

Anti-Icer/Deicer Application Rate Survey

Department of Public Works and Environmental Services
Working for You!



A Fairfax County, VA, publication

- **Survey sent to neighboring jurisdictions to assess application rate guidelines**
- **Focused on DOTs**
- **Sent to:**

- Maryland Department of Transportation
- Montgomery County Public Works
- Prince Georges Department of Public Works and Transportation
- Charles County Public Works
- DC Department of Public Works
- NCDOT
- DeIDOT
- NJDOT
- NYSDOT
- WVDOT
- Penn DOT
- Fort Meade
- NGA
- ADFE
- Base Ops
- NPS GWMP
- Other federal agencies



Additional Research

**Searched publicly
facing publications
for all snow states
looking for salt
application rates:**

DOTs from:

- Utah
- Vermont
- Wisconsin
- Kentucky
- Rhode Island
- Oregon
- Maine
- NY State
- Maryland
- Tennessee
- Pennsylvania
- Various Canadian Agencies
- And others



Application Rate Example

- Southern States: Limited public facing info
- Northern States: Publicly available, prescriptive approaches
- Many copy Snow Fighter's Handbook and Minnesota Snow and Ice Control
- Typical layout of publicly available application rates for Northern States (Penn DOT)
- NY State had the most detailed approach

PAVEMENT TEMPERATURE RANGE, AND TREND	INITIAL OPERATION				SUBSEQUENT OPERATIONS			COMMENTS
	Pavement surface at time of initial operation	maintenance action	material spread rate, lbs/snow lane-mi		maintenance action	material spread rate, lbs/snow lane-mi		
			dry	prewet solid		dry	prewet solid	
Above 32°F, steady or rising	Dry, wet, slush, or light snow cover	See comments			See comments			1) Monitor pavement temperature closely for drops toward 32°F and below 2) Treat icy patches if needed with material at 100 lbs/lane-mi; plow if needed
Above 32°F, 32°F or below is imminent; ALSO 30 to 32°F, remaining in range	Dry Wet, slush, or light snow cover	Apply dry or prewetted solid material Apply dry or prewetted solid material	100 100	100 100	Plow accumulation and reapply liquid or solid material as needed	100	100	1) If the desired plowing/treatment frequency cannot be maintained, the spread rate can be increased to 200 lbs/ lane-mi to accommodate longer operational cycles 2) Do not apply liquid chemical onto heavy snow accumulation or packed snow
25 to 30°F, remaining in range	Dry Dry, wet, slush, or light snow cover	Apply liquid or prewetted solid material Apply liquid or solid material	250 250	150-200 150-200		Plow accumulation and reapply liquid or solid material as needed	200	
15 to 25°F, remaining in range	Dry, wet, slush, or light snow cover	Apply dry or prewetted solid material	300	250	Plow accumulation and reapply prewetted solid material as needed	300	250	1) If the desired plowing/treatment frequency cannot be maintained, the spread rate can be increased to 500 lbs/ lane-mi to accommodate longer operational cycles 2) If sufficient moisture is present, solid material without prewetting can be applied
Below 15°F, steady or falling	Dry or light snow cover	Plow as needed			Plow as needed			1) It is not recommended that chemicals be applied in this temperature range 2) Abrasives can be applied to enhance traction

BLACK ICE

Surface Temp. Range (° F)	Surface Condition	Initial Maintenance Action	Dry Rock Salt Lbs./lm.	Pre-Wetted Rock Salt Lbs./lm	Follow Up Action	Follow Up Rock Salt Lbs./lm	Follow Up Pre- Wetted Rock Salt Lbs./lm	Comments
Above 32	Dry or Damp	Apply pre-wetted rock salt or direct liquids to prevent formation.		115	None, see comments.			Monitor pavement temperature closely; begin treatment if pavement temperature starts to fall toward 32 and it is at or below the dew point.
23 to 32	Frost or Black Ice	Apply pre-wetted rock salt or direct liquid; use dry salt if pre-wetted not available.	275	225	Re-apply pre-wetted rock salt as needed.	115	90	1) Monitor pavement temperatures closely; if pavement becomes wet or if thin ice forms re-apply chemicals. 2) Do not apply direct liquids on ice so thick that the pavement cannot be seen. 3) Heavier follow up application(s) may be necessary.
15 to 23	Frost or Black Ice	Apply pre-wetted rock salt; use dry rock salt if pre-wetted not available.	360	275	Re-apply pre-wetted or dry rock salt as needed	115	90	1) Monitor pavement temperature closely; if pavement becomes wet or if thin ice forms re-apply chemicals. 2) Do not apply direct liquids on ice so thick that the pavement can not be seen. 3) Heavier follow up applications(s) may be necessary.
Below 15	Frost or Black Ice	Apply abrasives			Apply abrasives			1) Refer to Snow and Ice Guidelines Section 5.4406, paragraph B. for abrasive application rates.

