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Iowa State University's Center for Transportation Research and Education (CTRE) is the umbrella organization for the following centers and programs:

Bridge Engineering Center
Center for Weather Impacts on Mobility and Safety
Construction Management & Technology
Iowa Local Technical Assistance Program
Iowa Statewide Urban Design and Specifications
Iowa Traffic Safety Data Service
Midwest Transportation Consortium
National Concrete Pavement Technology Center
Partnership for Geotechnical Advancement
Roadway Infrastructure Management & Operations Systems
Sustainable Transportation Systems Program
Traffic Safety and Operations

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Shop focus: Snow and ice control 101

The winter of 2008-2009 is off to a wet, white, slippery start in Iowa. To remove snow and ice from roads, local agencies use a combination of strategies: anti-icing and deicing, plowing, and abrasives.

Anti-icing and deicing

Anti-icing and deicing consist of applying chemicals to the road that lower the freezing point of water.

Anti-icing is a proactive approach in which chemicals are applied to the pavement before, or at the very beginning of, a storm. The chemicals create a barrier layer that helps prevent snow and ice from bonding to the pavement surface.

Deicing is a reactive strategy of applying chemicals to the pavement after a storm to break the bond between snow or ice and pavement.

Chemicals used for anti-icing and deicing

Salt is the most common deicing material and, in the form of brine, the most common anti-icing material used in Iowa. Salt is cost-effective and, in its dry form, can provide rapid anti-skid protection while starting the melting process.

To melt snow and/or ice, salt must be in a liquid solution. The salt dissolves into the solution, lowering the freezing point of water. For effective melting action, there must be enough salt concentrated in the solution to lower the freezing point of water to a temperature that is below the current air temperature.

Salt brine is produced by circulating water through salt to achieve a desired concentration level of brine. For anti-icing, the brine is spread on the roadway before a storm begins. However, salt brine is only effective at temperatures above 20 degrees F.



Know your options for snow and ice control.

For deicing, it has become common to pre-wet salt so that some of the salt is already in solution when applied. Wet salt has another advantage: it is less likely to bounce off the road or to be blown off by traffic, saving 20 to 30 percent in wasted salt.

Salt can be pre-wet by spraying it as it is loaded into the truck or, with truck-mounted equipment, as it leaves the spreader.

Common chemicals used for pre-wetting salt are liquid calcium chloride, magnesium chloride, and salt brine.

Liquid calcium chloride and magnesium chloride are widely used because they draw moisture from the air and release heat when they dissolve. Calcium chloride has the added advantage of melting snow/ice at lower temperatures—down to 0 degrees F in proper concentrations.

Using salt brine to pre-wet is becoming more common because of its lower cost. But remember, salt brine should only be used for pre-wetting in temperatures above 20 degrees F.

Applying salt for deicing

On two-lane pavements with low to medium traffic volumes, apply a windrow of salt in a strip along the centerline. Traffic will move salt off the centerline. The salt brine will move down the pavement cross slope and toward the shoulders, melting snow and ice across the entire road width. This application pattern wastes less salt

Strategies for snow and ice control continued on page 2

Acronyms in Technology News

AASHTO	American Association of State Highway and Transportation Officials
APWA	American Public Works Association
CTRE	Center for Transportation Research and Education (at ISU)
FHWA	Federal Highway Administration
Iowa DOT	Iowa Department of Transportation
ISU	Iowa State University
LTAP	Local Technical Assistance Program
MUTCD	Manual on Uniform Traffic Control Devices
NACE	National Association of County Engineers
TRB	Transportation Research Board



U.S. Department of Transportation
Federal Highway Administration



Iowa Department
of Transportation

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Strategies for snow and ice control continued from page 1

and quickly gives vehicles clear pavement under at least two wheels.

On multiple-lane pavements with medium to high traffic volumes, apply salt in a pattern that covers the full width of the roadway to provide melting action over the full width of the pavement.

