

Alaska Department of Transportation and  
Public Facilities

Central Region

# Standard Operating Procedures for Winter Road Maintenance

## Acknowledgements:

This text is adapted from the Minnesota Snow and Ice Control Field Handbook for Snowplow Operators to fit Alaska specific conditions.

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## Introduction

The purpose of this field handbook is to help promote the understanding of the tools, best practices, and limitations for snow and ice control. The handbook will also help you understand when to use and when not to use these tools and practices. In addition, it encourages progressive changes in snow and ice control practices that will help you reduce salt/sand use and environmental impacts while meeting the safety and mobility needs of roadway users.

Improved practices such as anti-icing, pre-wetting, and pre-treating are emphasized in this field handbook. Also included are standard best practices expected in a quality snow and ice control program.

Throughout the field handbook you will find environmental tips shown with the adjacent fish symbol. These tips are provided to help you reduce environmental impacts from snow and ice control operations.



Less material on roads  
means  
less material in lakes and  
streams

A blue rectangular box containing a fish symbol icon at the top and the text "Less material on roads means less material in lakes and streams" below it.

A blanket approach will not work for the broad range of conditions Alaska experiences; different strategies are needed for different districts and different conditions. We encourage you to continue to test, document, and refine the practices from this field handbook.

## Basic Concepts

### WEATHER

Knowing existing and potential weather conditions is very important for a successful snow and ice control operation. Six pieces of information are especially valuable:

1. Start of precipitation
2. Type of precipitation
3. Total precipitation expected
4. Expected event length
5. Wind conditions (speed, gusts, directions)
6. Temperature trend

Monitor the weather closely so that you are available and prepared to act early in storm situations.

### Weather information sources

- Phone 511 to get road condition and travel information or visit the Web: [511.alaska.gov](http://511.alaska.gov)
- Talk to neighboring agencies and share information on conditions.
- Subscribe to a value-added meteorological service (VAMS). These are useful for viewing weather forecasts.
- Check the National Weather Service.
- Check all available weather sources.

### PAVEMENT TEMPERATURE

Most weather stations measure temperature and other conditions 30 feet above ground, which means these conditions can differ substantially from pavement temperatures. Thus, use the pavement temperature – not the air temperature to determine your application rate.

*Pavement temperatures can be substantially lower or higher than air temperatures.*

You'll notice changes in pavement temperature first on bridge decks; pavement temperatures will also be lower in shady and mountain areas.

### Measuring with sensors or RWIS

There are two ways to measure pavement temperatures: with sensors or with the Road Weather Information System (RWIS).

Sensors can be hand-held or truck-mounted. Hand-held infrared laser sensors are pointed at the pavement to get a pavement or surface temperature while your vehicle is stopped or moving slowly.

Truck-mounted temperature sensors measure pavement or surface temperatures while your truck is moving. Ideally, every agency should own at least one truck-mounted unit.

RWIS - [www.roadweather.alaska.gov](http://www.roadweather.alaska.gov) is an Internet service provided by Alaska DOT and available to everyone. The RWIS is a predictive system that consists of a network of towers and temperature sensors embedded in state highways.

If you do not have road sensors in your truck, look up the road temperature from the closest state highway on RWIS. This will give you an idea of the local road temperatures.

**DILUTION: THE CAUSE OF REFREEZE**

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 and you may experience refreeze if pavement temperatures are dropping. This process is *Dilution of Solution*.

How long an application will last depends on five factors: pavement temperature, application rate, precipitation, beginning concentration, and chemical type. These factors explain why one application rate will not fit all storm events.

## Before the Winter

Take some time before the season to plan your routes and learn the plowing policies. A little planning up-front can help you do a more efficient job in keeping the roads safe.

### **POLICIES**

- Make sure you have a plowing policy and meet to discuss it. Your level of service may be based on average daily traffic, environmental concerns, safety, mobility, economics, and other factors.
- Inform your citizens of policies.
- Learn to record what and how much you apply on each shift. Be prepared to analyze and make adjustments to your process based on what you learn.

### **PLAN YOUR ROUTES**

- During the fall, inspect and make sure ditches, culverts, and surfaces are free from obstructions and ready for the spring melt.
- Remove potential snow traps, such as tall grasses, that will catch and accumulate snow.
- Drive the assigned routes prior to winter to identify critical areas and find the most efficient way to cover the routes.
- Inventory all the areas prone to drifting and have a plan to manage them.
- Know your routes. Plan which way you will start.
- Be flexible. Conditions could change the way you plow your route.

### **ADJUST YOUR EQUIPMENT**

Adjustment is an essential procedure to ensure good sanding patterns. Adjust the gate, auger and spinner as needed to ensure good sanding patterns are achieved.



