

CROSSROADS



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

Fine tune equipment for efficient snow season

EFFECTIVE SNOW AND ICE OPERATIONS

begin with preparing people and equipment to do the job right.

An important element of an efficient and effective winter maintenance program is using the least amount of salt necessary to restore safety and return the road surface to acceptable winter condition. Equipment calibrated to dispense the exact amount of deicing or anti-icing material needed saves money and the environment while clearing the road for safe travel.

Managers, supervisors and crew members from highway and street departments in Wisconsin can learn more at the 2013 *Winter Road Maintenance* workshops presented by the Wisconsin Transportation Information Center. Workshop instructors will discuss equipment calibration techniques and strategies for managing salt use. Go to the workshop link at <http://tic.engr.wisc.edu/Workshop> for details about the October workshops.

Important step

Fine tuning salt spreaders and spreader controls annually or more often keeps this equipment in good shape for snow events. It is a critical “best practice,” according to Mark Cornwell, a Michigan-based consultant on winter maintenance operations who presents at the TIC workshops. Cornwell has experience in winter maintenance operations and sits on the Transportation Research



Equipment calibrated to dispense the exact amount of deicing or anti-icing material needed saves money and the environment while clearing the road for safe travel.



Keeping local roads in good driving condition during snow season requires a winter maintenance program that includes carefully calibrating equipment to apply the correct amount of salt during anti-icing and deicing operations.

Board Winter Maintenance Committee and the American Public Works Association Winter Maintenance Subcommittee.

“For public road agencies looking to reduce costs and the impact of winter maintenance on lakes and streams, the single most important step is making sure their equipment is calibrated to prevent misapplication and misuse of resources,” Cornwell says. “Along with accurate weather forecasting and treatment technologies, equipment that performs with greater accuracy can maintain levels of service while controlling costs.”

Calibrating systems

Calibration is a challenge unless equipment managers understand the specific procedures for their equipment, information that is available from manufacturers, equipment vendors or other sources. The workshops will feature a visual demonstration of doing calibrations on both a ground speed controlled system and a manual system. “We’ll compare systems and see, in particular, how difficult it is to maintain a proper application rate with the variable speeds of a manual system,” Cornwell explains.

Continues on page 4



Local agencies learned about cost-effective methods for maintaining gravel roads, important local links to the network of roads that connect communities and commerce across the state.



Sound design and regular maintenance keep gravel roads in good condition.

Gravel roads in the spotlight

GRAVEL ROADS in Wisconsin are important local links to the network of roads that connect communities and commerce across the state. Most of them fall under the jurisdiction of towns that have the job of keeping these roadways in good condition.

The Wisconsin Transportation Information Center (TIC) recently sponsored a series of workshops on gravel road maintenance where these agencies learned about cost-effective methods for maintaining their gravel roads. They discussed strategies for selecting gravel materials, shaping the road for improved ride and drainage, and reducing loss of fine material through proper compaction and dust control. Another topic on the agenda was evaluating the condition of gravel roads using the PASER pavement rating system.

This overview of information presented in the workshop sessions provides local road officials with a helpful review of best practices when it comes to gravel roads.

Good gravel, good grading

Roads surfaced in gravel account for more than 30,000 miles of Wisconsin's local roads. A practical travel surface in many areas, gravel roads serve areas with low traffic volume. The workshops explored the role factors like correct road crown, use of quality materials and ongoing maintenance play in keeping gravel roads in good condition.

Workshop instructor and engineer William Heiden brought extensive private and public sector experience in road construction and maintenance to the discussion of how to maintain gravel roads. Heiden specializes in rural roadway problems with an emphasis on dust control and soil stabilization on gravel roads. Poor maintenance of gravel roads puts a burden on tight road budgets, he notes,

suggesting that local governments can generate significant savings by regular attention to managing unpaved roads that includes planning and training.

Road characteristics

Certain characteristics influence how the roadway crown affects drainage and how a road wears over time. Heiden explains that it is important a road have enough crown to allow water to drain away from its surface and prevent the saturation that weakens road structure and produces potholes and washboards.

The quality of the surface materials that go into a gravel road affects how well it holds up to traffic and weather. Heiden says a good gravel blend is one that combines hard stone for strength and enough silt or clay to bind the surface mix together.

At the workshops, Heiden also reviewed grading techniques and the type of equipment used to spread the gravel material and shape the road. As long as crews perform regular maintenance to preserve the original correct shape of a gravel road with regrading or repairs, he observes, the roadway stays in good travel condition.