Plowing

Snow plowing is used to clear snow and loose ice from the road during and after a storm. Plowing can be a challenge in both rural and urban areas. Operators in rural areas face challenges such as blowing and drifting snow and decreased visibility. In urban areas, operators must deal with parked cars, narrow streets, and cul-de-sacs.

To minimize dilution and waste of deicing chemicals, plow immediately before applying chemicals to the road.

For more on snow plow operations, see the safety tips on this page and the snow plow checklist on page 4.

Abrasives

Abrasives provide little to no snow- and ice-melting capability, but they are most useful in providing traction. The most popular abrasive is sand.

Many agencies in Iowa combine sand with salt as a half-and-half mixture. This mixture helps provide some traction support with some melting capability. In a winter where salt stores may be scarce, reducing the amount of salt used can be a useful strategy.

Final thoughts

Know your route

Snow plow drivers who know their routes well can navigate them more easily and avoid hazards. Review your route before the storm.

Know traffic volumes

Traffic volumes can impact the rate of chemical application since traffic can help work salt into the snow/ice and aid the melting process. Agencies can use a lower rate of application with higher traffic volumes.

Know the weather

Weather conditions can also affect the rate of application. A windy route, for example, will be more prone to rock salt blowing around.

Iowa's Roadway Weather Information System (RWIS) can assist agencies by providing road surface temperatures and atmospheric weather data.

For more information

For more information on snow and ice control strategies, contact the Iowa LTAP's local roads safety liaison Bob Sperry, 515-294-7311, rsperry@iastate.edu. ■

Safety tips for snowfighters

Check with your supervisor and follow your agency's policies and procedures.

Suggested personal safety gear

- Layers of clothes, extra gloves, heavy boots
- Shovel and ice scraper
- Flashlight for night operations
- Sunglasses for glare
- Water and/or hot liquid

Advance preparation

- Be properly trained and thoroughly familiar with all equipment and chemicals.
- Make sure an up-to-date first-aid kit, emergency contact information, and handheld radios or cell phones are available in your vehicle.
- Be in good physical condition with adequate rest.
- Perform a pre-trip safety check of truck and equipment. Make sure the vehicle has adequate warning lights in good working order.
- Make a practice run of assigned route to check for obstacles and potential problem areas.
- Know the contact procedures for reporting crashes or equipment breakdowns.

During operations

- Dress in layers with heavy boots.
- Wear highly visible apparel when out of your vehicle.
- Plow at appropriate speed.
- Watch for pedestrians and other vehicles.
- Don't back up without a spotter.
- Operate wings carefully.
- Make sure warning lights are activated.

Salt away for winter

It's hard to get salt in the middle of winter.

Just ask the dozens of Iowa agencies that scrambled to replenish their salt stores during the winter of 2007-2008, when some areas of the state received more than 70 inches of snow.

Getting enough salt isn't just a problem in severe winters. It's a problem every winter for almost every agency in the state. And the problem isn't always lack of planning—it's lack of storage space.

But the Des Moines metropolitan area just implemented a solution—a shared salt storage facility.

Planning ahead

The Salt Institute recommends that agencies have 100% of their anticipated annual salt usage on hand before the winter starts. However, even though agencies can typically estimate how much salt they will need to get them through the winter, they usually don't have the facilities to store it all.

For example, West Des Moines Public Works Director Bret Hodne says the city typically uses around 5,000 tons of salt each winter. However, its storage facility only holds 1,500 tons.

"Even if we start the winter with a full storage facility, we still have to have about 3,500 tons of salt delivered during the winter months," explains Hodne.

Finding (and paying for) salt

Agencies typically contract for their annual supply of winter salt as early as May or June, when prices are lower and contractors have plenty of time to transport the salt from the mine to the agency's storage facility.

The first shipment, considered a preseason delivery, usually arrives by November 1 and contains enough salt to fill the agency's storage building. The remainder of the contracted amount is delivered throughout the winter as the agency's inventory dwindles.