### **PREPARE SNOW STORAGE SITES**

Snow storage sites need to be inspected prior to the start of the winter plowing season. Any debris or potential sources of runoff pollutants need to be removed before roadway snow removal starts.

### **PREPARE SALT AND SAND STORAGE**

Inspection of the storage sites for salt and sand need to be performed prior to the winter plowing season. The quantity of salt and sand need to be documented to ensure there is enough for the initial start of the plowing season. Any obstructions or debris that would impede the loading or movement of trucks on the site need to be removed prior to the start of the season.

## EMPLOYEE TRAINING

Prior to commencing winter street maintenance staff should be briefed on winter maintenance standard operating procedures. All applicable staff is required to read the standard operating procedures and sign the training log in Appendix E. Supervisors also have access to a variety of training videos for various aspects of maintenance operations. New staff or policy changes shall also prompt training and review of procedures.

### Before the Storm

#### ANTI-ICING

Anti-icing is often the most cost-effective and environmentally safe practice in certain winter road maintenance situations. You should consider heading in this direction.

Anti-icing is a proactive approach that should be first in a series of strategies for most winter storms. By applying chemical freezing-point-depressant materials before a storm, you can prevent snow and ice from bonding to the pavement.

Anti-icing requires about ¼ the material of deicing at 1/10 the overall cost, making it the least expensive option for improving traffic safety. Anti-icing is effective and cost-efficient when used correctly and approached with realistic expectations.

*Anti-icing can reduce airborne dust and spring sweeping.*

#### Guidelines for anti-icing

- Anti-icing is often effective for heavy frosts.
- Anti-icing works best when combined with accurate road weather information.
- Early application is particularly important for frost or light freezing drizzle.
- Liquids are the most efficient and may be applied days in advance of an event.
- Pretreated salts will work at lower applications closer to the expected event.

#### *What to do*

- For best results apply only with stream nozzles to maintain some bare pavement between sprayed areas to reduce slipperiness. Fan spray is not recommended.
- Schedule applications on bridge decks and critical areas if temperature and conditions could produce frost or black ice.
- Consider spot-applications on hills, curves, intersections and turn lanes if predicted conditions warrant.
- Use appropriate chemical for your pavement temperature range.
- Apply an anti-ice product during non-rush-hour traffic periods.
- When frost on the shoulder starts to move into the travel lanes, reapply anti-icing product.

#### *What not to do*

- Don't anti-ice under blowing conditions and in areas prone to drifting. Be aware of areas that are prone to wind issues.

- Reapplication isn't always necessary if there is still a residual. The residual effect can remain for up to five days after application if precipitation or traffic wear-off does not dilute the initial application.
- Remember that the surface can refreeze when precipitation or moisture in the air dilutes the chemical.
- Don't apply  $MgCl_2$  or  $CaCl_2$  to a warm road (above 28° F pavement temperature). It can become slippery and cause accidents!
- Don't apply before predicted rain.
- For the first application or after a prolonged dry spell, apply liquids at half the rate (not half the concentration). On dry roads, liquids tend to mix with oil from vehicles and cause slippery conditions.
- Don't apply too much or the roadway may become slippery. Less is better. Always follow application recommendations.

#### Equipment

- Anti-icing unit, i.e., transport vehicle with tank.
- Fan spray is not recommended.

#### PRETREATING AND PREWETTING SALT AND SAND

Dry material bounces or blows off the road, so everyone should be either pretreating or prewetting dry material. Liquids also increase salt's effectiveness by jump-starting the melting process. Depending on the liquid used, it can lower salt's effective working temperature.

*If you must use dry material, follow best practices to reduce bounce and scatter.*

Because pretreating and prewetting cause material to stick to the road, 20 to 30 percent less material is used—saving money and reducing environmental impacts.

#### Guidelines for pretreating

Pretreating is mixing a liquid into the stockpile of salt or sand before it is applied. Unlike prewetting, it does not require equipment changes and requires no new capital investment for equipment. You can also switch from dry application to wet application immediately—just turn down the application rate.

#### *Sand stockpile*

- Pretreat the stockpile to keep it flowable.
- Add 4% to 5% of salt by weight to ton of sand to keep flowable. More may be required in colder regions.
- For best results store the stockpile under cover.
- Because leach risk at a stockpile is increased, store it covered on an impervious pad if possible.



*Maintain stockpiles to prevent migration and locate piles away from surface waters.*



## Guidelines for prewetting

Prewetting is adding a liquid to the salt as it is being applied- either at the spinner or through a soaker pipe in the auger box-to help it stick to the road better. Although prewetting requires some equipment changes, it provides flexibility to switch the chemical makeup depending on conditions.

