweeping compound, let it absorb the liquid, and then sweep it off. For larger spills and to dry the track after a rain, the crew uses large truck-mounted jet dryers and leaf blowers. "Any kind of moisture on the track is dangerous," Salenbien said.

For emergency track repairs, the maintenance crew uses a two-part epoxy patch kit developed by Harrington specifically for use during races. The kit uses the same blast furnace slag that is used in the pavement. The slag is combined with epoxy resin to make one part of the repair kit. The other part is the hardener. "During a race, it's not practical to use hot-mix asphalt for repairs – it takes too long," Harrington explained. "Using the epoxy patch kit, the maintenance crew can combine the parts, place the patch, and have the track ready to race by the end of a typical caution." Each 10-pound kit will cover up to one square foot, two inches thick and costs $65.

## Crack Sealing: Race Track vs. Public Road


### Michigan International Speedway

1. Route the crack to establish clean, straight edges and a reservoir to hold the sealant.
2. Scrub the reservoir with a wire brush to clean it.
3. Sand blast the reservoir so sealant will adhere properly.
4. Air blast the crack and reservoir to remove sand and other loose material
5. Apply hot sealer in the crack and the reservoir, being careful not to get any of it on the pavement surface.




### Most Public Roads in Michigan

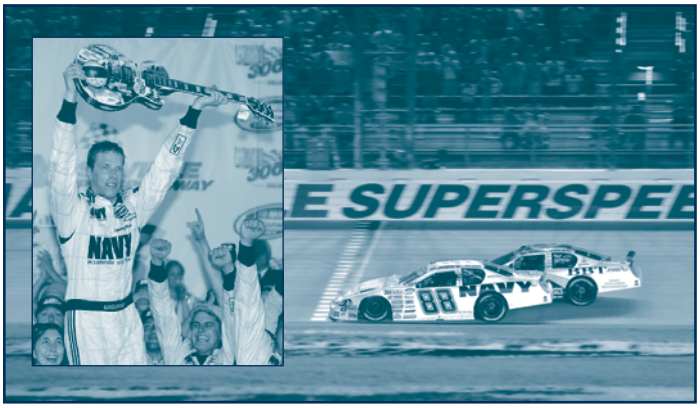
1. Airblast the crack to remove sand and other loose material
2. Fill the crack to overflowing with hot sealer, flattening the overflow so it adheres to the pavement surface on boths sides of the crack.

*Sealing cracks on the Michigan International Speedway is significantly more labor expensive and expensive than on most public roads.*

After each race the maintenance team washes the track with a laundry-detergent based solution. "The detergent is mild enough that it doesn't react with the SBS polymer, but strong enough to remove the greasy build-up the race cars leave," Salenbien explained.

### Pavement makes it possible

Brad Keselowski, who drives the #88 U.S. Navy Chevrolet for JR Motorsports in the NASCAR Nationwide Series, grew up within a couple of hours of MIS in Rochester Hills. He just missed a top ten finish in the CARFAX 250 there on August 16.




(Photos courtesy of JR Motorsports)

*Brad Keselowski celebrated is first win in the NASCAR Nationwide Series at the Federated Auto Parts 300 in Nashville in June.*

"MIS is one of the bigger tracks we race on," Keselowski said. "The track is so fast, you never seem to slow down, and it's wide so there's plenty of room out there."

Looking beyond the fact that he drives a vehicle that many of us wouldn't even be able to climb into, and that he moves about 150 miles an hour faster than the rest of us, and that the pavement he's driving on is designed and maintained at a cost greater than the annual maintenance budget of many county road commissions in Michigan, Keselowski is like most of the motoring public: he knows what to expect of the pavement. "The track surface is comparable to most of the tracks we race on," he said. "Every track has its own bumps and quirks but my team does a great job of making all the necessary adjustments to my car to make sure I get around the track as smoothly as possible."

150,000 screaming fans. Smells of burned rubber, spent racing fuel, grilling meat, and maybe a little beer. Several hours of loud, full-throttle racing action. It's all made possible by the few square inches of pavement under each tire. Gentlemen, start your engines; it's showtime.

**On the Web:**

Michigan International Speedway
*www.mispeedway.com*

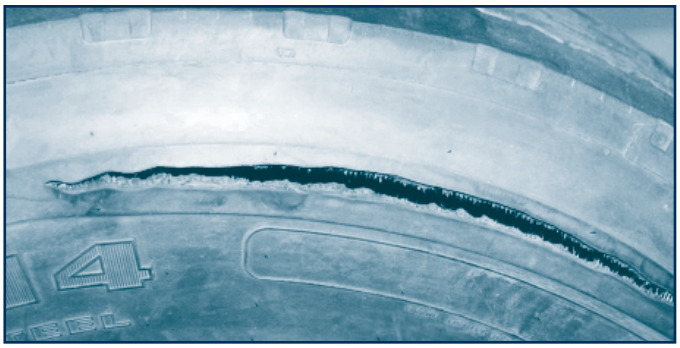
For a direct link to this resource and more, go to:
**www.MichiganLTAP.org/Bridge**

# Ten tips for tire life and worker safety

Adapted with permission from an article in the Spring 2005 issue of *Crossroads*, Wisconsin LTAP's newsletter.

