Lesson Six: Applications, Operations and Policy

As the storm progresses and conditions change the material types and rates may be adjusted as determined necessary by the manager to address the situation.

Positive communication between the operator and manager ensures the correct treatment is being applied.

A. Application

1. Timing

a. Timing is critical in applying materials. The two complementary strategies anti-icing and de-icing require sound understanding of how materials work for proper applications procedures.

b. Keep in mind that changing conditions will affect operations.

i. Falling temperatures can cause refreezing.

ii. Additional precipitation can dilute winter maintenance materials, rendering them ineffective.

2. Material application

a. Spread Patterns

i. While spread patterns differ depending on traffic conditions and road type (two-lane or four-lane, crowned or super-elevated), salt is normally applied to the middle (or crown) of the road and to the high side of the ramps.

a) This type of spread pattern allows the salt to form a brine that flows downhill across the pavement surface in the direction of the slope of the pavement.

ii. Rock salt takes a minimum of 20 minutes to work and can be used alone or in conjunction with other materials.

a) Plowing operations must be coordinated to allow salt adequate time to work.

iii. Operators can watch melting snow kicked out behind vehicle tires.

a) If the slush is soft and "fans" out like water from vehicle tires, the salt is still working.

b) Once the slush begins to stiffen and is thrown directly to the rear of vehicle tires, it is time to plow and spread more salt.

b. Spinner Speeds

i. Spinner speeds are critical to proper spreading.

a) A spinner that revolves too fast will throw salt over a wide area, possibly wasting material.

b) The speed needs to be low enough to ensure that the material remains on the road surface.

ii. A strong wind blowing across the road can cause salt to "drift" as it comes out of the spreader.

a) Taking note of the wind conditions will assist in proper placement of salt to the locations of where it will do the most good.

c. Rock Salt Facts

i. Disadvantages of salt:

a) It is highly affected by temperature

b) Can easily be applied incorrectly

c) If you're not careful, salt will not stay where it is intended to on the road.

Exercise: Rock Salt

True or False? When properly spread, salt forms a brine that flows across the pavement surface.

B. Application Rates

1. Application Rate Selection

a. There are numerous factors to consider in determining application rates including:

i. pavement temperatures and trends,

ii. precipitation type and intensity,

iii. traffic volumes,

iv. resource considerations and

v. various environmental factors.

b. Storm Elements - The operator needs to recognize and understand the elements within the storm event.

i. Snow is dry and blowing horizontally

a) Do not treat the road.

1) Treating the road will give the snow something to stick to, causing you to continue to treat that area, and giving the motorists a false sense of security.

2) One moment the road is dry and the next it is wet and snow covered. This will cause accidents.

ii. Wet snow but the pavement temperature is up and the snow is melting as it hits.

a) Do not treat, especially if it is daylight as pavement temperatures are above freezing and the snow will melt without treatment.

iii. Sunlight

a) Significantly raises the temperature of the pavement.

1) Pavement and air temperatures can be dramatically different. During daylight hours, take advantage of the de-icing benefit the thermal energy of the sun provides.

b) Remember that all chemicals need time to work.

1) As a rule of thumb, give a minimum of twenty minutes before plowing an area that has been previously treated.

iv. Berms and shoulders

a) Generally not part of the traveled area and should not be treated.

1) An exception to this may be if there are drains located in the berm or shoulder area, but for the most part brine from the traveled area will run toward the drains, melting snow as it travels, especially after plowing back.

2) Check with a supervisor before treating these areas.

v. Ramps, intersections, bridge decks, underpasses and driving lanes

a) All require frequent attention.

