

Executive Summary, Research Readiness Level Assessment, and Technology Transfer

Mechanical Rocker Test Validation

Research Objectives

The objective of this investigation was to evaluate the Mechanical Rocker Test Method for Ice Melting Capacity (MRT-IMC) [2] for validity and suitability as a standard test method for assessing deicer performance for NDOT approved deicing products.

Research Benefits

This research provides NDOT a test that ensures the highest quality deicers are delivered to NDOT maintenance forces.

Principal Investigators

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Background

The anti-icing and deicing industry has interest in the development of an objective, repeatable test procedure for the evaluation and comparison of anti-icing and deicing products. Pursuant to this goal, the Nebraska Department of Transportation (NDOT) funded research at the University of Nebraska-Lincoln (UNL) to investigate methods for evaluating deicing products, beginning in 2011^[1]. Researchers at UNL developed the procedure for the Mechanical Rocker Test for Ice Melting Capacity (MRT or MRT-IMC) in 2014^[2].

From 2017-2019, NDOT evaluated the MRT-IMC procedure for validity and suitability as a standard test procedure for assessing deicer performance. NDOT also explored opportunities to improve the procedure that could improve precision. This included testing temperature, freezer configuration, timing critical steps, rocking effect, ice-cube breakage, and the effect of settleable solids. Following exploration in these areas, the MRT-IMC was modified to minimize error. NDOT first validated the MRT-IMC and determined an intra-laboratory, single operator precision. NDOT then shared the modified procedure with three collaborating labs to conduct an inter-laboratory study for further validation of the MRT-IMC.

Conclusion

The results of this validation study indicate that the MRT-IMC is a valid and repeatable standard test method for assessing ice melting capacity of deicing products. NDOT validation of the method included the modification of the procedure by shortening time windows that ice is exposed to the ambient temperature in the lab. The resulting single-operator CV is 2.66%. The multi-laboratory CV is 5.65%, indicating that the MRT-IMC will provide consistent, repeatable results.



The Mechanical Rocker

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Final report is available:
[HERE](#)

NDOT Recommendations Based Off Research Project - 2020

The MRT was validated at 15 minutes to be a reliable and consistent test for measuring the melting power of liquid deicers. In the Spring of 2020, NDOT utilized the MRT-IMC (15-minute test) in the scoring of bids during a solicitation for Corrosion-inhibited Liquid Magnesium Chloride (Clear Roads Product Category 1). NDOT will follow up with the proposed MRT-IMC₉₀ test procedure to develop a curve that establishes melting capacities at various time intervals; 15, 30, 60 and 90 minutes. The curve will indicate a product's performance over a time interval similar to the time to maintain a plow truck route, which could provide winter maintenance personnel insight as to how long a particular deicer could be effective in the field.

- As provided by Wally Heyen, PCC Engineer, and Ty Barger, Hwy Operations Assistant Division Manager, Lead TAC Members

NDOT Recommendations Based Off of Research Project - 2025

The Department has been using the 15-minute MRT-IMC test in the scoring of bids during a solicitation for Corrosion-inhibited Liquid Magnesium Chloride (Clear Roads Product Category 1) and as part of its QA program since 2020. Through the Clear Roads pooled fund, Clear Roads successfully completed a research project that continued development of the MRT-IMC based on NDOT's validation Research. The goal was for the MRT-IMC to be accepted as a nationally recognized provisional test method for ice melting capacity and implemented in the Transportation Community industry practice by AASHTO. Originally set to be codified in 2024, a formatting concern pushed back its publication date, now expected to be summer 2025. It will be published as a provisional test to allow other State Departments of Transportation to evaluate the test themselves and potentially provide feedback. The NDOT will not follow up with the MRT-ICM₉₀ test procedure nor develop a curve at various time intervals at this time due to concerns on the contribution of heat transfer of the ambient room temperature that would significantly contribute to ice melting after the initial 15-minute test interval.

- As provided by Jasmine Dondlinger, Chemistry Lab Manager

Research Readiness Level (RRL) Assessment Level 5: Standard Practice

RRL 5

Research adopted; no further evaluation required.

Moved up from RRL Level 3 Development/Field-Level, assessed in 2020.

Technology Transfer

Webinars/Presentations

- APWA Western Snow and Ice Presentation, Loveland, Colorado - 2019
- <https://www.clearroads.org/project/18-06/>

This brief summarizes “In House Research Validation of the Mechanical Rocker Test Method for Ice Melting Capacity (MRT-IMC)”
Nebraska Department of Transportation Research Program