Tires are tougher than ever these days, so it's easy to forget about them. Remembering a few basics can save you money, and may keep you safer, according to Larry Lampe, a trainer for Pomp's Tire Service in Green Bay, WI. "There's a direct relationship between proper air pressure and tire life," said Lampe. "It's the most basic and the most overlooked factor." Lampe offers the following tips to maximize the life of your tires and to ensure the safety of the people working on them.

1. **Under-inflation costs money.** Operating on soft tires means they wear faster and the truck burns more fuel. Running tires at 20% under recommended pressure at normal speeds, you'll cut tire life by 16% and increase fuel use by 2%.
2. **Explosion is possible.** Any radial tire that has been driven at less than 80% of its recommended pressure has the potential to "zipper rupture" when it's re-inflated. A zipper rupture is when the side of a radial tire explodes during inflation. You can learn to recognize hazardous tires and how to re-inflate them safely from videos or in training programs provided by tire suppliers.



*A zipper rupture is a tear in the mid sidewall of a steel cord radial tire . The resulting blast of air can cause serious injury or death to anyone nearby.*

3. **Expect tires to lose air.** Rubber tires are porous; they lose air continuously. A truck tire is expected to lose up to two pounds a month according to industry standards. In addition, air can leak through valve caps or small punctures.
4. **Consider the temperature outside.** A tire will gain or lose a pound of pressure with every 10 degree difference in outdoor temperature. "A tire with 100 psi in it in August can lose 15 psi by November or December," said Lampe. "You could be plowing snow with an under-inflated tire and it isn't due for regular preventive maintenance."
5. **Know the proper pressure.** Tires are designed to run at specific pressures based on the total load. Gather information on each truck's actual axle load, and then use standard load charts to calculate the correct tire pressure. Ask your tire supplier for help and training.
6. **Calibrate gauges monthly.** Even with regular checking, tires could be at the wrong pressure due to faulty gauges. "On average, about 15% of gauges in a facility are not properly calibrated," Lampe said. He advises that every shop invest in a master gauge (about $100) and calibrate all the gauges in the shop monthly.
7. **Check pressure every season or before use.** You should check tire pressure every season at a bare minimum; more often is better. For infrequently used or seasonal equipment — a motor grader, for example — check tire pressure before using it. To get an accurate reading, be sure the tire is cold; don't check the pressure within three hours of last using it.
8. **"Read" tires regularly.** Check for signs of wear before tires sustain serious damage. Regularly inspect side walls for cuts, cracks, blisters, or bulges, all of which could cause zippering. Measure tread depth. (It should be no less than 4⁄32 inch on the steer axle and no less than 2⁄32 inch on all others.) Run your hand over the tread and feel for abnormalities like rib edge feathering or cupping. Feathering is an early sign of misalignment or could be caused by improper pressure. Take the tire/wheel assembly off and look at the face of the tire for any type of irregular wear pattern. For example, drive tires may develop heel and toe wear.
9. **Rotate tire position for longer life.** Any rotation schedule is better than no rotation. How often it's needed depends on truck usage. "If you use it very little, you may only need to rotate tires every other year," Lampe explained.
10. **Repair correctly.** The only proper way to fix a tire is to put a patch on the inside and a plug through the injured area. Any repair from the outside will void the tire warranty, even if it is properly fixed afterwards. "25 to 40 percent of all tires repaired out there today are probably not repaired properly," says Lampe. "Besides voiding the warranty, it's a safety issue."

**On the Web:**

Tire Retread and Repair Information Bureau
*www.trib.org*

Tire Load Ratings
*www.dualport.com/bustech/load_tires.html*

For direct links to these resources and more, go to:
**www.MichiganLTAP.org/Bridge**

## A Good Road

"A good road makes it possible to reach market in all kinds of weather and at a speed before unthought of. It brings the city man into the country, and by creating a demand for property for residence purposes, greatly enhances the value of farms. A good road makes possible the hauling of loads weighing three to five tons and it reduces the wear and tear of wagons, harnesses, horses and men. In no community where roads have been built has the verdict been anything but unanimous in favor of more good roads."

*H.P. Gillette, in his book, Economics of Road Construction, published in 1901*

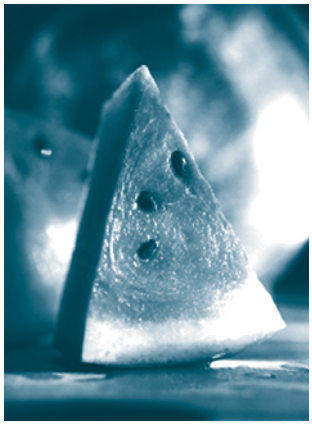
Bridging the Gap to
# Better Health

## Watermelon: 3 Juicy Benefits

by RealAge, Inc. Reprinted with permission.