Notes: 1) Black ice or frost is normally a spot condition – these application rates would be applied to areas susceptible to the formation of black ice or areas where black ice has developed. Watch for freezing surface temperatures below dew point with sources of vapor, clear night skies and light winds. 2) Refer to direct liquid chemical application guide lines (Appendix C Page C – 10) if anti-icing liquids are used.



FREEZING RAIN

Surface Temp. Range (° F)	Surface Condition	Initial Maintenance Action	Dry Rock Salt Lbs./lm.	Pre-Wetted Rock Salt Lbs./lm	Follow Up Action	Follow Up Rock Salt Lbs./lm	Follow Up Pre- Wetted Rock Salt Lbs./lm	Comments
Above 32	Wet or Slushy	Apply pre-wetted or dry rock salt, plow if plowable.	115	90	Monitor precipitation and temperature.			1) Monitor pavement closely and anticipate drops toward 32° F and below. 2) Adjust application rates as surface conditions and precipitation intensities change.
Above 32, but dropping to 32 or below soon	Wet or Slushy	Apply pre-wetted or dry rock salt, plow if plowable.	180	115	Re-apply pre-wetted or dry rock salt as needed.	180	115	1) Monitor pavement temperatures and precipitation closely. 2) Treat icy patches and colder areas with higher applications. 3) Increase applications if precipitation intensity increase or surface shows signs of icing.
23 to 32	Wet or Slushy	Apply pre-wetted or dry rock salt, plow if plowable.	275	225	Re-apply pre-wetted or dry rock salt as needed.	275	225	1) Monitor pavement temperatures and precipitation closely and adjust application rates as surface conditions and precipitation intensities change. 2) Treat icy patches and colder areas with higher applications. 3) Increase applications if precipitation intensity increase or surface shows signs of icing.
23 to 32	Icy	Apply pre-wetted or dry rock salt.	360	320	Re-apply pre-wetted or dry rock salt as needed.	360	320	1) Use Application Rate for “wet and slushy” when icing condition is removed. 2) Increase application rate if precipitation intensity increases or if pavement shows signs of re-freezing.
15 to 23	Wet or Slushy	Apply pre-wetted or dry rock salt, plow if plowable.	360	275	Re-apply pre-wetted or dry rock salt as needed.	360	275	1) Monitor pavement temperatures and precipitation closely and adjust application rates as surface conditions and precipitation intensities change. 2) Treat icy patches and colder areas with higher applications. 3) Increase applications if precipitation intensity increase or surface shows signs of icing.
15 to 23	Icy	Apply pre-wetted or dry rock salt.	450	360	Re-apply pre-wetted or dry rock salt as needed.	450	360	1) Use Application Rate for “wet and slushy” when icing condition is removed. 2) Increase application rate if precipitation intensity increases or if pavement shows signs of re-freezing.
Below 15	Dry, wet or icy	Apply abrasives			Re-apply abrasives			Refer to Snow and Ice Guidelines Section 5.440 (B) for application rates.

Notes: 1) Freezing Rain requires a timely and aggressive response to prevent ice formation; application rates should be increased if not effective or cycle times are increased due to difficult driving.

