

CROSSROADS



WISCONSIN TRANSPORTATION INFORMATION CENTER – LTAP at the University of Wisconsin–Madison

Road weight study provides answers



The road weight study measured the seasonal effect of vehicle loads among other factors. Rutting failure on the 3.5-inch thick asphalt section above occurred during a spring test period when temperatures were hot and the pavement base and subgrade close to fully saturated.

"It's the only study of its kind that invited public agencies, industry and the companies that run the equipment to ask the same questions: What can we do to minimize damage now and what innovations are on the horizon?"

OFFICIALS WHO MANAGE local roads in rural areas recognize the impact large farm equipment can have on asphalt pavements and aggregate shoulders. As farms and the vehicles that carry their loads get bigger, the risk of damage to town roads is greater.

Now road officials know for a fact that heavy agricultural loads can do more harm to pavements than an 80,000-pound semi-truck. That finding comes from a report released last year on a pavement performance study conducted at MnROAD, the Minnesota research facility.

The study provides local and state transportation agencies with information about how heavy farm vehicles put stresses and strains on the roads they travel. It also recommends actions local governments and the agricultural industry can take to minimize damage.

Unique collaboration

Proponents say this newest study on road weight, titled *Effects of Implements of Husbandry (Farm Equipment) on Pavement Performance*, provides more useful data than previous research.

Kevin Erb, Conservation Professional Development Specialist in the Green Bay office of the University of Wisconsin-Extension (UWEX), works with agricultural businesses that haul manure and other farm materials. He calls the three-year study unique because it looked at the problem of heavy loads from many perspectives. "It's the only study of its kind that invited public agencies, industry and the companies that run the equipment to ask the same questions: *What can we do to minimize damage now and what innovations are on the horizon?*"

Study sponsors include state transportation departments in Minnesota, Wisconsin, Illinois and Iowa, equipment manufacturers, and industry partners representing agricultural trade associations from the Midwest.

Erb now includes study findings in his training programs and presentations. He highlights actions local governments, custom manure and forage haulers, and farmers can take to protect local roads. Along with other UWEX outreach professionals across the state, Erb also helps haulers and local road officials on joint efforts to implement road-saving alternatives like temporary one-way road patterns that allow heavy vehicles to travel in the middle of the road away from the weakest part of the pavement.

Farm loop

The study involved running selected farm equipment on different test sections at MnROAD, including two flexible pavement sections built at the Minnesota Department of Transportation (MnDOT) test track specifically for the study. One section had an asphalt pavement thickness of 3.5 inches on an 8-inch gravel base. The other had 5.5 inches on a 9-inch gravel base. The test sections replicate asphalt pavements found on some of the region's newer low-volume rural county roads. Local road officials will recognize that these test sections are thicker than many of their town roads.



This tandem-axle semi truck with dual tires is one of two control vehicles the study researchers used to compare the impact on pavement performance of a fully loaded semi to that of the farm vehicles tested. Results showed the agricultural equipment consistently did more damage than the 18-wheelers.

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Temporary one-way routes protect roads

Setting up the one-way route required cooperation among groups that rarely coordinate their activities.

ALLOWING HEAVY FARM equipment to travel in the middle of a roadway can reduce stress on the pavement. The Town of Russell in Sheboygan County tested this idea for the first time in the spring of 2011 when town officials approved a temporary one-way route for a local farmer's manure-hauling operation.

The arrangement required cooperation among groups that rarely coordinate their activities. They did so in this case for a variety of reasons: a wish to protect town roads, to accommodate farm businesses needing to move multiple loads from storage to field in a short period of time and to promote traffic safety.

Extend life of new roads

Town Chair Herbert Dickman raised all these issues when he suggested trying the one-way option after hearing about it during a Wisconsin Towns Association meeting. Since only limited funds are available for repairing or rebuilding local roads, Dickman says any reasonable strategy that prevents damage or early deterioration to the pavement was worth considering.

A major incentive for exploring this approach with local farmers and haulers was getting more expected life out of newer roads. Dickman explains that after the town did a road reconstruction a few years ago, the new pavement suffered minor damage right away from a heavy load. There also was so much damage to the gravel shoulder, they must replace it this summer. Dickman says permitting large agricultural equipment to drive one way down the center of the road for a specified period during the day or for a day or two in spring and fall does protect the shoulder and the weaker road edge.

Public-private cooperation

Setting up temporary one-way road patterns involves local governments, area farmers and the haulers they hire to move manure or feed, local law enforcement and neighboring residents. Public-private cooperation is essential to creating a plan that works for everyone.

Dave Eisentraut, owner of Eisentraut AG based in southwest Sheboygan County, worked with Russell and other area towns last year to implement several one-way operations for his customers. He is President of the Professional Nutrient Applicators Association of Wisconsin, a group that participated in the three-year MnROAD study of how heavy farm equipment affects pavement performance. *See related story on page 1.* Eisentraut has followed results of the study closely.

