Winter Maintenance: During the Storm

It's snowing, and you and your team are now in action.

You've done all you can to prepare you highways, roads, and bridges for the storm, but there's no rest for the weary. Now the storm is on you and it's time to take a look at the technologies and operations you and your crews are going to employ to keep traffic moving.

Deicing

Deicing is a reactive operation in which a deicer is applied to the top of an accumulation of snow, ice, or frost that is already bonded to the pavement surface. Deicing generally costs more than anti-icing in materials, time, equipment, and environmental damage.

Removing ice that has already bonded to the pavement can be difficult, and removing it mechanically can damage equipment and roads. Generally, enough ice must be melted chemically to break the bond between the ice and the pavement, which requires larger quantities of chemical than anti-icing.

- Use an appropriate amount of salt. Most over-salting can be prevented by using calibrated, speed-synchronized spreaders and good judgment in selecting application rates and truck speed.

- It is not necessary to melt all the snow or ice on the road with salt. This is an overuse of materials. Apply just enough to loosen the bond between the road and the ice so it can be plowed off.

Figure 1 provides application rate guidelines, and here's how to use it:

1. Select the row with the appropriate pavement temperature, temperature trend, and weather conditions.

2. Select the column that has the type of material you are using.

3. Find the box where the row and columns intersect to find the application rate. These rates are not fixed values, but rather the middle of a range to be selected and adjusted by your agency according to your local conditions and experience.

4. Compare those values to the calibration chart for your truck.

5. Dial the correct setting for the rate indicated in Figure 1.

6. If you are not treating a 24-ft wide road (typical two-lane road), adjust the rate as follows: for application on a single lane, cut rates in half. For an 18-ft wide road, use 3/4 of the listed rate.

- Dilution of solution also applies to deicing. An ice control product will work until product dilution causes the freeze point of the brine to equal the pavement temperature. At this point, the material will stop melting

Cold Weather Operating Tips

- Keep batteries fully charged and warm.
- Store equipment inside heated sheds, barns, or garages when possible. When that isn't possible, park the equipment in a structure or area where it is protected from the wind. A temperature just a few degrees warmer helps make starting easier.
- Keep fuel tanks as full as possible to prevent condensation on exposed tank walls. Water from condensation can freeze and plug fuel lines between the fuel tank and engine. In extremely cold weather, fill the fuel tank when the engine will be shut off for eight or more hours.
- Diesel engines require different grades of fuel during extremely cold weather. In temperatures below 20 degrees F, use diesel fuel No. 1 (DF1) or diesel fuel No. 2 (DF2). Both fuels should have a minimum cetane rating of 45.
- A winter additive specially formulated for diesel fuel reduces the possibility of gelling and improves starting. Be sure to follow the instructions on the container.
- When working in snow, check air cleaners and air inlets periodically to maintain proper airflow to the engine compartment.
- Accessories such as radios, heaters, and other high-amperage devices put an extra strain on batteries during starting. Turn off all these devices while the starter motor is engaged.
- After starting an engine on a cold day, allow it to warm up for a few minutes before putting the machine under load. Proper engine operating temperatures ensure more efficient fuel combustion and help prevent damage to cold engine parts.

Courtesy Caterpillar Inc.

and you may experience refreeze if pavement temperatures are dropping. How long an application will last depends on five factors: 1) pavement temperature, 2) application rate, 3) precipitation, 4) beginning concentration, and 5) chemical type. These factors explain why one application rate will not fit all storm events.

Using Abrasives

Use winter sand and other abrasives when temperatures are too cold for deicing chemicals to be effective. But be aware that sand does not melt anything. It provides temporary traction, and only when it is on top. Sand also clogs sewers, ditches, and streams. As a result, avoid sand use as much as possible.