1) Because of the stopping, starting, accelerating, decelerating and steering that occur on each, all are considered a priority.

b) Bridge decks need attention because air can pass over and under cooling the pavement temperature, causing them to freeze faster than the regular road surface.

c. Tips for spreading and plowing

i. Salt bridges first

a) Bridges freeze long before road surfaces because they do not hold warmth as a roadbed does, since cold air reached both the top and bottom surfaces of bridge decks.

b) They should receive early attention and an application of material.

c) Bridge decks may ice over even when there is no precipitation.

d) Anti-icing (pre-treating) has proven especially effective at preventing frost on bridges.

ii. Salt the high side of elevated curves

a) Once salt goes in to solution as brine, it will flow down and across a banked curve.

b) If salt is spread down the centerline of an elevated curve, everything above it will remain icy.

c) Spread salt on the high side of the curve and let gravity do the rest of the work.

iii. Leave no gaps

a) In some situations, operators must go beyond their assigned areas, if necessary, to plow or salt a gap that has not been treated for some reason.

b) A short, neglected stretch of roadway can be very hazardous to an unsuspecting motorist.

c) Take note of any such areas on your route and communicate with your supervisor for needed action and direction.

iv. Watch for drifting

a) In continued high winds, watch for drifting and slick spots, even after the pavement has been cleared.

b) Plow and treat icy buildups.

c) During some very low temperature storms with dry blowing snow, salt should not be used. The dry snow may blow off the pavement if no salt is used. If salt is used it can create problems by causing the snow to stick, melt and refreeze on the pavement surface.

v. Watch for slick spots

a) Occasionally, under certain weather conditions, a paper-thin sheet of ice forms in wheel paths on bare pavement even when pavement looks clear.

b) This light ice formation can be deadly.

c) Always watch for this condition and apply material immediately.

vi. Get equipment on the road

a) Once deployed, equipment needs to be on the road and to their assigned work locations as soon as possible.

b) Delay in getting to critical areas may cause severe traffic tie-ups.

vii. Note trouble spots

a) Intersections, ramps, hills and curves are also typical trouble spots in addition to bridges as mentioned earlier.

b) Early treatment of these areas is critical for maintaining traffic flow.

viii. Allow enough time for materials to work

a) Retreating does not clear roads faster, allow 20 minutes for salt to work.

ix. Questions or concerns

a) Always check with the supervisor for direction on activities.

x. Plowing techniques vary

a) There are a number of plowing techniques designed to address various issues associated with snow and ice removal from the highway:

These factors include:

1) multi-lane with and without medians,

2) two-lane roads,

3) intersections,

4) bridges,

5) ramps,

6) R/R tracks and

7) gore areas.

b) Learning the various techniques is important to efficient and effective removal.

1) Two lane roads

(a) Position left side of plow at centerline and angle plow to right, pushing snow to the right and trying to uncover the centerline on the first pass.

(b) When the centerline is not visible you may have to judge where the edge is and use it as your guide.

2) Multi-lane roads – The direction in which the snow is plowed will depend upon the median type.

(a) Wide median – In the right lane, snow is plowed to the right and in the left lane snow is plowed to the left.

(b) Narrow or no median – Snow must be plowed to the right.

3) Bridges – Various bridge types are also plowed using different techniques.

(a) Open design and not a roadway or R/R overpass – Plow similar to plowing a roadway pushing snow to the right.