"A lot of what the data showed was not a surprise because haulers like me are out there, running equipment, sharing the roads. We see what goes on." Eisentraut notes that manure haulers tend to get "singled out" because

they transport large quantities of material over the roads in a concentrated few days. "But we are not the only ag equipment putting pressure on the roads and some operations, like milk trucks, run year round."

Eisentraut says many members of the Nutrient Applicators Association recognize there are heavy vehicles out there doing more damage than necessary, which makes enforcing weight limits necessary. He suggests more haulers retrofit their equipment to mitigate problems. Past experience dealing with road weight issues induced Eisentraut to add axles to his own equipment. It is an expensive proposition that can increase hauling costs but one Eisentraut says eliminated much of the damage his tankers caused to pavements.

Temporary one ways are a measure he and others consider a useful option as long as those involved agree on common goals. The Town of Russell's response last year to the immediate road-weight issues focused on measures that were necessary to get the work done while protecting the roads. Eisentraut praises the cooperation demonstrated in Sheboygan County and says he hopes the one-way solution catches on in other counties.

Need for alternatives

Sheboygan County Highway Commissioner Greg Schnell works with local governments on haul-weight issues. He notes that highway departments mostly manage to provide adequate roads for all users, from cars and bicycles to horse-drawn carriages, trucks and agriculture equipment. Infrastructure dating back 40 to 70 years, however, is not built to withstand today's heaviest loads.



Eisentraut AG sometimes moves materials from farm to field by transferring loads from a tanker on the road to spreaders in the field, avoiding the need to drive a heavier vehicle on town roads.



Allowing large tractor tankers transporting agricultural materials, like the 9500-gallon MnROAD test vehicle pictured here, to use temporary one-way routes during hauling operations can protect town roads from serious damage.

"New design and construction methods have started to answer this need but they come along at a time when revenues cannot keep up with the cost of updating a road," Schnell says. "It's a real challenge."

The response in Sheboygan County and elsewhere in the state is to explore alternatives like the one-way road patterns or issuing permits for farmers to pump manure from pit to field through pipes running under the road or in ditches.

Schnell's Department assisted the Town of Russell, the County Sheriff's Department, the owner of a large dairy and Eisentraut in developing the provisional one-way route that moved manure loads between locations. Such arrangements generally allow manure haulers to travel on the strongest pavements when fully loaded and require they make the return trip on lower-quality roads.

Schnell observes it is a short-term solution most effective in areas where traffic volume is low. "Inconvenient for a few days," he says, "With cooperation by all parties, the impact of a one-way detour is minimal."

Education, enforcement

Sheboygan County Deputy Sheriff Cory Roeseler calls the Russell operation a good effort that, in his judgment, met everyone's expectations. Roeseler participated in initial discussions but says the planning was so thorough, law enforcement had minimal involvement during the operation. His department consulted with the haulers on how to set up barricades and monitored road-user compliance on the first operation with the temporary restrictions. Now the farmers and haulers run things. They ask the Town of Russell to approve the traffic restriction and then follow the established process.

County Board Member and Town Supervisor Alan Bosman is in the early stages of setting up similar agreements in the Town of Lima in south central Sheboygan County. He suggests education is essential. "To get compliance and support for these temporary detours, we need to get the whole community involved and keep them informed."

And since the farm economy is at the mercy of field conditions and weather, Bosman says it is hard to predict exactly when town authorities will enact a temporary one way. "So the more community buy-in, the better."

Deputy Roeseler also emphasizes the need to communicate a planned change in traffic flows on a road. In Russell, town officials held a town meeting on the topic and offered other chances for area residents to hear about what the town was proposing and why. "Educating all stakeholders made a difference. People understood what was going on before it happened," he says. The Sheriff's office had no complaints during the initial operation last spring or for subsequent one-ways in and around Russell.

Benefit all road users

Wisconsin local governments can deter haulers and other road users who run overweight loads with fines. But the more strategies local road officials have for extending the life of a road while supporting an area's economic interests, the better for all road users.

Findings from the pavement performance study give public officials, equipment manufacturers, tire makers, farmers and haulers valuable guidance on measures for protecting local roads. They also help neutralize an issue that can cause friction between farm businesses and local governments. As the Sheboygan County example shows, having the facts is useful when farmers make plans to expand and as towns allocate road maintenance budget dollars. ■

The more strategies local road officials have for extending the life of a road while supporting an area's economic interests, the better for all road users.

Contacts

Herbert Dickman
Town of Russell
920-894-3182
dickman@tcei.com

Dave Eisentraut
Eisentraut AG
920-980-5905
eisentrautag@frontier.com

Cory Roeseler
Sheboygan County Sheriff's Department
920-459-3111
roeseclr@co.sheboygan.wi.us

Greg Schnell
Sheboygan County Highway Department
920-459-3822
schnegfs@co.sheboygan.wi.us

Funding match for lower-cost safety improvements



Signs at busy pedestrian crossings are a safety improvement that fits the HSIP definition of lower cost and easy to implement.

HSIP emphasizes safety improvements that public agencies can implement quickly, following a formula of 90 percent federal dollars to a 10 percent state or local match.

