PAVEMENT TECHNOLOGY ADVISORY
- DEICING/ANTI-ICING CHEMICALS -
PTA-D8

BACKGROUND

The rise in cost of traditional deicing/anti-icing chemicals as a result of supply shortages leads to greater competition from other products on the market. Some of these products are relatively new (i.e. agricultural byproducts), while others have been around for some time and are prohibited by moratorium for use in Illinois (i.e. magnesium chloride ($MgCl_2$)).

Many of the products are very effective deicing/anti-icing chemicals but can do considerable damage to pavements and bridges. This document will provide resources for information as well as general guidelines to assist in selecting products. For guidance on application procedures, consult Chapter 6 of the Snow and Ice Manual or contact the Weight Enforcement Engineer of the Bureau of Operations at (217) 782-2984.

RESEARCH

Recent research findings have demonstrated specific mechanisms of deterioration in concrete exposed to magnesium chloride and calcium chloride chemicals. The research was performed by Dr. Larry Sutter from the Michigan Technological University. The two-page project summary at the following link will provide more resources.

http://www.misti.mtu.edu/pdf/projects/SDDOT-Sutter.pdf

Illinois's experience using agricultural byproducts is limited. These products are said to improve the spreading characteristics of the salt, potentially resulting in reduced spread rates and less frequent spreading. Using these materials appears to reduce corrosion on spreading equipment and the need for regular vehicle washing, as well as potentially reducing the amount of salt used. The potential deleterious effects to concrete have not been studied. Potential concerns are the types of chloride used to modify the byproduct to make them effective for deicing, as well as the skid resistance of the surfaces after the residue remains.

MAINTENANCE STRATEGIES

There are several maintenance strategies that can be employed to assist with snow and ice control.

1. Reduce accumulation of snow through geometric designs or use of snow fences.

2. Better predict when to apply chemicals through use of the Road Weather Information System (RWIS).

3. Improve application of chemicals with electronic distribution systems and brine for frost prevention.

4. Maximize chemical benefits by pre-wetting solid chemicals with brine, which allows chemicals time to work before removal process or re-application.

5. Reduce the amount of chemicals used.

ILLINOIS SPECIFIED AND PREFERRED CHEMICALS

Illinois currently allows the use of the following chemicals:

***Sodium Chloride (NaCl)*:** This chemical is allowed in the form of either Rock Salt or Evaporated & Solar Salt meeting AASHTO M143 Type I, Grade 1. This chemical may be applied either directly or as brine with a 23% concentration. The effective temperature for its application is ≥ 15 °F.

***Calcium Chloride ($CaCl_2$)*:** This chemical is applied as brine either directly on bridge decks or as a pre-wetting agent on rock salt for use on pavements. The brine has a 32% concentration. Its use should be limited to the coldest temperatures, below 20 ºF, due to its deleterious effects on concrete.

ALTERNATIVE PRODUCTS

There are no current Illinois specifications for alternative products. The use of these products should be based upon a lack of traditional, specified deicing and/or anti-icing products. If interested in using an alternative product, contact the Weight Enforcement Engineer of the Bureau of Operations at (217) 782-2984 to determine if it will be allowed for use.

The following categories were taken from the Pacific Northwest Snowfighters (PNS) website. This is a well respected organization that performs extensive testing and research on various products marketed for deicing and anti-icing. If you have questions about a particular product, consult the lists at the following link:

http://www.wsdot.wa.gov/partners/pns/pdf/PNSQPL9-28-07.pdf .

The following list provides the PNS categories of deicing and/or anti-icing products. Also included are generic guidelines for selection purposes.

- Corrosion Inhibited Liquid Magnesium Chloride – Not allowed in Illinois by moratorium due to deleterious effects on concrete.

- Corrosion Inhibited Liquid Calcium Chloride – Illinois has limited experience with byproducts; therefore, these should be used with caution due to concerns with skid resistance and residue remaining on pavement. Ensure the product is not enhanced with magnesium chloride. Calcium chloride is known to have deleterious effect on concrete. Limit use of these products to temperatures below 20 °F.

- Non Corrosion Inhibited Liquid Calcium Magnesium Acetate (CMA) – Not recommended for use on concrete. Research has shown various problems on airport runways due to expansive alkali silica reaction products forming as a result of the use of susceptible aggregates and CMA solutions. Illinois's deicing chemical testing does not include CMA.

- Calcium Magnesium Acetate (CMA) Solid – Not recommended for use on concrete. Research has shown various problems on airport runways due to expansive alkali silica reaction products forming as a result of the use of susceptible aggregates and CMA solutions.

- Corrosion Inhibited Sodium Chloride – Ensure the product is not enhanced with magnesium chloride. Caution should be taken with agricultural byproducts due to concerns with skid resistance and residue remaining on pavement.

- Corrosion Inhibited Sodium Chloride Plus 10% Magnesium Chloride – Not allowed in Illinois by moratorium.

- Corrosion Inhibited Sodium Chloride Plus 20% Magnesium Chloride – Not allowed in Illinois by moratorium.

- Non Corrosion Inhibited Solid Sodium Chloride – Make sure product meets AASHTO M143 Type I, Grade 1.

- Standard Gradation, Road Salt, Moisture less than 0.5% – Make sure product meets AASHTO M143 Type I, Grade 1.

- Standard Gradation, Road Salt, Moisture less than 5.0% – Make sure product meets AASHTO M143 Type I, Grade 1.

- Fine Gradation, Brining Salt, Insoluble Material less than 1%, Moisture less than 0.5% – Make sure product meets AASHTO M143 Type I, Grade 1.

- Fine Gradation, Road Salt, Moisture less than 0.5% – Make sure product meets AASHTO M143 Type I, Grade 1.

- Liquid Corrosion Inhibited Products
  - Potassium Acetate (KA) – Little is known about these products. Lab testing was inconclusive; product failed to melt ice during testing for scaling and freeze/thaw. Potassium acetate is a suspect in the Denver CO airport runway concrete failures.
  - 12.5% CMA / 25% KA – Do not use CMA on concrete.
  - 25% KA / 30% Carbohydrate material – Little known about either product; therefore, use caution.
  - 20% NaCl / 2% $CaCl_2$ – Combination that is likely used in Illinois already.
  - 25% $CaCl_2$ / 2% $MgCl_2$ / 3% other chlorides – Not allowed in Illinois by moratorium.
  - Sodium Chloride Brine – Used in Illinois. Make sure not enhanced with magnesium chloride, which is not allowed in Illinois.

If you have any questions regarding the use of a product or the information presented here, please contact:

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