SLEET

Surface Temp. Range (° F)	Surface Condition	Initial Maintenance Action	Dry Rock Salt Lbs./lm.	Pre-Wetted Rock Salt Lbs./lm	Follow Up Action	Follow Up Rock Salt Lbs./lm	Follow Up Pre- Wetted Rock Salt Lbs./lm	Comments
Above 32	Dry	Patrol and spot treat as needed. See comments.			Patrol and spot treat as needed. See comments.			1) Monitor pavement temperatures closely and anticipate drops toward 32 F and below. 2) Treat icy patches with pre-wetted rock salt at 115 lbs./lm.
Above 32	Snow, slush, or wet.	Apply pre-wetted or dry rock salt, plow if plowable.	115	90	Re-apply pre-wetted or dry rock salt as needed.	115	90	1) Monitor pavement temperatures closely and anticipate drops toward 32F. 2) Treat icy patches and colder areas with higher applications. 3) Increase rates if precipitation intensity increases.
Above 32, but dropping to 32 or below soon.	Snow, slush, or wet.	Apply pre-wetted or dry rock salt, plow if plowable.	180	115	Re-apply pre-wetted or dry rock salt as needed.	180	115	1) Monitor pavement temperatures and precipitation closely. 2) Treat icy patches and colder areas with higher application rates. 3) Increase application rates if precipitation intensity increases.
23 to 32	Snow, slush, or wet.	Apply pre-wetted or dry rock salt, plow if plowable.	225	180	Re-apply pre-wetted or dry rock salt as needed.	225	180	1) Monitor pavement temperatures and precipitation closely. 2) Treat icy patches and colder areas with higher application rates. 3) Increase application rates if precipitation intensity increases.
15 to 23	Snow, slush, or wet.	Apply pre-wetted or dry rock salt, plow if plowable.	275	225	Re-apply pre-wetted or dry rock salt as needed.	275	225	1) Monitor pavement temperatures and precipitation closely. 2) Treat icy patches and colder areas with higher application rates. 3) Increase application rates if precipitation intensity increases.
Below 15	Any condition.	Apply abrasives.			Re-apply abrasives.			1) Refer to Snow and Ice Guidelines Section 5.4406 (B) for abrasive application rates.

Notes: 1) Sleet that creates accumulating ice will require more aggressive treatment.

LIGHT SNOW
(Less than 1/2"/hour; visibility > 1/2 mile)

Surface Temp. Range (° F)	Surface Condition	Initial Maintenance Action	Dry Rock Salt Lbs./lm.	Pre-Wetted Rock Salt Lbs./lm	Follow Up Action	Follow Up Rock Salt Lbs./lm	Follow Up Pre- Wetted Rock Salt Lbs./lm	Comments
Above 32	Wet, slush or light snow covered.	Patrol and spot treat as needed. See comments.			Patrol and spot treat as needed. See comments.			1) Monitor pavement temperature for drops toward 32 F. 2) Blast isolated icy patches with salt, treat slushy areas beginning to freeze with 180 dry/160 pre-wet, lbs./lm and plow as needed
Above 32, but dropping to 32 or below soon.	Dry	Apply pre-wetted rock salt or direct liquids. Patrol and spot treat as needed. See comments.		160	Patrol and spot treat as needed. See comments.			1) Monitor pavement temperature and precipitation and select appropriate follow up as conditions change.
Above 32, but dropping to 32 or below soon.	Wet, slush, or light snow covered.	Apply pre-wetted or dry rock salt, plow as needed.	180	160	Plow and re-apply pre-wetted or dry rock salt as needed.	115	100	1) Application will need to be more frequent at lower temperature and higher snowfall rates. 2) Adjust application rates as surface conditions and precipitation intensities change.
23 to 32	Dry	Apply pre-wetted rock salt or direct liquids.		160	See comments.			1) Monitor pavement temperature and precipitation and use select appropriate follow up as conditions change.
23 to 32	Wet, slush or light snow covered.	Apply pre-wetted or dry rock salt, plow as needed.	200	160	Plow and re-apply pre-wetted or dry rock salt as needed.	115	100	1) Application will need to be more frequent at lower temperature and higher snowfall rates. 2) Adjust application rates as surface conditions and precipitation intensities change.
15 to 23	Wet, slush or light snow covered.	Apply pre-wetted rock salt, plow as needed.	250	200	Plow and re-apply pre-wetted rock salt as needed.	180	160	1) If sufficient moisture is present, dry rock salt can be applied. Dry pavement at these temperatures is better left untreated if snow does not track to surface.
Below 15	Dry or light snow covered. Wet and Snow/ice/slush	Plow as needed. If previous salt applications made, plow and apply pre-wetted rock salt as needed.		200	Plow as needed. If previous salt applications made, plow and re-apply pre-wetted rock salt as needed.		160	1) Abrasives can be applied to enhance traction, a heavy salt mix will create glazing. Refer to Snow & Ice Guidelines Section 5.4406 (B) for abrasive application rates. Apply rock salt in anticipation of rising temperatures. 2) If salt had been applied prior, continue with pre-wet salt as needed.