"MANY OF THE BEST SAFETY solutions are also the most cost effective." So says Justin Shell, who directs the federally funded Highway Safety Improvement Program (HSIP) for the Wisconsin Department of Transportation. The HSIP program looks for exactly those solutions when allocating dollars to local road and street projects.

The federal program, introduced in 2005, helps fund lower-cost highway safety projects that reduce the number and severity of crashes on state and local roadways. HSIP emphasizes safety improvements that public agencies can implement quickly. It follows a formula of 90 percent federal dollars to a 10 percent state or local match.

High return on safety

WisDOT uses a focused project evaluation process to identify proposed lower-cost treatments that have a high return on improving traffic and pedestrian safety. Local governments can qualify for funds by identifying sites with safety problems, gathering the crash history at those sites, and recording other pertinent factors like the presence of traffic controls and average annual daily traffic volume.

Regional WisDOT Safety Engineers work with local road officials to evaluate proposed projects and assist with the HSIP

application. The next round of applications are due to HSIP coordinators in each region by August 15 for the 2015-2016 funding cycle.

Typical treatments

Which treatments qualify as a *best solution*? Shell says a variety of street and highway improvements fall in this category, including projects to:

- Install or modify traffic signals
- Construct roundabouts
- Straighten or remove isolated curves or hills
- Improve sight distances
- Add turn, bypass or other auxiliary lanes
- Improve safety for pedestrians, bicyclist and people with disabilities
- Add traffic calming features
- Eliminate roadside obstacles
- Install countdown pedestrian signals
- Install priority control systems for emergency vehicles at signalized intersections
- Install guardrails, barriers and crash attenuators
- Install signs, delineators, flashing warning lights (including fluorescent, yellow-green signs) at pedestrian-bicycle crossings, in school zones and other problem areas

The program funds stand-alone projects and safety treatments that are part of larger projects. Shell cites as an example a major municipal street reconstruction project that included the HSIP-funded addition of turning bays and other access modifications.

Calculate benefits gained

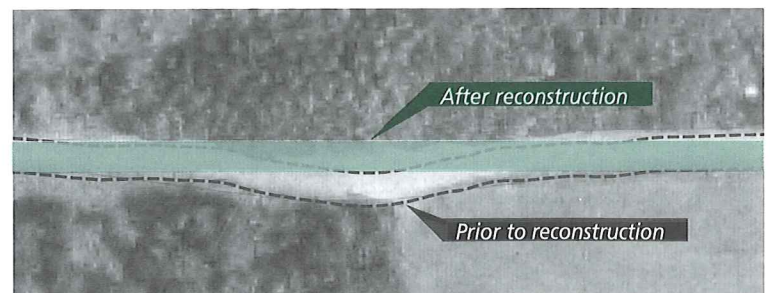
Besides requiring states to monitor the HSIP funds they allocate through project planning and implementation, the FHWA asks them to determine if funded projects achieve desired and cost-effective results. To accomplish this, WisDOT asked the University of Wisconsin Traffic Operations and Safety (TOPS) Laboratory to come up with a reliable method for judging if benefits gained from an HSIP-funded improvement are worth the cost of implementing it. Those efforts earned recognition last year as an HSIP Noteworthy Practice, "one of the best in the country" according to the FHWA.

The evaluation process combines a look at crash data from five years before and three years after the HSIP project is completed with an examination of specific roadway traits, like average daily traffic volume, to calculate expected crash frequency. Andrea Bill, traffic safety engineer and research program manager for the TOPS Lab, says this benefit-cost analysis approach reduces the risk of over-estimating the safety benefits of an improvement.

Accessing local crash data

Requesting crash data to support road improvement efforts begins online at the WisTransPortal page, where users have login access to a variety of specific crash data resources.

<http://transportal.cee.wisc.edu/>



Aerial view highlights a safety-related reconstruction project that straightened a section of the roadway on a vertical curve to improve sight distances.



Converting a signalized intersection to a roundabout helps slow traffic, reduce conflict and improve safety.

"The crash data is good but has its limitations," Bill explains. "By looking at other factors, we get a realistic picture of the true impact of an improvement and its value from an economic perspective."

Right fix, right locations

Shell calls the TOPS Lab results essential for selecting new projects. It gives WisDOT's HSIP program a consistent way of comparing the costs of a specific treatment to the expected crash reduction at a location. "Impressions of an intersection or other stretch of road as dangerous don't always tell the

whole story," he notes. "The crash data alone might support the need for more safety measures but a benefit-cost analysis helps us focus on the most effective improvements and advise public agencies which treatments to consider."

Shell says a good first step for local agencies is to discuss proposed safety projects with their regional WisDOT office. The safety engineers in these offices are knowledgeable about HSIP guidelines and can evaluate proposed projects and assist with the HSIP application.

Collecting the multi-year crash data from the WisTransPortal website (<http://transportal.cee.wisc.edu/>) and preparing a benefit-cost analysis gives local road officials facts to back up their HSIP applications. Equally important, says Shell, is how the combined data helps persuade local boards and councils to make the 10-percent match a budget priority.