A salt/sand mix is generally not recommended. Salt reduces the effectiveness of sand, and sand reduces the effectiveness of salt. However, a salt/sand mix may be helpful in limited situations such as a long freezing rain event where the salt is washed away quickly. A 25- to 50-percent sand/salt mix has been documented as effective in increasing friction by sticking the sand to the surface, like sandpaper.

- Use abrasives in slow-moving traffic areas such as intersections and curves.
- If your purpose is melting, use salt only.
- Salt is ineffective in cold weather, so use sand or an alternative chemical.
- Sand is not cheap when you consider the handling, cleanup, and disposal costs.
- Sweep up sand frequently, after each event if feasible.

			Lbs/ two-lane mile			
Pavement Temp. (°F) and Trend (↑↓)	Weather Condition	Maintenance Actions	Salt Prewetted/ Pretreated With Salt Brine	Salt Prewetted/ Pretreated With Other Blends	Dry Salt*	Winter Sand (abrasives)
>30° ↑	Snow	Plow, treat intersections only	80	70	100*	Not recommended
	Frz. rain	Apply chemical	80 – 160	70 – 140	100 – 200*	Not recommended
30° ↓	Snow	Plow & apply chemical	80 – 160	70 – 140	100 – 200*	Not recommended
	Frz. rain	Apply chemical	150 – 200	130 – 180	180 – 240*	Not recommended
25 - 30° ↑	Snow	Plow & apply chemical	120 – 160	100 – 140	150 – 200*	Not recommended
	Frz. rain	Apply chemical	150 – 200	130 – 180	180 – 240*	Not recommended
25 - 30° ↓	Snow	Plow & apply chemical	120 – 160	100 – 140	150 – 200*	Not recommended
	Frz. rain	Apply chemical	160 – 240	140 – 210	200 – 300*	400
20 - 25° ↑	Snow or frz. rain	Plow & apply chemical	160 – 240	140 – 210	200 – 300*	400
20 - 25° ↓	Snow	Plow & apply chemical	200 – 280	175 – 250	250 – 350*	Not recommended
	Frz. rain	Apply chemical	240 – 320	210 – 280	300 – 400*	400
15 - 20° ↑	Snow	Plow & apply chemical	200 – 280	175 – 250	250 – 350*	Not recommended
	Frz. rain	Apply chemical	240 – 320	210 – 280	300 – 400*	400
15 - 20° ↓	Snow or Frz. rain	Plow & apply chemical	240 – 320	210 – 280	300 – 400*	500 for frz. rain
0 to 15° ↑↓	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	300 – 400	Not recommended	500 – 750 spot treat as needed
< 0°	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	400 – 600**	Not recommended	500 – 750 spot treat as needed

*Dry salt is not recommended. It is likely to blow off the road before it melts ice.

**A blend of 6 – 8 gal/ton $MgCl_2$ or $CaCl_2$ added to NaCl can melt ice as low as -10°.

Figure 1. Deicing Application Rate Guidelines—24 ft of pavement (typical two-lane road). These rates are not fixed values, but rather the middle of a range to be selected and adjusted by an agency according to its local conditions and experience.

Standard Practices

- Know the pavement temperatures and trends to help you use the right application at the right time. Generally, use less chemical when temperatures are rising and more when they are falling.
- Don't apply dry salt at below 20 degrees F pavement temperature. It will not melt fast enough to help and it will blow off the road into the ditch.
- Below 20 degrees F, switch to other tools like $CaCl_2$ and $MgCl_2$ at curves, hills, and intersections to obtain maximum melting. If unavailable, use sand for traction.
- Adjust your spinner speed to the lowest setting possible, except at intersections.

- Drive at the slowest possible speed—17 to 25 mph—slightly higher if prewetting.
- Don't let the traffic dictate your speed. Keep it slow to keep material on the road.
- Apply deicers in the center of the road or high side of the curve.
- Set spinners lower to the ground to reduce bounce and scatter.
- Turn off auger when stopped, even briefly.