But when agencies need to replenish their salt supplies in the winter months, there is a much shorter turnaround time. Instead of

having 4–5 months in which to deliver the salt, contractors often have only 7–10 days.

Winter also brings a widespread demand for salt across the country.

"In a winter like last year, you'll see situations at the salt mine where they have trucks lined up for over a mile waiting to load salt," says Hodne.

"If you place your order and your trucks have to get in that line, it can take 18-24 hours just to get one of your trucks loaded with salt—if you can even find trucks to haul salt."

The high demand for salt and short timeframe for delivery during the winter months leads to higher prices. Agencies can pay \$5 to \$10 a ton more for salt delivered in the winter months than they paid for their preseason deliveries.

In severe winters, the amount of salt an agency contracted for to get them through the winter may not be enough, and the agency may have to purchase outside the original contract. In those cases, agencies can pay as much as 2–3 times the preseason price, or worse—they may not be able to find salt at all.

A shared solution

To stock up on salt when prices are lower, nine cities in the Des Moines metropolitan area began discussions in 2007 for a shared salt facility. With completion scheduled for December 2008, the Metropolitan Salt Storage Facility consists of two fabric-covered buildings off the I-80/35 corridor in Grimes. Together they can hold 22,000 tons of salt.

Partners include Clive, Des Moines, Grimes, Johnston, Pleasant Hill, Urbandale, Waukee, West Des Moines, and Windsor Heights. The new facility is a five-year lease-purchase 28E agreement between the nine cities and the Metro Waste Authority.



The Metropolitan Salt Storage Facility will hold 22,000 tons of salt.

Each city owns a certain percentage of the total amount, with payment based on the percentage stored. Salt-loaded trucks are weighed at a local certified scale to document each agency's inventory. Once a city has used all of its salt, it will have to bring more in or get approval to buy from one of its partners.

"With this facility, we will pay the preseason price and get all of the salt here before winter begins," says Hodne.

Sharing in other parts of Iowa?

Tom McGovern, assistant to the county engineer of Adair County, says in rural settings, the distance between agencies is too big for them to join together. Marshall County Engineer Royce Fichtner expresses similar skepticism. "The materials need to be close to where they're being used," Fichtner says.

However, Hodne says the goal of the facility "is not to work out of it during a storm, but to have salt in the area that allows the agencies to re-charge their respective salt storage buildings during off-storm periods."

"Having the salt within a reasonable distance from our shop rather than in a mine in Kansas is one of the key benefits of this project," he says.

For more information

For more information about the Metropolitan Salt Storage Facility, contact Bret Hodne, 515-222-3480, bret.hodne@wdm-ia.com. ■

Iowa LTAP Mission

To foster a safe, efficient, and environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

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Snow plow checklist

Tires and wheels

- ✓ After the truck has been inside overnight, inspect wheels for oil and/or fluid leaks.
- ✓ Look for tire damage (e.g., deep cuts or severe weather wear). Tire tread should be a minimum of 1/2 inch.
- ✓ Inflate tires to the pressure indicated on the sidewalls.
- ✓ Make sure wheel lugs are tight and check to see if they have recently slipped. A mark to the side of each wheel lug is a good indication that the wheel has spun. Some mechanics center the valve stem between two lugs, then by just looking at the stem they can tell if the wheel has spun.
- ✓ Check the axle bolts for tightness.
- ✓ Look for leaking around the wheel seals.

Hoses

- ✓ Check for oil leaks along each hose and around each fitting.
- ✓ When the box is raised for hose inspection, make sure the box stops are in place. Lower the box onto the stops before beginning inspection.
- ✓ Hydraulic hoses should not be pinched or rubbing against another surface. Make a note of these potential problem areas.

Lights

- ✓ Amber warning lights mounted above the truck cab are on when the truck is operated.
- ✓ Make sure brake lights work properly.
- ✓ Check both high and low beams of headlights, chassis headlights, and higher plow lights.
- ✓ Turning signals must work properly.
- ✓ Check clearance lights, both in front of the cab and rear corners of the dump box. (These lights help drivers see how wide your vehicle is.)