- Salt brine, calcium, magnesium chlorides, and acetates may be used as prewetting agents.
- The optimal application rate is 8 to 14 gallons/ton for salt brine.
- Prewetting with other chemicals at the spinner can help reduce the application rate.
- Below 15°F, salt brine is less effective than other liquids and may freeze hoses and valves.
- Salt brine should be mixed at 23.3%.



*Apply wisely. In most circumstances we will never get a chance to recover chemicals and sand from sensitive resources.*



## During the Storm

### 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.

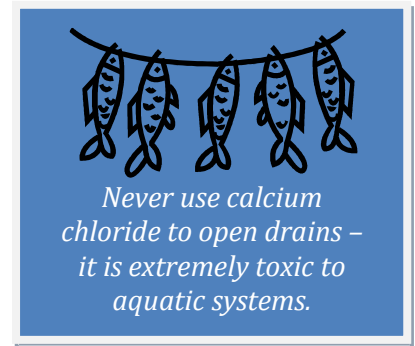
- Use an appropriate amount of salt. Most oversalting can be prevented by using good judgment in selecting application rates and truck speed.
- It is not necessary to melt all the snow or ice on the road with salt. This is an overuse of materials. Apply just enough to loosen the bond between the road and the ice so it can be plowed off.

### 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. It is important to remember that sand also infiltrates sewers, ditches, and streams.

A 5 percent salt/sand mix is generally utilized by the Department. If mixed in the wrong concentrations, salt reduces the effectiveness of sand and sand reduces the effectiveness of salt.

- Use abrasives in slow-moving traffic areas such as intersections, curves, hills and turn lanes.
- Salt is ineffective in the majority of Alaska's climate zones, so sand or alternative chemicals are predominantly utilized.
- Sand is not cheap when you consider the handling, clean-up and disposal costs.



### **Standard Practices**

- Know the pavement temperatures and trends to help you use the right application at the right time.
- Below 20° F, utilize the appropriate tools for the weather on curves, hills, and intersections.
- Adjust spinner speed to the lowest setting possible, except at intersections.
- Drive at the lowest possible speed – 17 to 25 mph – slightly higher if prewetting.
- When practical don't let 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.
- Turn off auger when stopped, even briefly.

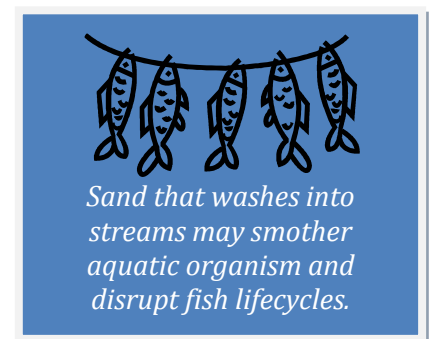
### **Loading/Hauling**

- Set up and load on a level surface whenever 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 chemicals and reduce sanding quantities.
- 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 maximize cutting efficiency or snow throwing capabilities.

### **Bridge plowing procedures for low speed roadways**

Accepted sanding and plowing practices on low speed roadways includes:

- Drive a reasonable and safe speed;
- When approaching bridges and overpasses operators are to slow down;
- If there is room on the deck, operators may store snow on the bridge/overpass. After the snow event is done, snow will be collected from these areas and hauled to designated snow storage sites;
- On bridges where the bridge rails are more open, operators are to slow down and manipulate the blade so the snow is pushed straight or carried across the bridge or overpass. When operators are clear of the bridge or overpass, the blade should then be re-set at an angle to cast off snow to the shoulder. Bridge length may prohibit or reduce the effectiveness of this practice in large snow events.
- On overpasses with sidewalks the snow will be pushed or blown straight ahead until the end of the overpass. When operators clear the bridge or overpass they may at that time angle the blade or blower to remove snow off of the sidewalk or pathway.
- Use the minimum amount of sand needed to keep the roadway safe and passable for road users and minimize traffic incidents.

### **Bridge plowing procedures for high speed roadways**

The speed and volume of traffic on high speed roadways is sometimes prohibitive to slowing down to perform any of the methods mentioned above. It would be a safety issue to slow down to speeds that would allow the operators to store snow on the bridge/overpass or to push snow straight across the bridge/overpass and cast off after they are clear of the structure. The slower speed could impact the safety of other vehicles on the roadway. Not sanding on the bridges and overpasses is also not an option. Bridges and overpasses are some of the most dangerous areas on roadways and it is essential they are kept free of snow and ice to minimize traffic accidents.