Support for safety

According to Shell, FHWA and WisDOT are committed to allocating all funds in each application cycle. They recently eliminated a small local HSIP program that funded projects of \$25,000 or less as part of this effort. The scope was limited and few local governments applied so WisDOT is concentrating all efforts on the main program. HSIP generally approves individual projects at funding levels that range from less than \$100,000 to multi-million dollar budgets.

WisDOT also plans to accept additional applications for the 2015-2016 cycle in January 2013 from public agencies that cannot make the August 15 deadline. Shell says the department will award any funds that remain to qualifying proposals.

Local governments need to spend wisely in all areas of public expenditure. Their investment in street and highway safety improvements is no exception. The HSIP program's 90 percent funding match and application process provide the incentive to do a fact-based analysis of projects that will provide the greatest return. ■

The HSIP program funds both stand-alone projects and safety treatments that are part of larger projects.

Contacts

Andrea Bill
TOPS Laboratory
608-890-3425
bill@wisc.edu

Justin Shell
WisDOT
608-267-9617
justin.shell@dot.wi.gov

Resources

Link to information about Wisconsin's HSIP funding and regional coordinators.
<http://www.dot.state.wi.us/localgov/highways/hsip.htm>

Link to the WisTransPortal page for crash data search.
<http://transportal.cee.wisc.edu/>



Safety improvements like chevrons installed at curves on streets and rural roads to warn and guide drivers also qualify for HSIP matching dollars.

State tests rumble strips on two-lane roads



The FHWA reports rumble strips reduce roadway departure crashes and head-on crashes significantly and are a greater safety benefit on two-lane roads than any other roadway type.

Contact

Jerry Zogg
WisDOT
608-266-3350
jerry.zogg@dot.state.wi.us

Resources

FHWA web page about rumble strips on two-lane roads.

http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_008.htm

RUMBLE STRIPS THAT ALERT

inattentive drivers with sound and vibration to steer back into the correct travel lane are common on Wisconsin's multi-lane state and interstate highways. This summer, the Wisconsin Department of Transportation is adding the strips to a group of two-lane state roads as part of a pilot program to expand use of the safety measure in Wisconsin.

The Federal Highway Administration reports rumble strips reduce roadway departure crashes and head-on crashes significantly and are a greater safety benefit on two-lane roads than any other roadway type.

Wisconsin's effort is a response to reports of those benefits from around the country, says WisDOT Chief Roadway Standards Engineer Jerry Zogg. States with centerline rumble strips on two-lane roads saw a 44 percent reduction in fatal and injury crashes related to head-on and sideswipe crashes. Shoulder rumbles on rural two-lane roads helped reduce severe run-off-the-road crashes by 36 percent.

There is evidence that rumble strips, when present, also help drivers *feel* where the driving lane is when traveling in snow, rain or foggy conditions.

Compelling stats

Zogg calls the crash-reduction statistics "very compelling" since run-off-the-road and centerline crashes accounted for 35 to 40 percent of fatalities in Wisconsin in the last five years. "If we can achieve those kinds of reductions, this is an opportunity to save lives and prevent injuries," Zogg says.

The pilot projects will install rumble strips on four two-lane state road pavement rehabilitation projects and add them to existing two-lane state roads with five retrofit projects—one in each region of the state—for a total of more than 500 miles of centerline

strips and 54 miles of shoulder strips. Contractors will widen the paved shoulder on the pavement rehabilitation projects, Zogg says, so bicyclists can ride clear of the shoulder rumble strips.

Since WisDOT does not plan to do any widening on the retrofit projects, Zogg and his group received input from the department's bicycle/pedestrian coordinators and conferred with the Bicycle Federation of Wisconsin when selecting roads for retrofit projects to balance the needs of all road users.

Narrow the choice

Besides avoiding roads where rumble strips would interfere with a high volume of bicycle traffic, like those with trail crossings, WisDOT used other criteria to narrow the list of pilot locations for the retrofit projects.

They called on the University of Wisconsin Traffic Operations and Safety (TOPS) Laboratory to help identify two-lane roadways with high rates of run-off-the-road and head-on crashes.

Traffic Safety Engineer Andrea Bill, who is research program manager for the TOPS Lab, says

they identified "the worst of the worst" in the state as the starting point for the rumble strip pilot. "Using available data, we can see why certain crashes occur where they do," she notes. "What we found are roads where rumble strips could be a real help."