- ✓ Check spinner lights. They allow operators to see the material being spread.
- ✓ Check strobe lights, which help motorists see the truck when bad weather interferes with visibility.
- ✓ Check to see that all reflectors are in place: amber in front and red in back.

Under the hood

- ✓ Change fuel filters at the beginning of the winter season.
- ✓ Check for water in the fuel water separator and drain.
- ✓ Look for fuel leaks along the fuel lines and on the garage floor.

Engine oil

- ✓ Check the oil level.
- ✓ Check the color of the oil. A chocolate milky color could indicate antifreeze is getting into the oil.
- ✓ Smell the oil. A burned smell may indicate engine overheating.
- ✓ Look around the engine compartment for oil leaks. (Small amounts of oil in and around an engine are normal.)

Engine coolant system

- ✓ Check the radiator coolant level and add coolant if necessary.
- ✓ Check for coolant leaks around hose connections.
- ✓ Look for wet spots on the radiator and garage floor.
- ✓ Inspect the fan belts for frays and cracks and report the problem areas.
- ✓ If the truck has a manual transmission, get under the truck and remove the transmission plug. The fluid level should be level with the check or fill plug.
- ✓ If the truck is an automatic transmission, check the transmission fluid level. Add transmission fluid if necessary, but don't fill beyond the full mark.

Truck toolbox

- ✓ Check the condition of tire cables or chains. Mount them to be sure that they fit.
- ✓ Make sure the toolbox contains a hand shovel, towing chains, extra plow and wing pins, extra pin safety clips, and any tools you may need out on the road.

Truck cab

- ✓ Keep the cab clean, with no loose items like pop cans, bottles, or log chains.
- ✓ Make sure the fire extinguisher is properly mounted and fully charged.
- ✓ Make sure the following items are in the cab: ice scraper, wisk broom or snow brush for brushing snow off your lights, flashlight, well-stocked first-aid kit (with CPR mask), and emergency reflector kit.
- ✓ Check the safety belts, making sure the locks work.
- ✓ Check the two-way radio and make sure the display or power light turns on.
- ✓ Check the dash lights and gauges to make certain they are all working.
- ✓ Make sure that you have accident report forms.
- ✓ Check the windshield for serious damage. Report any problems.
- ✓ Check the wiper blades for damage or aging.

Mounting brackets

- ✓ Check all brackets to make sure they are secure and that all bolts are in place and tight.

Heating and defrosting system

- ✓ As the engine heats up, make sure all heater fan speeds are operational and that the heat produced is adequate to keep windows clear.



LTAP 25th Anniversary

The Iowa LTAP staff

Over the past year, we have celebrated Iowa LTAP's 25th anniversary with a series of articles about the history of LTAP. We've told you a little bit about how Iowa LTAP got started and what we've accomplished so far.

In this final issue celebrating our 25th anniversary, we'd like to introduce (or re-introduce) you to your Iowa LTAP staff and give you a sneak peek of what lies ahead for the Iowa LTAP.

Meet your Iowa LTAP staff!

Duane Smith has been director of Iowa's LTAP since 1993. He oversees all of the LTAP programs and is constantly working to develop new workshops and training events. Duane also works with the Iowa LTAP advisory board to ensure that the LTAP program is meeting the needs of Iowa's local agencies.

Tom McDonald joined the LTAP staff as Safety Circuit Rider in 1998. He travels across the state conducting workshops on topics such as flagger safety, sign and pavement markings, work zone safety, and more.

Bob Sperry, the newest member of the Iowa LTAP team, is your Local Roads Safety Liaison. He provides individual consultations and training in crash-data tools for Iowa's local agencies.

Jim Hogan took over as Iowa LTAP's librarian in 2000. He manages hundreds of publications—manuals, DVDs, reports, training references, etc.—through the Iowa LTAP library. If you're looking for information on a specific topic, call Jim!