Loading/Hauling

- Set up and load on a level surface wherever possible.
- Maintain loading area. Keep it clear and smooth.
- Don't overload. Avoid spilling on units.
- Remove loose material from the exterior of the dump body.
- Watch for co-workers/pedestrians in or near the loading area.

Effective Use of Plows

Plow to remove snow and loose ice before deicing applications. If snow accumulates before or after applications, plowing directly before your next application will minimize product dilution.

- Plow first before applying deicers to avoid dilution of the salt.
- Coordinate plowing activities to eliminate windrows at intersections and prevent plowing off another operator's material.
- Never plow or blow snow over a bridge into the water or onto traffic below.
- Remove snow from roads as quickly as possible to reduce compaction; use of underbody blades helps remove compacted or slushy snow.
- Make use of carbide plow blade edges.
- Adjust blade angle to minimize cutting efficiency or snow throwing capabilities.

Public Safety/ Operator Safety

- Perform your required CDL pre- and post-trip inspections.
- Make sure you're mentally and physically prepared to drive.
- Obey traffic laws. Use the seat belt. Clean lights and windows frequently.
- Flow with traffic as much as possible. Avoid sudden moves. Be alert to all surroundings.
- Demonstrate courtesy toward other drivers and pedestrians.
- Be aware of spinner discharge at all times.
- Avoid pushing snow over bridge rails and onto roads below.
- Be alert to hazards such as downed power poles, stop lights, overhead structures, power lines, etc.
- Know the height of your truck box. Raise box only to move material to the back of the box. When raising the box, be certain no overhead obstacles are present.
- Be aware of changing braking abilities from a loaded box to an empty one.
- Keep others informed of changing conditions.
- Assist/report stranded motorists as necessary.

Snow Cloud

Be aware of wind conditions and potential problems. Snow clouds can form during any plowing operation. A slight snow cloud can temporarily block out any lighting configuration and increase chances of being hit from the rear.

- Reduce your speed to minimize snow clouds.
- Don't plow just to plow. If plowing (shoulder) isn't necessary when the wind is blowing, don't do it. GE

The preceding article is based on material excepted from the Minnesota Snow and Ice Control Field Handbook for Snowplow Operators *(Manual 2005-1), published by the Minnesota Local Road Research Board, Mn/DOT Research Services Section and Office of Maintenance, www.lrrb.org.*

Weather Management on the Nation's Roads

Weather can affect highway operations on any day and on any road. To improve safety and mobility during adverse weather, transportation practitioners need to know not only how different types of weather will affect roadways, but also what types of strategies and tools they can apply to avoid or minimize those effects.

To provide practitioners with information on the various resources and techniques available to deal with adverse weather, the Federal Highway Administration's (FHWA) National Highway Institute (NHI) is offering the course "Principles and Tools for Road Weather Management," (FHWA-NHI-137030).

The course begins with an overview of road weather problems and their impacts, and provides a lesson in basic meteorology. In addition, participants review common methods to deal with weather-related problems, such as maintenance, traveler information, emergency management strategies, and the application of Road Weather Information Systems and other decision support tools. After completing the course, participants will be able to:

- Recognize the impacts that weather has on roadway operations.
- Identify the challenges of implementing road weather management strategies.
- Explain the range of tools and techniques available to solve road weather problems.

To help ensure that participants understand the lessons, each topic or session includes one or more exercises. At the end of the course, participants can take an additional quiz to receive 0.6 credits through the International Association for Continuing Education and Training.

The course targets professionals engaged in highway maintenance, operations, traffic management, emergency management, and highway safety. The course will be particularly beneficial to practitioners engaged in implementing solutions to roadway problems, staff from state and local transportation or public works agencies, mid-level managers who direct their agency's resources, and FHWA personnel. There are no prerequisites.

To learn more about participating in the course or for scheduling information, visit www.nhi.fhwa.dot.gov. For answers to technical questions, contact Roemer Alfelor at 202-366-9242 or roemer.alfelor@fhwa.dot.gov.