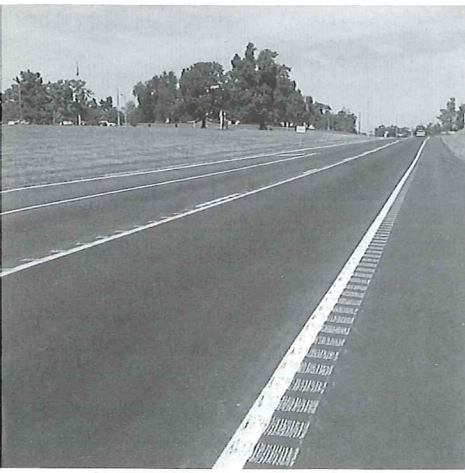
The TOPS Lab supplied maps and data on each high-crash roadway to the WisDOT regions where people who know the terrain and the traffic could apply other considerations. For example, Zogg explains, the planners looked for retrofit locations where pavements were in good enough condition to undergo the grinding process.

The volume of oversized truck traffic on certain roads influenced the choice of whether to install shoulder rumbles, which can take a portion of the 12-foot driving lane and can force wide loads to ride the strip. WisDOT will not install rumbles on designated Over Size Over Weight routes this summer, but Zogg does not rule it out in the future.

Noise was an issue since the sound tires make on rumble strips can carry. For that reason, WisDOT tried to avoid locating projects in close proximity to residential areas.



Centerline rumble strips on two lane roads, like this example from Mississippi, can reduce fatalities and injuries from head-on and sideswipe crashes by 44 percent.



Severe run-off-the-road crashes account for a significant number of fatalities on Wisconsin's rural roads each year. Shoulder rumble strips, shown above, alert drivers to pull safely back into their travel lane.

Finally, because rumble strips can spook horses pulling buggies, Zogg says they will not install them on roadways in Amish communities.

Model for safety

With the pilot underway, WisDOT will review how rumble strips might affect state design standards and issue installation guidelines for public agencies and contractors. Zogg says the department is committed to adding rumbles where appropriate on all future state improvement projects and will continue working with the TOPS Lab to monitor the impact of the safety feature on crash types and frequency. WisDOT transportation planners will use the information from this pilot to determine how to balance application of this safety measure with other initiatives.

Zogg says when they embarked on the process of deciding which two-lane state roads would benefit most from rumble strip installation, WisDOT wanted to create a model for introducing safety countermeasures on state and local roads. "Relying on good data and good collaborations, we found a mix of projects I feel will tell us much more about how this application can make these and other roads safer." ■

Road weight study provides answers from page 1

The study also measured results on two existing concrete sections.

Shongtao Dai, a MnDOT Research Operations Engineer involved in the study, says the dedicated asphalt road sections, known as the "farm loop," gave the researchers control over the tests, from construction and time-of-day traffic patterns to making detailed calculations of each vehicle tested. They installed electronic sensors in the test sections to monitor pavement responses under the test vehicles. Equipment companies participating in the study supplied farm vehicles and drivers. The tests took place in the spring and fall, times of the year when pavements often are at their weakest and the movement of farm equipment is heaviest.

Key study results

Besides confirming that a typical 5-axle, 80,000-pound semi when fully loaded produced lower subgrade stresses than all the farm equipment tested, the study

posed questions that helped prove or disprove existing assumptions held by various road users and road managers.

Dr. Dai says results showed clearly that individual axle weight is more important than gross vehicle weight when it comes to pavement damage. Increasing the number of axles along with distributing the load evenly can reduce the impact.

Asphalt thickness made a huge difference. The test section with 3.5-inch design thickness had extensive structural failure and severe rutting early in the test while the 5.5-inch section did not experience any significant break down.

The research team found that paved shoulders reduce the potential for damage and provide more support when a large vehicle rides near the edge of the driving lane. Given this and the fact that roads are strongest at their center, the study recommends operators drive heavy equipment at least 16 inches away from the

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The tests took place in the spring and fall, times of the year when pavements often are at their weakest and the movement of farm equipment is heaviest.



The road researchers used portable scales to measure the weight of all study vehicles at the start of each test period, as with this double-axle applicator. It was one of two applicators tested that produced some of the highest stresses and strains recorded.

Road weight study

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"It's critical that local governments have strategies for managing large-equipment weight issues on their roads. There are practical ideas in this study many towns should be willing to try."

pavement edge and, where the shoulder is unpaved, get permission to travel down the middle of the road. On asphalt, the 16-inch offset reduced both asphalt strain and subgrade stress by more than 75 percent.

Some counties and towns in Wisconsin began to apply that idea last year with temporary one-way routes during manure hauling operations. See *related story on page 2*. Working with local governments to implement these measures, Erb learned several of them consider the approach a success and anticipate getting four or five more years of service out of their pavements as a result.

One assumption discounted by the study was that wider (flotation) tires decrease pavement damage. Installed on manure tankers and other equipment to reduce soil compaction in the field, the oversized tires tested actually produced contact pressure on road pavements similar to regular truck tires.

Towns' perspective

Rick Stadelman of the Wisconsin Towns Association says the farm equipment study is validating discussions the Association has

had with its members for some time about the tendency of newer, heavier agricultural vehicles to accelerate the deterioration of asphalt pavements. Study data on tire type and weight per axle correspond with what local road officials are seeing in their jurisdictions.