Adding water to the gravel when placing it and using the right equipment to achieve proper compaction of the gravel layer

are other important maintenance practices. Heiden recommends having a water truck and compaction equipment on hand when placing gravel or regrading existing gravel. Since many small local road departments lack such equipment, an alternative is to grade after a rainfall and use a loaded dump truck to make multiple passes across the entire surface to compact the gravel.

A good example of using water in a gravel road grading operation comes from the Town of Athelstane in Marinette County. The town fabricated a water tank to slide into the bed of a dump truck. It allows the town crew to bring water to the maintenance operation, which improves compaction of the gravel surface. The town can then do an effective job of grading gravel roads even in dry weather conditions.

Eliminate hazards

Preventing encroachments on the gravel road is another critical element Heiden says belongs to effective gravel road maintenance. Overgrown roadside weeds and grasses that crowd the roadway, or mailboxes, trees, power poles and fences placed close to the road are potential problems. Driveways graded to encroach on the road can disrupt the crown of the road. Such hazards cause



Severe rutting makes travel difficult and can require substantial repairs. Preventing this level of deterioration is important to gravel road maintenance.



Traffic and loose gravel combine to create washboarding. A good aggregate mix can help prevent a recurrence of this condition.

road users to drive in the center of the road. Over time, the wear pattern flattens the crown and reduces the road to two or three worn wheel tracks.

Another major problem is air-borne dust. Heiden discussed stabilizing the surface materials with dust suppressants like calcium chloride, magnesium chloride, and lignum sulfonates.

Keeping dust under control not only improves safety and air quality, it also helps maintain surface quality of the road and extends intervals between grading operations by preserving the fine materials in the gravel that bind the surface together.



Controlling dust and stabilizing the surface means needing to grade a gravel road less often. Stabilization also keeps gravel fines bound in the road's surface.

Necessary, useful ratings

Pavement ratings are due in December on all local roads in Wisconsin, including gravel roads. The PASER rating system gives local road officials a simple process for evaluating the condition of their gravel roads on a five-point scale.

Local agencies can use the system to visually evaluate condition details on their roads, a process that includes rating the height of the crown, observing how well ditches and culverts function and whether the thickness and quality of the gravel is adequate. The PASER Manual for gravel roads also guides raters as they document specific surface distresses or defects, including washboards, potholes and ruts.

Rating roads with PASER satisfies Wisconsin Department of Transportation requirements. It also gives local highway and public works managers useful information for planning and budgeting for maintenance operations and improvements of their gravel roads.

Practical ideas

Sound design and construction plus regular maintenance help reduce costs and keep gravel roads in good condition. Elected officials, engineers, superintendents, equipment operators and others responsible for local roads can use the resources listed here, including publications available in the TIC online library, to find practical ideas for cost-effective management of their gravel roads. ■

Keeping dust under control not only improves safety and air quality, it also helps maintain surface quality and extends intervals between grading operations.

PASER/WISLR Q&A

Answers to questions about making good use of the rating system and analysis tools. Wisconsin local governments must complete and submit pavement ratings to the Wisconsin Department of Transportation by December 15, 2013.

Q: *What rating makes a road a good candidate for fog seals and rejuvenators?*

A rating of 7 or 8 identifies pavements just starting to exhibit cracking or raveling. These spray-applied treatments can help slow the appearance of age-related distresses.

Q: *How do I use PASER to rate drainage conditions along with the pavement?*

Poor drainage is a key factor in pavement deterioration on all roads. For unimproved roads, PASER includes drainage in the rating. The system does not include drainage in condition descriptions for asphalt and concrete roads but drainage problems are a cause of some distresses that occur. Use the *Drainage Manual* available from TIC to evaluate drainage on asphalt and concrete roads.

Q: *What if two parts of one road section have different surface conditions?*

Depending on how different they are, divide the section in two and rate each separately or rate based on the condition exhibited by most of the roadway. Road agencies also can repair localized distresses and then rate the section based on overall condition after repairs are made.

Contacts

William Heiden, P.E., L.S.
970-227-9223
bill@MyDirtRoads.com

Resources

Link to download *Gravel Roads*, TIC Bulletin #5. Reviews effective design and maintenance of gravel roads.
<http://tic.engr.wisc.edu/Publications.lasso>

Gravel-PASER Manual, guide to system of evaluating condition of gravel roads.
http://lepfiles.engr.wisc.edu/pdf_web_files/tic/manuals/Gravel-PASER_02.pdf

Link to *Gravel Roads Maintenance and Design Manual* from the South Dakota Local Technical Assistance Program. Addresses maintenance and when to pave a gravel road.
<http://ntlsearch.bts.gov/repository/record/ntl/12188.html>

SAFER Manual, TIC, practical guide to evaluating roadway safety. Describes common roadway hazards, strategies for minimizing hazards, and how to prioritize safety improvements.