Georgia Parham is Iowa LTAP's event coordinator and secretary. She manages the LTAP mailing list; organizes workshops, conferences, and special events; and handles a variety of other day-to-day tasks.

Dee Short is CTRE's receptionist. She helps Georgia with various LTAP tasks.



Meet your LTAP staff (from left to right) Georgia Parham, Dee Short, Bob Sperry, Jim Hogan, Duane Smith, and Tom McDonald.

Publications staff

In addition to the regular LTAP staff members, several members of CTRE's publications group also work with the LTAP program.

Marcia Brink has been managing editor of *Technology News* since she first came to CTRE in 1994.

Michele Regenold has been a writer and editor for *Technology News* since she started at CTRE in 1996. Michele maintains Iowa LTAP's website and acts as issue editor for *Technology News*.

Alison Weidemann joined the staff as CTRE's first full-time graphic designer in 2005. She designs the graphics and layout for *Technology News* and creates promotional materials for LTAP events.

Sabrina Shields-Cook began writing and editing articles for *Technology News* in 2008. She works closely with other LTAP staff, especially Director Duane Smith, to brainstorm article ideas.

What's coming in 2009?

Training and workshops

The Iowa Public Employees Leadership Academy (IPELA) is the big project on the horizon for Iowa's LTAP in 2009.

"We'll be working on getting a couple of new modules up and running and making the

ones we already have available online," says LTAP Director Duane Smith.

Supervisory Skills and Techniques, the first module in the IPELA, is already available online through Iowa State University's Distance Education program. The Effective Communication module has been developed and should be available online by mid-year of 2009.

Technology News

After the first of the year, look for an old favorite to return to *Technology News*. The always-popular "Tips from the Field" section will be making a comeback in 2009. Get your ideas ready and look for submission information in the next issue of *Technology News*. ■

You've heard from us, now let's hear from you!

If there's a topic you'd like to read about in *Technology News*, contact Sabrina Shields-Cook, 515-294-7124, shieldsc@iastate.edu.

For questions about workshops and training programs, contact Duane Smith, 515-294-8817, desmith@iastate.edu.

Stanley L. Ring Memorial Library: New acquisitions

Note about delivery of materials: The library now sends orders through the U.S. Postal Service. This change is resulting in important savings for LTAP, but ordered materials do not arrive as quickly. If you have an urgent need for library materials, let us know when you place your order and we will arrange faster delivery.

Three ways to order LTAP library materials

- Use the online catalog, www.ctre.iastate.edu/library/search.cfm.
- Contact Jim Hogan, library coordinator, 515-294-9481, hoganj@iastate.edu, fax 515-294-0467.
- Mail or fax the order form on the back cover of *Technology News*.

Publications

P-1729 ITS/Operations Resource Guide

This guide contains a comprehensive listing of over 500 documents, videos, websites, training courses, software tools, and points-of-contact relating to intelligent transportation systems and other innovative transportation operations strategies.

P-1730 Road Stabilizer Product Performance: Buenos Aires National Wildlife Refuge

This study documents the results of a Federal Lands Highway Technology Program roadway dust stabilization project at the Buenos Aires National Wildlife Refuge. Six dust control products were installed and monitored for two years. The results show that for this specific semiarid desert location and granular nonplastic material, the best performing product was a formulation of an organic nonpetroleum plus water-absorbing material.

P-1731 Advanced Surveying and Mapping Technologies: Systems Overview and Applications

This study assessed the applicability of Ground-Based Laser Scanning and Airborne Light Detection and Ranging to typical assignments at the Federal Lands Division of the Federal Highway Administration.

P-1732 Specification Writers' Guide for Federal Lands Highway

This document contains guidelines to help writers develop specifications for the Federal Highway Administrations' Federal

Lands Highway program. Topics include writing style, organization and format, proper terminology and phrasing, capitalization and abbreviation, and punctuation and grammar rules.