"For many reasons, seasonal hauling of agricultural materials is more intense than in the past," Stadelman says. "It's critical that local governments have strategies for managing large equipment weight issues. There are practical ideas in this study many towns should be willing to try." Towns are already initiating discussions with local farmers and haulers, he adds, implementing seasonal or special weight limits, developing an approval process for temporary traffic patterns and taking other actions.

More attention to local weight limits raises the issue of consistency. Stadelman says the Association encourages towns to prevent confusion by coordinating their rules with other local governments and avoid acrimony by treating all large loads — farm and forest — the same.

Other measures

Other measures are in use or under discussion by parties concerned with the issue of heavy ag equipment harming local roads. Some haulers are modifying the equipment they use to transfer large quantities of material from farm to field, especially as they learn more about the impact of the heavier equipment on the roads.

Farmers and towns are working together to install wider driveways with longer culverts that give large hauling vehicles more room to turn, minimizing their impact on pavement edge and shoulder. Erb says significant damage can occur as vehicles speed up and slow down so this modification helps. Another method the industry is adopting to avoid turns and keep from tracking mud onto the roads is to transfer loads in the field from semi-tankers to spreaders rather than transport a loaded spreader.

A method that circumvents town roads completely involves pumping the manure through pipes or flexible hoses threaded along ditches or running underneath roads. Some towns and counties in Wisconsin are starting to install dedicated under-pavement pipes or culverts to facilitate this type of transport.



Testers compared farm vehicles like this single-axle grain cart, loaded and empty, to measure pavement deflection and other results. The study found that individual axle weight mattered more than gross vehicle weight in causing pavement failure, suggesting the more axles, the better.

Building roads that can carry the heaviest loads without early failure is a long-term solution local governments need to consider, according to Stadelman. Recognizing the pressure on many towns to rebuild stronger to meet heavier agricultural and logging loads, he says the legislature allocated an additional \$10 million for the Town Road Improvement-Discretionary Funds in the last state budget specifically for improvements on roads damaged by or inadequate for heavy or high-volume traffic. The state awarded the funds in early April for this biennium.

Drivable and safe

The role of local governments is to make sure roads are available for all users. That means building road to meet local needs and keeping them in good shape, drivable and safe. It also means acting on opportunities to protect pavement life without unduly hampering local commerce.

Erb, Stadelman and others are in agreement that the farm equipment study provides local road officials, farmers and haulers with



The study measured different load levels over five days of testing on the flexible pavement sections in each of the spring and fall test periods. Experienced drivers drove tankers like this one, empty and with loads at 25, 50, 80 and 100 percent capacity.

reasonable, fact-based recommendations for protecting those roads. Dr. Dai describes the project as a good example of how successful cooperation between the public and private sectors can accomplish something that benefits both.

"These groups came together to support this research because they knew it mattered," agrees Erb, who is doing his part through UWEX to educate town officials and farm businesses. "As many of them start to put the study findings into practice, that cooperation tied to a shared interest is evident."

Readers can download a copy of the complete roadway research report, titled *Effects of Implements of Husbandry (Farm Equipment) on Pavement Performance*, from the UW Cooperative Extension website, <http://fyi.uwex.edu/wi/manuremgmt/resources/road-study/>. ■

Contacts

Shongtao Dai
Minnesota Department of Transportation
651-366-5407
Shongtao.Dai@dot.state.mn.us

Kevin Erb
UWEX Green Bay
920-391-4652
kevin.erb@ces.uwex.edu

Rick Stadelman
Wisconsin Towns Association
715-526-3157
wttowns1@frontiernet.net

Resources

MnROAD test-track website:
An overview of farm equipment study and links to study details and related material.

<http://www.dot.state.mn.us/mnroad/projects/Implements%20of%20Husbandry/Index.html>

Cooperative Extension manure management site:
Links to various December 2011 presentations about the road-weight study and an electronic version of the study.
<http://fyi.uwex.edu/wimanuremgmt/resources/road-study/>

Asphalt thickness made a huge difference. The test section with 3.5-inch design thickness had extensive structural failure and severe rutting early in the test while the 5.5-inch section did not experience any significant break down.

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Crash Calendar illustrates trends

LOCAL STREET AND HIGHWAY departments interested in a deeper look at trends affecting crash type and frequency on Wisconsin roads now have access to the information in a very visual form. The *2011 Wisconsin Crash Calendar* organizes 12 months worth of crash data in a color-coded display showing the number of property damage, injury and fatal crashes for each time period. It further defines the data by factors like alcohol, deer, bicycle, motorcycle,

pedestrian, weather, rural single-vehicle, speed, work zone and young driver.

The Wisconsin Transportation Information Center (TIC) produced the calendar to give the Wisconsin Bureau of Transportation Safety (BOTS) another way to examine and evaluate highway safety problem areas. TIC plans to create county-specific calendars in 2012.