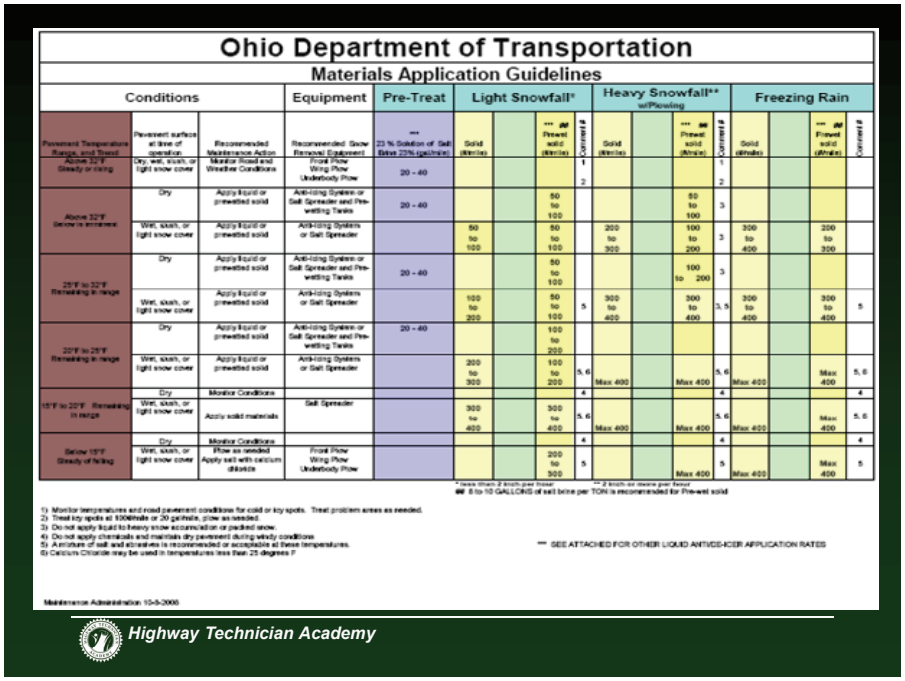
(b) High barrier or overpass – Plow straight through and move snow to the end of the bridge.

(c) Bridge expansion joints – Make sure the plow is not parallel to expansion joints. The plow must be angled when plowing over such joints.

4) Ramps and elevated curves – Always plow moving snow from the high side to the low side.

5) Gore areas – Always plow in a manner to carry snow past the gore area. Never push snow into the gore area.

6) Railroad Tracks – Raise plow high enough to clear tracks when crossing a railroad track and turn off spreader to avoid a build up of materials on tracks.



Ohio Department of Transportation

Materials Application Guidelines

Conditions			Equipment	Pre-Treat	Light Snowfall*				Heavy Snowfall** w/Plowing				Freezing Rain			
Pavement Temperature Range, and Trend	Pavement surface at time of operation	Recommended Maintenance Action	Recommended Snow Removal Equipment	*** 23 % Solution of Salt Brine 23% (gal/mile)	Solid (lbs/mi)		*** ## Prewet solid (lbs/mi)	Comment #	Solid (lbs/mi)		*** ## Prewet solid (lbs/mi)	Comment #	Solid (lbs/mi)		*** ## Prewet solid (lbs/mi)	Comment #
Above 32°F Steady or rising	Dry, wet, slush, or light snow cover	Monitor Road and Weather Conditions	Front Plow Wing Plow Underbody Plow	20 - 40				1 2				1 2				
Above 32°F Snow is imminent	Dry	Apply liquid or prewetted solid	Anti-Icing Systems or Salt Spreader and Pre-wetting Tanks	20 - 40			50 to 100				50 to 100	3				
	Wet, slush, or light snow cover	Apply liquid or prewetted solid	Anti-Icing Systems or Salt Spreader		50 to 100		50 to 100		200 to 300		100 to 200	3	300 to 400		200 to 300	
25°F to 32°F Remaining in range	Dry	Apply liquid or prewetted solid	Anti-Icing Systems or Salt Spreader and Pre-wetting Tanks	20 - 40			50 to 100				100 to 200	3				
	Wet, slush, or light snow cover	Apply liquid or prewetted solid	Anti-Icing Systems or Salt Spreader		100 to 200		50 to 100	5	300 to 400		300 to 400	3, 5	300 to 400		300 to 400	5
20°F to 25°F Remaining in range	Dry	Apply liquid or prewetted solid	Anti-Icing Systems or Salt Spreader and Pre-wetting Tanks	20 - 40			100 to 200									
	Wet, slush, or light snow cover	Apply liquid or prewetted solid	Anti-Icing Systems or Salt Spreader		200 to 300		100 to 200	5, 6	Max 400		Max 400	5, 6	Max 400		Max 400	5, 6
15°F to 20°F Remaining in range	Dry	Monitor Conditions						4				4				4
	Wet, slush, or light snow cover	Apply solid materials	Salt Spreader		300 to 400		300 to 400	5, 6	Max 400		Max 400	5, 6	Max 400		Max 400	5, 6
Below 15°F Steady or falling	Dry	Monitor Conditions						4				4				4
	Wet, slush, or light snow cover	Plow as needed Apply salt with calcium chloride	Front Plow Wing Plow Underbody Plow				200 to 300	5			Max 400	5	Max 400		Max 400	5