Notes: 1) Rush Period Traffic on high volume highways may require more aggressive initial treatments. 2) Use weather information to anticipate changes in storm intensity, precipitation type, and surface temperatures; Use appropriate guideline for heavier intensity or precipitation type change. 3) Rates may need to be increased if cycle times are longer than normal. 4) In the event of hard pack or icing development, adjust application rates as needed. 5) For pre-storm anti-icing operations, refer to direct liquid chemical application guides lines. Consider use of follow-up application rates for initial maintenance action if pre-storm liquid anti-icing is effective.

MODERATE OR HEAVY SNOW

(Moderate: ½”/- 1”/hour; visibility ¼ to ½ mile) (Heavy: More than 1”/hour; visibility < ¼ mile)

Surface Temp. Range (° F)	Surface Condition	Initial Maintenance Action	Dry Rock Salt Lbs./lm.	Pre-Wetted Rock Salt Lbs./lm	Follow Up Action	Follow Up Rock Salt Lbs./lm	Follow Up Pre- Wetted Rock Salt Lbs./lm	Comments
Above 32	Wet, slush or light snow covered.	Patrol and spot treat as needed. See comments.			Patrol and spot treat as needed. See comments.			1) Monitor pavement temperature for drops toward 32 F. 2) Blast isolated icy patches with salt, treat slushy areas beginning to freeze with 180 dry/160 pre-wet. lbs./lm and plow as needed.
Above 32, but dropping to 32 or below soon.	Dry	Apply pre-wetted rock salt or direct liquids. Patrol and spot treat as needed. See comments.		160	Patrol and spot treat as needed. See comments.			1) Monitor pavement temperature and precipitation and select appropriate follow up as conditions change.
Above 32, but dropping to 32 or below soon.	Wet, slush, or light snow covered.	Apply pre-wetted or dry rock salt, plow as needed.	180	160	Plow and re-apply pre-wetted or dry rock salt as needed.	180	160	1) If normal cycle times can not be maintained, the application rates can be increased to 220 dry/180 pre-wet, lbs./lm to accommodate longer cycles.
					Slushy Conditions	115	100	
23 to 32	Dry	Apply pre-wetted rock salt or direct liquids.		160	See comments.			1) Monitor pavement temperature and precipitation and use select appropriate follow up as conditions change.
23 to 32	Wet, slush or light snow covered.	Apply pre-wetted or dry rock salt, plow as needed.	200	160	Plow and re-apply pre-wetted or dry rock salt as needed.	200	160	1) If normal cycle times can not be maintained, the application rates can be increased to 250dry/200 pre-wet, lbs./lm to accommodate longer cycles. 2) See notes below.
					Slushy Conditions	115	100	
15 to 23	Wet, slush or light snow covered.	Apply pre-wetted rock salt, plow as needed.	250	200	Plow and re-apply pre-wetted rock salt as needed.	250	200	1) If normal cycle times can not be maintained, the application rates can be increased to 325 dry/250 pre-wet, lbs./lm to accommodate longer cycles. 2) See notes below.
					Slushy Conditions	200	100	
Below 15	Dry or light snow covered.	Plow as needed.			Plow as needed.			1) Abrasives can be applied to enhance traction, a heavy salt mix will create glazing. Refer to Snow & Ice Guidelines Section 5.4406 (B) for abrasive application rates. Apply rock salt in anticipation of rising temperatures. 2) If salt had been applied prior, continue with pre-wet salt as needed.
	Wet and Snow/ice/slush	If previous salt applications made, plow and apply pre-wetted rock salt as needed.		200	If previous salt applications made, plow and re-apply pre-wetted rock salt as needed.		160	

Notes: 1) Rush Period Traffic on high volume highways may require more aggressive initial treatments. 2) Use weather information to anticipate changes in storm intensity, precipitation type, and surface temperatures; Use appropriate guideline for heavier intensity or precipitation type change. 3) Rates may need to be increased if cycle times are longer than normal. 4) In the event of hard pack or icing development, adjust application rates as needed. 5) For pre-storm anti-icing operations, refer to direct liquid chemical application guides lines. Consider use of follow-up application rates for initial maintenance action if pre-storm liquid anti-icing is effective.

Results so far:

- Lbs./LM standard unit of measure
- Brine use – Reliably 45-80 gallons per lane mile
- Salt use conditional on temp/weather
 - 100-500 lbs./LM
- Pre-wetting nearly universally recommended by northern states
- Neighboring jurisdictions and agencies assess in field
 - Methods do not appear to be standardized in most cases
- Spotty state published info on alternative deicers
- Other BMP info varies widely (spreader calibration, storage info, etc.)