P-1733 Roundabouts: A Safer Choice

This brochure provides general information about the safety and economic advantages of roundabouts.

CD-ROMs

CR-93 Common Sense Solutions to Intersection Safety Problems.

These training materials are intended to provide more than enough material to conduct a one-day training session. The target audience is nonengineers from all backgrounds and can include elected officials, law enforcement officers, municipal workers, safety advocacy groups, and members of the general public. The materials provide (1) a basic understanding of intersection safety issues, (2) "how to" information for common safety tasks that do not require an engineer, and (3) background information on safety tasks that do not require an engineer. ■

Ten commandments for snowfighters

1. Thou shalt present thyself to thy job physically and mentally fit and properly clothed for any emergency in order to withstand the rigors of thy task.
2. Thou shalt always inspect thy lights, windshield wipers, defrosters, flares, and other safety equipment before entering thy cab.
3. Thou shalt know thy spreading and plowing routes, as well as the performance of thy spinner and the life of thy plow blade.
4. Thou shalt faithfully remain alert in order to avoid guardrails, headers, stalled cars, manhole covers, railroad tracks, and mailboxes. Otherwise thou might smite thy windshield with thy head.
5. Thou shalt contain thy temper, even though cars and trucks pass thee on both sides and tailgate thee too close for comfort. Anger only multiplies thy prospects of coming to grief by accident.
6. Thou shalt use thy radio as briefly as possible—assuming thou art fortunate enough to have one. Remember thy fellow workers may need to communicate in an emergency.
7. Thou shalt interrupt the flow of power to thy spreader before attempting to free any foreign objects or blockage if thou treasures thy fingers.
8. Thou shalt render thy truck and spreader out of gear and stoutly set thy brakes before dismounting from thy cab.
9. Thou shalt govern thy speed according to conditions, else thou might wind up with thy truck upside down.
10. Thou shalt mind thy manners on the roadway, clearly signal thy intentions, and remember that it is more blessed to give than to receive.

[Adapted from the National Local Technical Assistance Program/Salt Institute. Source: *Rural & Urban Roads*, 1980]

Conference calendar

January 2009

21	Work Zone Safety	Iowa City	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
22	Work Zone Safety	Iowa City	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
23	Work Zone Safety	Ottumwa	Tom McDonald 515-294-6384 tmcdonal@iastate.edu

February 2009

11	Work Zone Safety	Mason City	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
12	Work Zone Safety	Mason City	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
13	Work Zone Safety	Ames	Tom McDonald 515-294-6384 tmcdonal@iastate.edu

March 2009

24	Work Zone Safety	Storm Lake	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
25	Work Zone Safety	Sioux City	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
26	Work Zone Safety	Council Bluffs	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
30	Work Zone Safety	Ames	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
31	Work Zone Safety	Ames	Tom McDonald 515-294-6384 tmcdonal@iastate.edu

Interactive Highway Safety Design Model available for free download

The 2008 Public Release (Version 5.0.0) of Interactive Highway Safety Design Model (IHSDM) is now available for free downloading at www.ihsdm.org.

The existing 2007 IHSDM is a suite of software analysis tools for evaluating safety and operational effects of geometric design decisions on two-lane rural highways. It includes five evaluation modules: Policy Review, Crash Prediction, Design Consistency, Intersection Review, and Traffic Analysis.

This 2008 release includes the addition of a fully-functioning beta version of a Driver/Vehicle Module (DVM), as well as significant enhancements to reporting capabilities, the evaluation process, the graphical user interface, data handling, the Highway Editor, accessibility features, and more.

The DVM is a computational model of driver behavior that simulates the driver's perceptual, cognitive, and control processes to generate steering, braking, and acceleration inputs to the vehicle. The DVM allows users to (1) evaluate how a driver would operate a vehicle (passenger car or truck) along a roadway with a specific geometric design and (2) identify whether conditions exist that could result in loss of vehicle control (e.g., skidding or rollover).

For more information, visit <http://www.ihsdm.org>. ■

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