Fine tune equipment

from page 1

Reaping the benefit of correctly calibrated spreaders and a selection of application rates depends on delivering as much of the salt as possible on the target area.

He will discuss how to verify that material application rates for ground speed control systems done out of a moving truck match with rates recorded in a static drop test. A hands-on demonstration of calibration procedures for common trucks, controller and spreader configurations will get participants involved.

Cornwell suggests highway and public works departments establish an operations chart or other reliable tools to determine application rates under various precipitation and pavement temperature conditions. An operations chart combines effectiveness with efficiency, he says, by giving managers a method for deciding the amount of salt needed to maintain safe roads in winter at the lowest cost.

On target

Reaping the benefit of correctly calibrated spreaders and a selec-

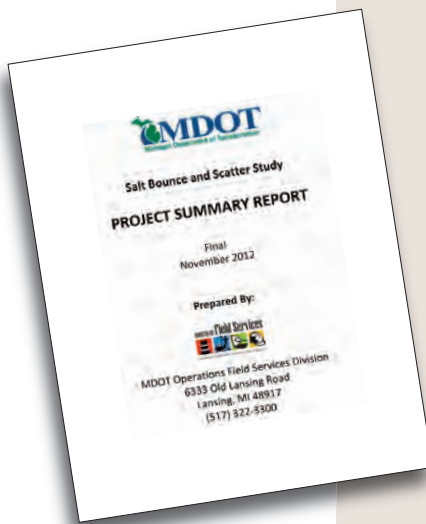


Street and highway departments can use a materials application grid like this to observe the scatter of salt delivered at various spreader and spinner speeds.

tion of application rates based on conditions depends on delivering as much of the salt as possible on the target area. If 50 percent of the material the spreader lays down goes in the ditch, Cornwell says, that salt is not doing its job.

The workshop includes a

demonstration of how salt scatters at different speeds using a grid laid out on the pavement. Presenters will share findings from a *Salt Bounce and Scatter Study* released last year by the Michigan Department of Transportation to explain the concept. *See story below.*



Keep the salt on the road

Looking to improve the effectiveness of winter spreader operations for state and local agencies, the Michigan Department of Transportation (MDOT) conducted a study last year to measure salt bounce and scatter, recording the precise amount of salt that rebounds from the target to land outside the pavement area.

Researchers experimented using three factors: vehicle speed, salt type (pre-wetted or dry) and spreader type (rear cross conveyor or Y-chute). Testing every combination, they concluded that speed was the biggest factor affecting salt bounce and scatter. Test runs at 25, 35 and 45 mph revealed that more salt stayed in the target zone at lower speeds. Seventy-eight percent of the salt hit and remained on target at 25 mph compared to 44 percent at 35 mph. Estimated salt savings were at least 25 percent. As a result of this

research, MDOT lowered spreader speeds to 25 mph for its 2012/ 2013 operations and plans to continue the practice.

Pre-wetting the salt also helped reduce bounce and scatter in the tests compared to untreated material. Delivery method had the least impact on salt loss but the conveyer system slightly outperformed the Y-chute in study tests.

While the report emphasizes that lower speeds (25 mph) produce optimal results, the final recommendations called for applying pre-wetted salt at speeds no greater than 35 mph. The study report also recommended additional testing of delivery systems and more operator training.

MDOT released its summary report on the *Salt Bounce and Scatter Study* in November 2012. It is available for download at http://www.michigan.gov/documents/mdot/Final_ReportNov2012_404228_7.pdf.

Calibrating spreaders and spreader controllers is a worthwhile investment in improving the effectiveness and efficiency of local winter maintenance operations.



Winter Road Maintenance

Dates and locations for TIC workshop on the latest strategies to improve snow and ice control.

October 8	Beloit
October 9	Fond du Lac
October 10	Manitowoc

Presenters and participants also will discuss the advantages of pre-wetting salt, review alternative application equipment and discuss other procedures that can minimize salt use while providing the desired level of service.

Control cost and minimize impact

There is significant pressure on local public works and highway departments in Wisconsin to provide a high level of snow removal service, keep maintenance

costs under control and minimize impacts on the environment. An important strategy for doing so is to improve the performance of people, equipment and materials.