* less than 2 inch per hour ** 2 inch or more per hour

8 to 10 GALLONS of salt brine per TON is recommended for Pre-wet solid

1) Monitor temperatures and road pavement conditions for cold or icy spots. Treat problem areas as needed.
2) Treat icy spots at 100#/mile or 20 gal/mile, plow as needed.
3) Do not apply liquid to heavy snow accumulation or packed snow.
4) Do not apply chemicals and maintain dry pavement during windy conditions.
5) A mixture of salt and abrasives is recommended or acceptable at these temperatures.
6) Calcium Chloride may be used in temperatures less than 25 degrees F

*** SEE ATTACHED FOR OTHER LIQUID ANTI/DE-ICER APPLICATION RATES

Maintenance Administration 10-5-2006

Highway Technician Academy

2. Material Application Guidelines

a. Within ODOT those best practices have been documented on our Material Application Guidelines (MAG). See the Appendix for a copy.

b. Recommendations are detailed for guidance in achieving effective and efficient treatment types under various conditions. The MAG is illustrated below for three winter event conditions:

Exercise: Using the MAG

Given pavement temperatures that are in the range of 20°F to 25°F, with wet pavement surface and heavy snow fall, what is the recommended application rate if using pre-wetted solids? See the Appendix for a copy of the MAG.

3. Pre-Treatment Plan

a. Use

i. Anti-icing or pre-treating measures take place before snow falls and ice forms on the roadway.

a) These measures are intended to prevent frost or black-ice from forming on the surface of the pavement or to prevent the bond of frozen precipitation to the road surface.

ii. Additionally, pre-treatment of a pavement can provide critical response time to remote areas.

b. Advantages

i. The roadway surface is never "lost". Operators respond proactively.

ii. Anti-icing returns road surfaces to normal faster, resulting in fewer accidents and delays.

iii. Using a liquid jumpstarts the melting process because salt needs moisture to be effective.

iv. Brine doesn't bounce or blow off the road surface so material is more efficiently used.

v. If the storm is delayed, salt residue remains on the road ready to begin work when precipitation does occur.

vi. Crews can cover more territory by beginning treatment in advance of a storm.

vii. Increased efficiency results in use of less salt, minimizing environmental concerns.

c. Pre-Treatment Plan Document

i. Just as ODOT has documented best practices for material applications in the MAG, the Department has also documented operational guidelines for establishing a uniform anti-icing or "Pre-treatment Plan".

ii. The guidelines provide support for the commitment of anti-icing as well as practical guidance for daily operations. Here is an example of the Pre-treatment Plan:

OHIO DEPARTMENT OF TRANSPORTATION
SNOW & ICE
PRE-TREATMENT GUIDELINES

I. PURPOSE

Pre-treat Priority Routes and any identified trouble spots with liquid material for black ice, unexpected winter events, frost control, and forecasted winter events when conditions warrant.

II. PRE-TREATMENT LIQUIDS

Salt Brine or equivalent

III. APPLICATION

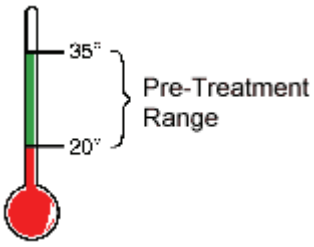
Pre-treat Priority Routes when conditions or forecast warrants. On higher volume roads where material may be tracked away by traffic, pre-treat as close to the onset of an event as possible.

