

TECHNICAL REPORT TITLE PAGE

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When Scraping Ice**4. TYPE OF REPORT & PERIOD COVERED**

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8. ABSTRACT

One of the challenges that faces winter maintenance personnel is how much chemical to apply to the road under given conditions. Insufficient chemical can lead to the road surface becoming slick, and the road thus becoming unsafe. In all likelihood, additional applications will have to be made, requiring additional effort and use of resources. However, too much chemical can also be bad. While an excess of chemical will ensure (in most circumstances) that a safe road condition is achieved, it may also result in a substantial waste of chemical (with associated costs for this waste) and in ancillary damage to the road itself and to the surrounding environment. Ideally, one should apply what might be termed the “Goldilocks” amount of chemical to the road: Not too much, and not too little, but just right.

Of course the reality of winter maintenance makes achieving the “Goldilocks” application rate somewhat of a fairy tale. In the midst of a severe storm, when conditions are poor and getting worse, the last thing on a plow operator’s mind is a minute adjustment in the amount of chemical being applied to the road. However, there may be considerable benefit and substantial savings to be achieved if chemical applications can be optimized to some degree, so that wastage is minimized without compromising safety. The goal of this study was to begin to develop such information through a series of laboratory studies in which the force needed to scrape ice from concrete blocks was measured, under a variety of chemical application conditions.

Ice may appear on the road as compacted snow ice, refrozen ice, or atmospheric ice. These ice types are different in microstructure, mechanical behavior, and adhesion to the road surface. However, reports on the effects of ice type on the removal of ice from pavements are rare.

In addition to examining how ice type affects the extent to which ice adheres to the pavement, this study also examined how various rates and types of de-icing chemical application effects the scraping resistance of ice on the pavement. Specifically, solid salt (Sodium Chloride), solid Calcium Chloride, and a liquid salt solution or brine were tested at different quantities of application, and also for differing delay times after application prior to scraping. It is well known that de-icing chemicals cause ice to melt. However, there are no data that indicate how application of such chemicals weakens ice strength, and specifically, how much such chemicals make ice easier to scrape from the pavement. De-icing chemicals are not applied with the intent of melting all the snow and ice on the pavement – such would require prohibitive quantities of chemicals be applied. The aim of such applications is to break the bond between ice and pavement, and thus make scraping away of the ice easier. This study aims to address this issue and begin the process of developing meaningful data on this issue.

9. KEY WORDSwinter maintenance, de-icing chemicals, ice
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