- Drive at reasonable and safe speeds;
- Slow down at bridges and overpasses as much as traffic speeds allow. By slowing down in these areas the castoff of sand into waterways is reduced or eliminated.
- Slow down at overpasses to reduce the amount of snow cast over due to the safety hazard of possibly hitting vehicles or trail users.
- On overpasses with sidewalks the snow will be pushed or blown straight ahead until the end of the overpass. When operators clear the bridge or overpass they may at that time angle the blade or blower to remove snow off of the sidewalk or pathway.
- Use the minimum amount of sand needed to keep the roadway safe and passable for road users.
- During nighttime operations, when other vehicles may not be present on the roadway, operators are to perform operations at slower speeds as described in the above section "Sanding and Plowing on Low Speed Roadways".

### **Public Safety/operator safety**

- Perform your required CDL pre and post trip inspections.
- Make sure you're mentally and physically prepared to drive.
- Clean lights, windows and signs frequently.
- Blow 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 time.
- Avoid pushing snow over bridge rails and onto roads and into streams 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 very light 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.

### **After the Storm**

After the storm, when snow and ice control operations have ended, evaluate what was done, how well it worked, and what could be changed to improve operations.

- Accurately record your material use at the end of your shift (see below).
- Attend a post-storm meeting in the shop to evaluate your operations.
- Look for opportunities to try new and improved practices.
- Clean and check all equipment.
- Report any hazards such as low-hanging branches, raised utilities, snow accumulation on bridges, or other potential problems.

### **STANDARD PRACTICES**

#### **Documenting and Charting**

Good documentation helps you use less material, reduce costs and environmental impacts, and run a more effective snow and ice control program. Unless you document and chart, you can't measure what you are doing.

- Track your material use.
- Understand the storm conditions and the target level of service for each route.
- Refine your procedures and material use based on observations.
- Share observations to improve operations and learn from each other.

- Use forms like those shown in appendix F of this field handbook to record and track your work and observations.
- Complete forms at the end of your shift.
- Turn in documentation forms to your supervisor.

## After the Winter

End of season review of plowing and sanding practices helps to create stronger understanding of the efficiency of winter maintenance procedures.

- At the end of the season, clean and maintain the truck, tanks, brine-making systems, and pumps according to manufacturer specifications.
- Place all piles on an impervious pad and cover them when possible. This includes salt and salt/sand mixes. Locate piles away from water bodies and berm to prevent migration of material.
- Inspect bridges during melt periods to determine if best management practices for sanding and plowing are being observed.
- Large quantities of material in streams may warrant review of procedure and possible cleanup to reduce impacts to waterways.



## STREET SWEEPING

In the spring, the sand that has been placed and has accumulated on the road must be removed to improve the safety of state roads for drivers and pedestrians. Different methods are employed depending on the drainage of the road way. Curb and gutter roads require different methods than open channel or ditched road ways.

## Application Rate Guidelines

Make it a goal to reduce application rates while keeping our roads safe. You can reduce rates by following anti-icing and other strategies covered in this field handbook.

### GUIDELINES FOR DETERMINING APPLICATION RATES

- Sand/salt mix isn't advised but may help in some situations such as freezing rain.
- Always plow before applying chemical. For reapplication, start with the lowest rate in the range.
- High traffic volume will work sand into the snow and aid in traction—so use a lower rate.
- Higher traffic speeds will blow sand off the road and hinder melting— so increase use of prewetted materials.
- Use sand for short-term traction only. It will never melt anything.
- For application on a single lane, cut rates in half. For an 18- foot-wide road, use 3/4 of the listed rate (i.e., multiply rate by 0.75).

## **Bibliography and Additional Resources**

### **BIBLIOGRAPHY**

MN Snow and Ice Control Field Handbook for Snowplow Operators

Street Sweeping Management Plan: Anchorage MS4

### **ADDITIONAL RESOURCES**

Statewide M&O and Alaska T2 Snow Plow Orientation Video

For fish stream and mapping information visit the Alaska Department of Fish and Game's Anadromous Fish Streams Interactive Maps at -

<http://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?adfg=maps.interactive>

T2 Wetlands training

## **Appendix A: Anchorage District**

The goal is to have anchorage specific information and policies for practices.

## **Appendix B: Kenai District**

## **Appendix C: Mat-Su District**

## **Appendix D: Southwest District**





## Appendix F: Daily Salt/Sand Use Ticket

This is the example from the MN manual. If we have something already we could use the existing form.

Operator:			Shift:		Date:	
Truck No.:			Capacity:			
Weather:						
Stockpile	Route	Yards Sand	Yards Salt	Yards Used	Yards Returned	Liquid Gallons
Totals						

## Appendix G: Anti-icing Form

Anti-icing Route Data Form				
Truck Station:			Date:	
Air Temp	Pavement Temp	Rel. Humidity	Dew Point	Sky
Reason for applying:				
Route:				
Chemical:				
Application time:				
Application Amount:				
Observation (1 <sup>st</sup> day):				
Observation (after event):				
Observation (before next application):				
Name:				