IV. WHEN CONDITIONS WARRANT

A. Roadways are dry.
B. Rain is not forecasted for the next 24 hours.
C. Forecasted low temperature to fall within the range of 20 to 35 degrees Fahrenheit or within critical dew point range.
D. Sufficient time exists for pavement to dry before pavement temperature falls below 20 degrees Fahrenheit.
E. Blowing snow is not anticipated.
F. Visual observation indicates sufficient material residue does not exist.

V. IMPLEMENTATION

The Pre-Treatment Plan will begin immediately.



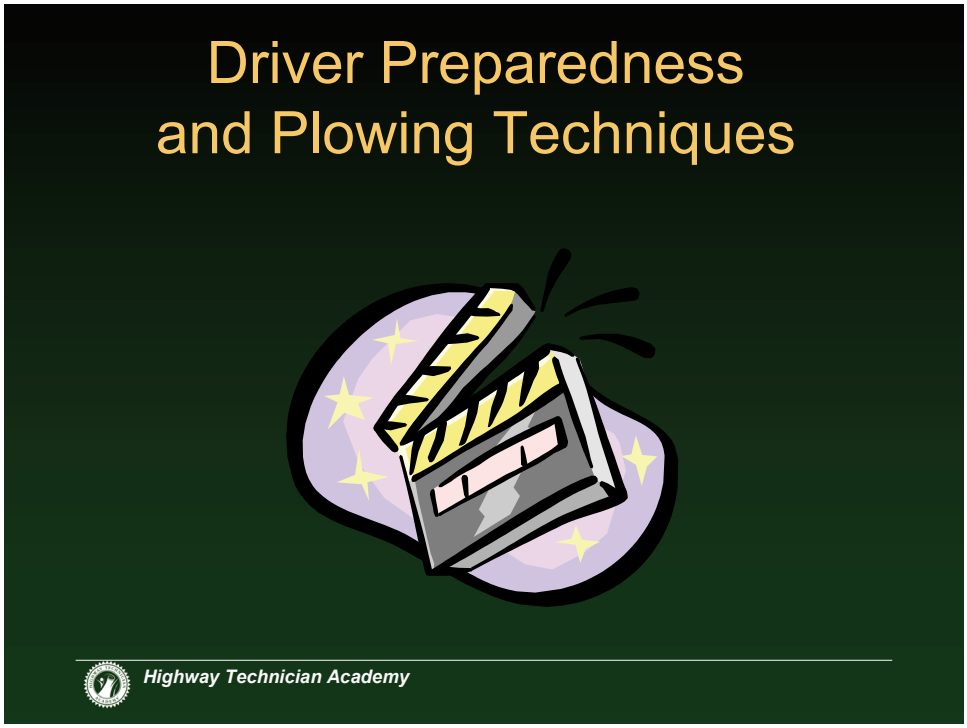
VI. SPECIAL CONDITIONS

A. Refer to the Material Application Guidelines.
B. "Black Ice" - Pavement temperature is equal to or predicted to be less than the due point temperature and is equal to or below 32 degrees Fahrenheit. When available, utilize RWIS data for pavement temperature, dew point temperature, etc.

Maintenance Administration 10-8-2008

Exercise: Using the Pre-Treatment Plan

Is pre-treating recommended if the forecasted temperature is below 20°F?



C. Preparation Check List

1. **While it is true that snow and ice control is not an exact science**, it is also true that an ounce of prevention is worth a pound of cure. With regards to performing snow and ice control, there are a few areas where a moment of extra attention to detail can produce huge benefits.

    a. Prior to Leaving the Maintenance Facility

        i. Know the expected weather forecast.

        ii. Dress for the conditions and bring extra clothing.

        iii. Make sure you have all the necessary safety equipment.

        iv. Get your route assignment and instructions from your supervisor.

        v. Complete your CDL walk around inspection, form EM-78.