Materials and Quality Control

Practical and Eutectic Temperatures of Deicers

Multiple products can be used in a snow and ice control program. This chart helps you choose the correct product and apply it under the correct conditions. For further guidance on blending chemicals, see the MNDOT Anti-icing Guide, in Appendix B.

Chemical	Lowest Practical Melting Temp.	Eutectic Temp.	Optimal Concen-tration
NaCl (Sodium Chloride) —Delivered as solid rock salt, also can be made into a brine. The basis of most deicing materials. Very corrosive. Inexpensive. Very available. Rarely has a corrosion inhibitor added.	15º F	-6º F	23%
$MgCl_2$ (Magnesium Chloride)—Delivered as a liquid. Often used to wet NaCl crystals to increase adherence to surface and reduce melting points. Corrosive. Higher cost. Often has a corrosion inhibitor added.	-10º F	-28º F	27 to 30%
$CaCl_2$ (Calcium Chloride)—Delivered as flakes, pellets, or liquid. Powerful deicer but extremely corrosive. Sometimes used incorrectly to open storm drains. Higher cost. Often has a corrosion inhibitor added.	-20º F	-60º F	30%
CMA (Calcium Magnesium Acetate)—Delivered as a powder, crystals, pellets, or liquid. Liquid CMA is used mainly on automated bridge deicing systems. Non-corrosive, biodegradable. Sometimes added to sodium chloride as a corrosion inhibiter. Alternative for areas where chloride use must be limited. Often higher cost.	20º F	-18º F	32%
KAC (Potassium Acetate)—Delivered as a liquid. Often used on automated bridge deicing systems and airports. Use for anti-icing, deicing, and prewetting. Non-corrosive, biodegradable. Alternative for areas where chloride use must be limited. Higher cost.	-15º F	-76º F	50%
Blends— Both chlorides and acetates exist in blends. Talk to your supplier and determine the lowest practical melting temperature, the optimal concentration and the basic components in the blend. Most blends are centered on rock salt since it is cheap.			
Winter Sand/Abrasives—Winter sand has salt mixed in it to keep it from freezing. Sand should be used for cold temperatures when deicers are not effective. They provide temporary traction but only work when they are on top of the ice.	Never melts—provides traction only		

Figure 12: Practical and Eutectic Temperatures of Deicers

Material Conversions

The following quick reference table will help you convert between tons and cubic yards. Weight will vary depending on moisture content and density. This chart is based on a density of 80lbs/cubic foot.[12]

Sand		Salt	
Yards	Tons	Yards	Tons
1	1.4	1	1.1
2	2.8	2	2.2
3	4.2	3	3.2
4	5.6	4	4.3
5	7	5	5.4
6	8.4	6	6.5
7	9.8	7	7.6
8	11.2	8	8.6
9	12.6	9	9.7
10	14	10	10.8
11	15.4	11	11.9
12	16.8	12	13
13	18.2	13	14
14	19.6	14	15.1
15	21	15	16.2
16	22.4	16	17.3
17	23.8	17	18.4
18	25.2	18	19.4
19	26.6	19	20.5
20	28	20	21.6

Figure 13: Material Conversions
Minnesota Snow and Ice Control: Field Handbook for Snowplow Operators, Second Revision, published by the Minnesota Local Road Research Board, 2012.

Materials Testing

It is important to understand how deicing chemicals will react on the roadway. Clear Roads developed a guide for testing the effectiveness of chemicals. See Appendix E.

Also test your materials to ensure that they are delivered as ordered and will perform as needed. Refer to your contract or Material Safety Data Sheet (MSDS) for optimal specific gravity and test for that. Michigan's state bid standard for moisture in road salt is 1.5%.

Testing solid salt

Having a standard for the moisture content in your salt prevents having to pay for water weight, and helps reduce the amount of leaching potential should you decide to pretreat the salt. Salt with excessively high moisture content is also more likely to freeze in storage and become difficult to work with.

- Watch the load being dumped and observe if it appears wet.
- Schedule deliveries for days when it is not raining, if delivery will occur outside.
- Test for moisture content. Typically you want a moisture content of less than or equal to 1.5% (check your agency's specification).

How to measure the moisture content of rock salt:

1. Supplies needed:
    - Calibrated scale (triple beam or digital) accurate to 0.1 grams
    - Microwave
    - Sample of the salt (about 1 cup), that is a good representation of the pile
    - Worksheet for recording weight measurements

2. What to do:
    - Place empty container on scale, zero out scale to account for your container.
    - Weigh sample before cooking and record weight on worksheet.
    - Cook sample on low heat (high power may be too hot and make the salt pop, compromising the weight of your sample).
    - Measure cooked/dry weight, record on worksheet.
    - Perform moisture calculations on the worksheet.
    - Save worksheet.

Salt Moisture Worksheet

Date: Company:

P.O. #: Ticket #:

A. Weight of wet salt

B. Weight of dry salt

C. Weight loss (A-B)

Moisture Calculations:

C÷A X 100 = _____ %moisture ***

Tested by:

Remarks:

***Typically you want a moisture content of less than or equal to 1.5% (check your agency's specification).

Testing sand

- Conduct a visual inspection of the material to make sure it is clean.
- Note that each agency has its own specifications based on available materials.

Testing liquids

- Take a 2 cup sample before unloading the tanker truck, use a clean container.
- Make sure you have the correct hydrometer for your material.
- Measure the specific gravity of the liquid using a hydrometer or salimeter.
- Record the results. Salt brine should have a salimeter reading of 85%, or a hydrometer reading of 1.176, which equates to 23.3% salt in the brine.
- Accept the load if the specific gravity is within specifications; if it doesn't meet specifications, don't unload, and notify the responsible supervisor.
- Keep a labeled, dated and sealed sample.