Liquid Roadway Treatments
Technical Reference Guide

For Clear Roads by Stonebrooke Engineering
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Definitions

- **Anti-Icing:** A proactive treatment (sometimes called pretreatment) that involves applying a liquid treatment prior to the onset of a snow event that prevents snow and ice from bonding to the road surface.
- **De-Icing:** A reactive treatment for melting existing snow and ice from a surface, either as a treatment by itself, or to aid in mechanical removal.
- **Direct Liquid Application (DLA):** The use of liquid-only treatments before, during, and after a storm event for anti-icing and de-icing.
- **Liquid-Only Plow Route:** A plow route on which only liquid treatments are used for anti-icing and de-icing when weather conditions fall within appropriate parameters.
- **Salt Brine:** A solution comprised of 23.3% sodium chloride (NaCl) and 76.7% water by weight.
- **Magnesium Chloride:** A solution comprised of magnesium chloride (MgCl) and water (ratio varies).
- **Calcium Chloride:** A solution comprised of calcium chloride (CaCl2) and water (ratio varies).
- **Granular:** Rock salt in solid form.

Usage Parameters

Table 1: Recommended Anti-Icing Parameters Prior to a Storm Event

Parameter	Salt Brine	Magnesium Chloride	Calcium Chloride
Pavement Temperature[1]	15°F or above	0°F or above[2]	0°F or above[2]
Time Remaining Until Storm	Within 24 hours[3]	Within 48 hours[3]	Within 48 hours[3]
Precipitation	None[4]	None[4]	None[4]

Notes:

1. *Consider temperature trends (increasing/decreasing temperatures)*
2. *Additives are available can reduce the freezing point of magnesium chloride. Magnesium chloride and calcium chloride are not recommended at pavement temperatures above 40°. Work with vendors to verify temperatures.*
3. *Applying anti-icing closer to the storm reduces the chances of traffic pushing the treatment off the roadway.*
4. *Rainfall prior to a snow storm event dilutes liquid applications, which reduces their effectiveness*

Table 2: Recommended DLA Parameters During a Storm Event

Parameter	Most Favorable For Liquid Treatment	Consider Using Liquid Treatment
Pavement Temperature[1]	15°F or above (salt brine) 0°F or above (magnesium chloride)[2] 0°F or above (calcium chloride)[2]	15°F or above (salt brine) 0°F or above (magnesium chloride)[2] 0°F or above (calcium chloride)[2]
Storm Intensity (inches/hour)	Light Snow (less than 0.5 inch/hour)	Medium Snow (0.5 to 1.0 inch/hour)
Moisture Content[3]	Ordinary (approx. 10:1 snow/liquid ratio)[3]	Dryer Snowfall

Notes:

1. *Consider temperature trends (increasing/decreasing temperatures)*
2. *Additives are available can reduce the freezing point of magnesium chloride. Similar temperature ranges are recommended for calcium chloride. Work with vendors to verify temperatures.*
3. *Wet snow can dilute liquid applications, which reduces their effectiveness*

Direct Liquid Application Rates & Cycle Times

Agencies have had success with direct liquid application rates generally from 20 gallons per lane mile (gplm) to 80 gplm, depending on conditions, timing, if granular is also being applied, level of service, and other local factors. Your local experience will allow you to fine-tune your application rates.

Cycle times will vary depending on location. Shorter cycle times help reduce refreeze potential, and longer cycle times increase dilution-refreeze potential. Generally about 1.5 or 2 hours is considered a preferred cycle time. Cycle time incudes the time needed to refill the truck tanks and the "dead head" time to the treatment route. As cycle times increase, supplementing liquids with direct granular should be considered.

Table 3: Suggested Liquid Roadway Treatments Application Rates (adjust based on local experience)

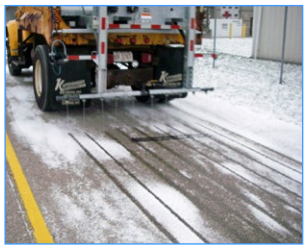
Application rates are in gallons of salt brine per lane mile (gplm)

Event Type	Pavement Temperature			
	32-30°F	29-27°F	26-24°F	23-15°F
For 2-Hour (or less) Cycle Times				
Light Snow (less than 0.5 inch/hour)	20 gplm	35 gplm	40 gplm	55 gplm
Medium Snow (0.5 to 1.0 inch/hour)[1]	35 gplm	45 gplm	55 gplm	Not Recommended
For 3-Hour Cycle Times[3]				
Light Snow (less than 0.5 inch/hour)	35 gplm	50 gplm	65 gplm	80 gplm
Medium Snow (0.5 to 1.0 inch/hour)[1]	50 gplm	65 gplm	80 gplm	Not Recommended

Notes:

1. *For medium snow events, only consider using liquid treatments based on your experience, and when other factors are highly favorable, such as pavement temperature and moisture content.*
2. *It is suggested to generally supplement the liquid application with a light direct pre-wet granular application (70 pplm) when possible (especially as dilution-refreeze potential increases).*
3. *For cycle times greater than 2 hours, supplementing liquids with direct granular is strongly suggested.*
4. *For magnesium chloride, calcium chloride, additives, and blends, work with vendors to verify application rates.*

General Tips



- Supplementing liquid treatments with granular can achieve a "best of both worlds" solution by producing the full road liquid coating (to prevent bonding), some traction (granular), and also allowing the granular to slow down the dilution of the liquid treatment.
- If the storm is severe, consider using only mechanical snow removal until the severity lessens, and then resume liquid treatments.
- Liquid treatments can be used on hard packed snow to loosen it for plowing.
- Magnesium chloride and calcium chloride are typically 2-5 times the cost of brine, depending on location and vendor. The application rates of magnesium chloride and calcium chloride are typically 30% lower than salt brine.