TIC Program Director Ben Jordan says that calibrating spreaders and spreader controllers is a worthwhile investment in improving the effectiveness and efficiency of local winter maintenance operations.

“Even a small over-application of deicer that goes undetected through a winter season can cost an agency thousands or tens of

thousands of dollars in additional salt use,” Jordan notes. “By attending this workshop, local agencies will get the information they need to implement an effective winter maintenance equipment calibration program.” ■

Contacts

Mark Cornwell
Sustainable Salting Solutions, LLC
248-634-0820
248-895-2888 (mobile)
sustainablesaltingsolutions@gmail.com

Benjamin J. Jordan, P.E.
Transportation Information Center
608-265-4478
bjordan@wisc.edu

Resources

Link to Clear Roads report on *Calibrating Accuracy of Manual and Ground-Speed-Control Spreaders* that includes practical guidelines for plow operators.

<http://www.clearroads.org/research-projects/05-02calibration.html>

Minnesota Department of Transportation *Calibration Guide* features easy-to-use steps for calibrating winter equipment, developed by experienced calibrators.

<http://www.dot.state.mn.us/maintenance/research/files/MnDOT%20Salt%20and%20Sander%20Calibration%20Guide.pdf>

Sand and Salt Spreader Calibration, 13-minute DVD from Baystate Roads Program in Massachusetts discusses calibration procedures for salt and sand spreaders. Available from the TIC Video Library.



More salt stays in the target zone at lower speeds. A spreader traveling at 35 mph can send 50 percent or more into the ditch. At 25 mph, salt loss is down to about 22 percent.

Better ditch maintenance

Identifying and correcting road problems that are bad for the environment is the primary focus of the field guide

EFFECTIVE DRAINAGE is necessary to keep paved and unpaved roads in good condition and reduce maintenance costs. Well-constructed and maintained roadside ditches are the answer for most local roads in Wisconsin.

A recently published field guide about environmentally sensitive maintenance for dirt and gravel roads includes practical advice on ditch maintenance that is useful whether the road is paved or unpaved, adjacent to an environmentally sensitive area or not. Maintaining a ditch in good condition to slow the velocity and reduce the volume of water in the road drainage system will reduce erosion and allow the runoff to infiltrate naturally.



Correcting problems

Identifying and correcting road problems that are bad for the environment is the primary focus of the helpful field guide

produced by the Pennsylvania State University Center for Dirt and Gravel Road Studies in conjunction with the United States Forest Service. *Environmentally Sensitive Maintenance Practices for Dirt and Gravel Roads* visually communicates strategies for maintaining unpaved roads that run near streams and rivers. Besides preventing adverse effects on natural areas, the authors contend that environmentally sensitive practices keep maintenance costs in check and help roads last longer.

Chapter-by-chapter, the guide presents visuals that show common road problems and details practical solutions for correcting them.

Ditch maintenance

Chapter Four deals specifically with roadside ditches. It defines

the criteria for using this method to disperse water and discusses alternatives that restore natural-surface drainage patterns.

The chapter has information on reading the ditch, an important step in diagnosing problems and identifying the best solution. *Environmentally Sensitive Maintenance Practices* describes a process that helps local road crews assess specific conditions so they can address problems with drainage rather than the symptoms. It calls for detecting subtle changes in the landscape and road to see where to apply appropriate maintenance practices. To *read the ditch*, a worker would:

- walk downhill along ditch to document frequency of outlets
- look for signs of erosion or downcutting
- record signs of debris and scour from runoff events
- estimate ditch stability and how long before it needs additional outlets
- check for locations above erosion point to create new outlet if needed
- document condition of ditch and outlets
- identify any water from offsite sources that increase the existing volume flowing through the ditch

Other topics include raising the road profile and berm removal. This "secondary ditch," caused by improper grading of unpaved roads or washout of shoulder materials along a paved road, can lead to erosion and road-edge deterioration.

A further discussion of ditch maintenance techniques illustrates options that improve how systems

Reading the ditch lets local road crews assess specific conditions so they can address problems with drainage rather than the symptoms.

collect and disperse surface water and high groundwater from springs or seeps.

Evaluate outlets

The field guide also discusses how to evaluate cross-drain culverts and ditch outlets to spot problems with erosion. Photos and illustrations compare solutions to show which are ecologically friendly and low maintenance. One example contrasts the benefits of a shallow cross-pipe approach that positions the outlet at ground level and avoids the need for extensive excavation versus traditional deep culvert construction that concentrates runoff and cause more pollution. Other strategies covered in the section on outlets are through-the-bank pipes placed in the downslope that drain water away from the road and the use of headwall and endwalls.