A cool wedge of watermelon on a hot summer day? Refreshing, for sure. But watermelon is more than just a seasonal treat. Here are three great health reasons to dig into this juicy fruit:

1. **It's loaded with lycopene**. Watermelon juice actually gave tomato juice a run for the money in a recent study of lycopene levels. That's good news for your body, because early research suggests that lycopene may be a cancer crusher.



2. **It can make your skin pretty**. Watermelon is loaded with a key compound credited with helping skin's healing and regenerative processes. Say no more – bring on the melon!
3. **It's practically calorie-free**. With fewer than 50 calories in every cup, watermelon is one smart way to satisfy a sweet tooth. And with a whopping 141 grams of water per cubed cup, watermelon will keep you hydrated, too.

### Room temperature is best

Ice-cold watermelon on a steamy summer day really hits the spot. But you'll be best served by keeping it on your countertop until cutting time.

Whole watermelons stored at room temperature deliver more cell-protecting antioxidants (specifically lycopene and beta carotene) than refrigerated or freshly picked melons. Here's why:

### A chilling effect

After it's picked, watermelon continues to ripen and build up antioxidants. Cold temperatures appear to cut this process short. So leave your watermelon out, as long as you haven't sliced it. After it's cut, it should be stored in the refrigerator for food-safety reasons.

RealAge®
www.RealAge.com



# Resources

## Web

### Rural Highway Safety Clearinghouse

www.ruralsafety.umn.edu/clearinghouse

The clearinghouse reports on the various activities conducted by the U.S. Department of Transportation (USDOT) and other federal, state, and local partners to improve rural safety. In addition to supporting the USDOT Rural Safety Initiative and facilitating new rural safety partnerships and collaborations, the site collects and markets best practices as well as the latest findings in rural safety research.

### National Workzone Safety Information Clearinghouse

http://wzsafety.tamu.edu

This clearinghouse provides transportation agencies, highway engineers and contractors, and other transportation stakeholders with a wealth of information on how to make road construction zones safer for motorists, pedestrians and highway workers. It has the world's largest online library of free information on a variety of workzone safety topics.

## Presentations and Workshops

### Project Showcase: Alternate Project Delivery and Accelerated Bridge Construction

September 5-6, 2008 – Cottage Grove, Oregon

This showcase will provide an overview of a bridge replacement project that involves five major structures along Oregon's Umpqua River Highway, near Eugene, OR. For more information and to register, please visit **www.utahltap.org**, click **Register for Classes**, and then click **Highways for LIFE Project Showcase**.

### Product Demonstration Showcase: Winter Maintenance Decision Support System

September 17, 2008 – Boise, ID

This showcase will feature MDSS, which exceeds current capabilities by providing roadway treatment recommendations based on state-of-the-art techniques in weather prediction, and in-house maintenance rules of practice. For more information and to register, please visit **www.utahltap.org**, click **Register for Classes**, and then click **PDS Maintenance Decision Support System - Boise, ID**.

### Product Demonstration Showcase: Performance Contracting for Construction (PCfC)

September 30, 2008 – Clare, MI

This showcase will highlight the innovative performance-based contract used in the M115 roadway construction project in Michigan. Other innovative techniques used for maintenance of traffic, mobility, and under-drain will also be featured. For more information and to register, please visit **www.pdshowcase.org**, click **Upcoming**, and then click **Highways for LIFE: M-115 Performance Contracting for Construction**.

Remember to check

www.MichiganLTAP.org

for the latest workshops and training opportunities in Michigan.

# New report provides clearer understanding of how local agencies use road data and information

**Meaningful Use of Local Roads Data and Information**

- Pavement management systems used by local agencies in the U.S.
- How the management system data is being used by agencies in IL, IN, IA, MI, MN, OH and WI.
- Identification of training available in the upper midwest.
- Validation of pavement deterioration curve models used in RoadSoft®.

**www.mrutc.org/research/0605**

In the United States, more than 38,000 local road agencies are challenged with implementing road management systems. Local agencies in Wisconsin and Michigan have overcome some of the organizational and financial hurdles that stand in the way of implementation. Starting in December 2005, the Midwest Regional University Transportation Center (MRUTC) with support from the Michigan Tech Transportation Institute (MTTI) and the Michigan Transportation Asset Management Council (TAMC) began to examine the practices of local agencies in Michigan and Wisconsin in order to gain a better understanding of the current use of management systems by local road agencies.

With the cooperation of hundreds of street and highway department personnel at counties, cities, villages and towns throughout the upper Midwest, the project was completed by September 2007. A full report of the findings was published in March 2008.

The report is available on the MRUTC web site at: www.mrutc.org/research/0605.

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