

## RESULTS SUMMARY

New guidelines provide application rates for liquid deicing agents across a range of field conditions, including lower pavement temperatures.

## PROJECT DETAILS

**Project Title:** Expanding Application Rate Guidance for Salt Brine Blends for Direct Liquid Application and Anti-Icing

**Project Number:** CR19-01

**Project Cost:** \$150,000

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# EXPANDED GUIDANCE FOR APPLYING LIQUID DEICING MATERIALS

## Need for Research

Using deicing liquids to clear snow- and ice-covered roads can be more effective and economical than salt and other materials. Under the right circumstances, direct application of salt brine and brine blends can be an effective tool in winter maintenance while also using less salt than traditional granular applications. Practices that use less salt and granular abrasives can translate into economic and environmental benefits—less waste, reduced impacts to the environment and lower road maintenance costs.

But choosing the right liquid deicing agents and application rates to keep roads clear of snow and ice depends on road and weather conditions. [Previous research](#) resulted in a [guidebook](#) that provides best practices for a range of winter maintenance material topics. However, the research involved limited field testing, and the guidance does not fully address material application rates for deicing at lower pavement temperatures (from 0° to 25°F) and diverse roadway surface conditions. For Clear Roads member agencies to take full advantage of these effective and efficient deicing techniques, they needed more complete information about appropriate application rates for salt brine and brine blends, particularly practitioner recommendations for application rates at low temperatures.

## Objectives and Methodology

The goal of this project was to expand existing guidance on application rates for salt brine and brine blends for liquid applications at low pavement temperatures and under diverse pavement conditions.

Researchers began with a review of existing literature on anti-icing and deicing products and application rates, including performance measures and environmental impacts. Then they surveyed winter maintenance practitioners across the country about road clearing practices and related issues, with a focus on materials, application rates, predominant winter conditions and performance measures. Using the results from the survey, researchers identified field sites to test various liquid deicer materials. They collected data from 167 winter storms on 31 routes in nine states, representing a wide range of winter conditions and road types. Additional consultations with practitioners validated the data.



New application rate guidance for liquid deicers addresses a range of pavement temperatures, temperature trends, road surface conditions and materials used.

## Results

Building on the previous Clear Roads research, investigators collected extensive field data and practitioner input to develop [expanded application rate guidance](#) on using liquid materials for winter road deicing under certain conditions. Guidance for application rates in light snow (less than 0.5 inch per hour) is provided based on pavement temperature, road surface condition, temperature trend and materials used.

To develop the guidelines, researchers tested materials including salt brine, magnesium chloride, and brine blended with calcium chloride and/or Geomelt, an organic additive. Consistent with practitioner recommendations, the researchers found that once pavement temperatures drop below 20°F, brine is generally more effective when blended with other chemicals. Researchers also tested the combined application of liquid and solid material, distributed by the same truck or separately.

Investigators developed deicing liquid application rate recommendations for six materials at a range of pavement temperatures:

- Salt brine (20° to 32°F).
- Magnesium chloride (20° to 32°F).
- Salt brine and calcium chloride (15° to 25°F).

- Salt brine and Geomelt (15° to 32°F).
- Salt brine, calcium chloride and Geomelt (0° to 20°F).
- Salt brine and dry salt (0° to 32°F).

For each pavement temperature range, specific guidance is provided based on air temperature trends (rising, falling or holding steady) and road surface conditions (dry, light snow cover, slush or icy patches). The field data researchers used to compile the guidance was validated through consultation with practitioners based on their experiences with specific practices. While most of the data-based recommendations were confirmed by practitioners, the recommendations for combined liquid and solid material were altered based on agency experience regarding ratios and effects at different pavement temperatures.

## Benefits and Further Research

This project resulted in guidelines that will assist winter maintenance managers in efficiently and effectively applying salt brine and brine-blend deicing liquids at lower pavement temperatures in winter storms with light snow. The guidelines may be updated as agencies gain more experience with the materials and as newer, more advanced products become available. Additionally, further research could inform liquid deicing and anti-icing application rates for other materials and different winter conditions.

“This research provides comprehensive guidelines for using liquid deicing agents to help winter maintenance practitioners choose the right methods and materials for a range of temperatures and road conditions.”

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