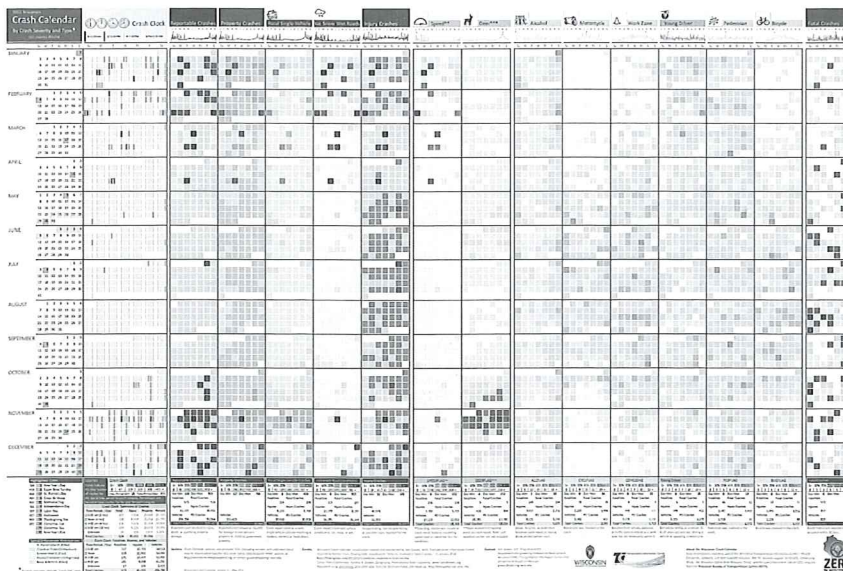
Joni Graves, Program Director for TIC on the calendar project, says BOTS uses hard copies of

the calendar at meetings around the state with various groups to generate discussions about what causes crashes and how to interpret what the data shows. Regional Program Managers use the calendar at Traffic Safety Commission meetings to communicate about safety issues.

Among trends Graves notes as emerging or confirmed by the calendar's data visualization are the fact that alcohol crashes tend to occur on weekends, deer crashes are a problem in November and all but fatal crashes tend to correlate with poor weather. She says the calendar also shows there is a drop in speed-related crashes in summer, something BOTS associates not with the fact that speeding is less of a problem in summer but with a disinclination by law enforcement to report speed as a contributing factor in good-weather months when other things, like alcohol, might play a role.

The *2011 Crash Calendar* is available for download at the Safety Data Resource Portal, <http://wisconsinsafetydataportal.org/>. BOTS also plans to distribute additional hard copies. ■

The 2011 Wisconsin Crash Calendar displays 12 months of data in a color-coded display.



New safety resources in TIC Library

The Wisconsin Transportation Information Center (TIC) recently added five new worker safety DVD programs to its Video Catalog for local governments to use in employee training. The programs range from 12 to 19 minutes long and feature topics that include

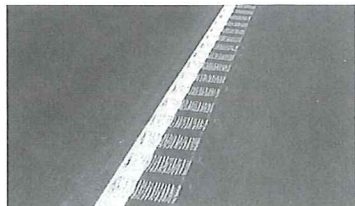
working safely with hot mix asphalt, operating commercial lawn mowers, investigating workplace accidents, safe chainsaw operation and preventing the dangers of heat stress on the job. Look for details on the new titles

in the **Resources** section of this issue and at <http://tic.engr.wisc.edu/Videos/index.lasso>. Free loan of these and other resources from the TIC Video Catalog are available through county UW-Extension offices. ■

Web Sources

Rumble strip information from FHWA sites features technical tips and answers to frequently asked questions related to shoulder and centerline rumbles.

http://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/



Pavement thickness is the subject of the website hosted by David Timm, a professor in the Department of Civil Engineering at Auburn University. Provides software applications for pavement thickness design and life cycle cost analysis for low-volume roads.

<http://www.eng.auburn.edu/users/timmdav/Software.html>

Highway Safety Improvement Program (HSIP) regional contacts from WisDOT site.

<http://www.dot.state.wi.us/localgov/highways/hsip.htm>

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Steve Pudloski, Director
pudloski@epd.engr.wisc.edu

Ben Jordan, Staff Engineer
jordan@epd.engr.wisc.edu

Joni Graves, Program Director
graves@epd.engr.wisc.edu

Katie Pawley, Program Associate
pawley@epd.engr.wisc.edu

Andrea Loeffelholz, Outreach Specialist
loeffelholz@epd.engr.wisc.edu

Mary Maher, Writer/Editor
WRITING & CREATIVE CONCEPTS

Susan Kummer, Graphic Designer
ARTIFAX, PUBLICATIONS BY DESIGN



Effects of Implements of Husbandry (Farm Equipment) on Pavement Performance study report link at University of Minnesota digital download site.

<http://conservancy.umn.edu/handle/122668>

Impacts of Overweight Implements of Husbandry on Minnesota Roads and Bridges, December 2004 report.

www.intrans.iastate.edu/reports/implements_husbandry_mn.pdf

DVD/VHS/Multimedia

Hot Mix Hazards and Safety, American General Contractors and WUMBUS Corporation, 2011, 12 minutes, DVD. Important safety tips and procedures to stay safe in hot mix hazardous work areas. Review methods for working with hazardous hot-mix material near traffic and heavy equipment. For supervisors and crews that work on paving, sealcoat, and patching.