Local governments in Wisconsin that plan to modify roadside ditches and culverts should contact their Department of Natural Resources Transportation Liaison early in the planning stages to determine if they need a permit.

They also can discuss with DNR staff members how the project will protect both the road and the natural creeks, streams and lakes where the road ditches empty. Go to the link under *Resources* on this page for liaison contact information.

Reduce need for repairs

One point made in the Forest Service publication is that well-designed roads are less costly to maintain and have minimal impact on natural resources. Conclusive research by the Wisconsin DNR and other experts shows that the fine soil particles from erosion that occurs on construction sites, unpaved roads and improperly maintained road drainage systems will degrade nearby tributaries and natural bodies of water over time. Good ditch and culvert maintenance reduces the need for repairs to the drainage system and to the road. ■

Resources

<http://www.fs.fed.us/eng/pubs/pdf/11771802.pdf>

Link to downloadable copy of US Forest Service publication on environmentally sensitive maintenance practices for dirt and gravel roads.

<http://dnr.wi.gov/topic/sectors/transportation.html>

Wisconsin Department of Natural Resources page describes the Transportation Liaison program and has links to a list of contact numbers for representatives around the state.

RESOURCES

Publications

Gravel Roads, TIC Bulletin #5, 4 pp. Reviews effective design and maintenance of gravel roads. Describes gravel types and special grading techniques.

Gravel-PASER Manual, Pavement Surface Evaluation and Rating, 2002, 20 pp. Guide to system of evaluating condition of roads and developing plans for improvements and ongoing maintenance.

PASER Manual Series. Additional books in the series of Pavement Surface Evaluation and Rating manuals that provide help with road ratings process include:

- Asphalt-PASER Manual, 39 pp., 2002
- Brick and Block-PASER Manual, 8 pp., 2001
- Concrete-PASER Manual, 48 pp., 2002
- Sealcoat-PASER Manual, 16 pp., 2000
- Unimproved Roads-PASER Manual, 12 pp., 2001

CROSSROADS provides road and bridge information for local officials. Published quarterly by the Wisconsin Transportation Information Center (TIC) at the University of Wisconsin–Madison, it is part of the nationwide Local Technical Assistance Program (LTAP). TIC is operated by the University of Wisconsin–Madison and sponsored by the Wisconsin Department of Transportation and the Federal Highway Administration. Please contact us for permission to reproduce articles or graphics.

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 Lennon, Program Associate
lennon@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

DVD/Video/Multimedia

Sand and Salt Spreader Calibration, Baystate Roads Program, Massachusetts Local Technical Assistance Program, 2006, #18928, DVD, 13 min. Discusses calibration procedures and how to calculate proper calibration.

Gravel Road Maintenance: Meeting the Challenge, University of Minnesota for Transportation Studies, Minnesota Local Technical Assistance Program, 2005, #18802, CD/DVD, unlimited minutes. Explore correct roadway shape, good surface gravel and dust control. Includes instructor guide and FHWA *Gravel Roads Maintenance and Design Manual*.

Forest Roads and the Environment Series, USDA Forest Service, 2006, #18828, DVD, 116 min. total. Six-part program with information on rural gravel and dirt road maintenance. Federal forest examples relate well to all rural low-volume roads. Also available as individual segments.

Anti-icing/RWIS Training, American Association of State Highway and Transportation Officials, 2003, #18790, self-paced CD. Learn about the use of anti-icing liquids. Covers topics from weather forecasting to application of anti-icing chemicals.

A Snowplow Operator's Guide to Snow and Ice Equipment, Idaho Technology Transfer Center, 2006, #18172–#18995, self-paced DVD. Train on plowing techniques and preparation and operation of equipment. Combines short video segments with interactive tests.

Chip Seals, Cold In-place Recycling, Dust Control, Full Depth Reclamation, Hot In-Place Recycling, Pavement Preservation, Thin Overlays, Savemyroad.com/Ergon Asphalt and Emulsions, 2012, #19145, DVD. Educational series with eight segments that discuss various asphalt maintenance treatments.

Web Sources

Gravel Roads Maintenance and Design Manual from the South Dakota Local Technical Assistance Program addresses gravel road maintenance and when to pave a gravel road.

<http://ntlsearch.bts.gov/repository/record/ntl/12188.html>

Environmentally Sensitive Maintenance Practices for Dirt and Gravel Roads features recommendations and examples from the US Forest Service.