Heat Stress: Real Accidents, Real Stories, WUMBUS Corporation, 2011, 15 minutes, DVD. Actual examples from the field help demonstrate how to deal with and prevent the medical condition called heat stress. Includes information on recognizing symptoms and acting quickly to save lives. Essential train-

ing for new workers, good review for supervisors and old hands.

The Safe Operation of Commercial Lawn Mowers, WUMBUS Corporation, 2010, 13 minutes, DVD. A review of basic safety procedures for fueling, use of guards, personal protective equipment and preventive planning. Best practices for mowing on slopes and effective equipment maintenance. Useful for both new and experienced mower operators.

WSI: Groundskeeping Safety, WUMBUS Corporation, 2011, 19 minutes, DVD. Follow the search by Workplace Safety Investigators (WSIs) for causes behind a rash of workplace accidents during field operations in a parks and recreation maintenance department. Crew leaders and supervisors learn from the approach of these professionals and their findings.

Chainsaw Safety Basics: An Expert's Perspective, American Arborist Supplies and WUMBUS Corporation, 2012, 14 minutes, DVD. Covers the basics of saw operation, routine maintenance, and typical safety problems. Includes information on preparing a work plan, using personal protective equipment, and the safe fueling and handling of a saw. Valuable training for new and experienced operators.

Print copies of listed publications available free from TIC. Download or request items at *Publications on TIC website*. Video, CDs, and DVDs loaned free at county UW-Extension offices. Also see *Video Catalog on TIC website*.

TIC website

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

Additional opportunities

from page 12

Independent Study

Enroll anytime!

Project Management 100: The Basics, Plus Important Insights #N547

<http://epd.engr.wisc.edu> or 800-462-0876.

Pesticide Applicator Training

Information available at <http://lipcm.wisc.edu/pat/>

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Wisconsin Transportation Information Center
432 N. Lake Street Rm 811
Madison, WI 53706

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

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- 1 Road weight study provides answers
- 2 One-way routes protect roads
- 4 Funding match for safety improvements
- 6 Rumble strips on two-lane roads
- 10 Crash Calendar available now
- 10 New safety resources
- 11 Resources
- 12 Calendar

“ Educating all stakeholders made a difference. People understood what was going on before it happened. ”

– page 3

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Wisconsin Transportation Information Center
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CALENDAR

TIC Workshops

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

Mitigation Banking and In-Lieu Fee Programs:
Can they really save you valuable time and money?
June 21, 1-3 pm

Learn to reduce costs, save time and satisfy mitigation requirements by having another entity fulfill your obligations. One session only at the Federal Highway Administration office in Madison.

FREE – REGISTRATION REQUIRED

Adaptive Signal Controls
August 16, 1-3 pm

Learn about improving traffic signal system performance with adaptive signal control technology that adjusts traffic light timing to changing traffic patterns. Includes national

examples and a discussion of adaptive controls in Wisconsin. One session only at the Federal Highway Administration office in Madison.

FREE – REGISTRATION REQUIRED

Winter Road Maintenance
Learn safe and effective approaches to winter maintenance. Topics include driving safety for operators, maintenance chemicals, using abrasives, plowing, liability issues, setting policies and making plans for snow-season operations. *Watch TIC website for dates in September and October.* FEE: \$60

Highway Safety
Review activities and programs for making local roads safer. Includes use of the MUTCD to ensure proper signing and pavement markings, and the SAFER Manual to develop a local road safety plan. Considers range of low-cost safety improvements

and other safety data and tools.
FEE: \$60

- NOV 8 BARNEVELD
- NOV 9 WAUKESHA
- NOV 12 TOMAH
- NOV 13 EAU CLAIRE
- NOV 14 HAYWARD
- NOV 15 TOMAHAWK
- NOV 16 GREEN BAY

On-Site Workshops
Instruction comes to you, saving time and travel costs. Schedule and tailor program to specific needs. Train more people for the same cost or less, including staff from other departments, nearby communities or vendor businesses. Contact the TIC to book programs. On-site workshops include:

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

UW-Madison Seminars

Wisconsin local government officials are eligible for a limited number of scholarships for these EPD courses held in Madison. Find out more at <http://lepd.engr.wisc.edu> or 800-462-0876.

SEPTEMBER

- 17-18 Soil Engineering for Non-Soils Engineers and Technicians N237
- 19-21 Pavement System Design: Subgrade, Materials, and Pavement Thickness N365

OCTOBER

- 2-4 Essentials of Hydraulics for Civil Engineers and Designers N164
- 10-12 Unsteady Flow Modeling Using HEC-RAS N418
- 16-18 Roundabouts: Calculating Capacity L948
- 18-19 Managing Snow and Ice Control Operations N561
- 23-24 Upgrading, Maintaining, and Repairing Parking Facilities N490
- 29-30 Introductory Principles of Engineering Project Management N249

For other opportunities, see page 11.