<http://www.fs.fed.us/eng/pubs/pdf/11771802.pdf>

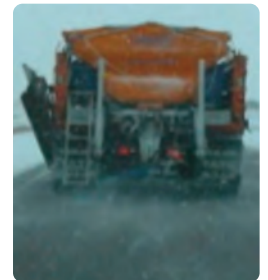
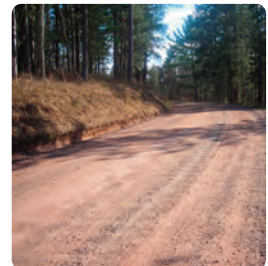
Salt Bounce and Scatter Study Michigan Department of Transportation summary of study measuring how to achieve effective salt spreading operations.

http://www.michigan.gov/documents/mdot/Final_Report_Nov2012_404228_7.pdf

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>



FEEDBACK

CONTACT US VIA EMAIL, PHONE, FAX OR MAIL ►

NAME _____ TITLE/AGENCY _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

PHONE _____ FAX _____ EMAIL _____

Mailing list change/addition Information/resource request Idea/comment Email delivery only

EMAIL tic@epd.engr.wisc.edu

TEL 800.442.4615

FAX 608.263.3160

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

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

CROSSROADS

Wisconsin TIC
UW–Madison

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

SUMMER/
FALL

2013

7



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

- 1 Fine tune snow season equipment
- 2 Spotlight on gravel roads
- 3 PASER/WISLR Q&A
- 4 Keep salt on the road
- 6 Better ditch maintenance
- 7 Resources
- 8 Calendar

“ Even a small over-application of deicer that goes undetected through a winter season can cost an agency thousands or tens of thousands of dollars in additional salt use. ”

– page 5

CROSSROADS



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

PRSRT-STD
 U.S. Postage
 PAID
 Madison, WI
 Permit No. 658

CALENDAR

TIC workshops

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

Winter Road Maintenance: Equipment Calibration

Review proper calibration of salt/sand spreaders, fine tuning of equipment and controllers to reduce cost and environmental impact of salt. Hands-on field demonstrations. Fee: \$80

- OCT 8 BELOIT
- OCT 9 FOND DU LAC
- OCT 10 MANITOWOC

Highway Safety Review rules for sign installation and pavement marking. Identify maintenance measures and sign materials to improve safety. Learn to use crash data. Fee: \$80

- NOV 18 GREEN BAY
- NOV 19 WESTON
- NOV 20 EAU CLAIRE
- NOV 21 WISCONSIN DELLS

Public Works Supervisory Certificate Programs

Courses also available individually. Fee per course: \$155. More information at: <http://tic.engr.wisc.edu/Certificates>

Nuts and Bolts of Personnel Management Recruitment, hiring and evaluation strategies in the public personnel system.

OCT 23 FOND DU LAC

Basic Management for Supervisors Public works organizational structure, service delivery, work planning, time management.

OCT 30 FOND DU LAC

Fundamentals of Government and Ethics Local powers in public works, standards of conduct and professional ethics.

NOV 6 MADISON

Advanced Communication Skills Learn skills for presentations and one-on-one situations, effective meetings and good media relations.

NOV 20 FOND DU LAC

Leadership Skills for Supervisors Setting goals and delegating, coaching, managing conflict.

DEC 11 MADISON

On-Site Workshops

TIC brings specific instruction to shop or office. Train more people for the same cost or less. Contact TIC to schedule. Choose from these topic areas:

- 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. Go to <http://epd.engr.wisc.edu> or 800-462-0876 for details.

OCTOBER

- 21-22 Managing Snow and Ice Control Operations P349
- 21-23 Essentials of Hydraulics for Civil and Environmental Professionals P372
- 24-25 Coaching and Mentoring for Technical Leaders P128

NOVEMBER

- 6-8 Effectively Managing Technical Teams N837
- 12-13 Soil Engineering for Non-Soils Engineers and Technicians P565
- 12-13 Fleet Management – Effective Practices for Public and Private Fleets P251

DECEMBER

- 5-6 Upgrading, Maintaining, and Repairing Parking Structures N868
- 9-11 Highway Bridge Design P057

JANUARY

- 6 Fundamentals of Public Works Construction Inspection P144
- 7-8 Improving Public Works Construction Inspection Skills P698
- 9-10 Maintaining Asphalt Pavements P247

Independent Study

Project Management 100: The Basics, Plus Important Insights P218

ENROLL ANYTIME