

ABSTRACT

Effective winter maintenance makes use of freezing-point-depressant chemicals (also known as ice-control products) to prevent the formation of the bond between snow and ice and the highway pavement. In performing such winter maintenance, the selection of appropriate ice-control products for the bond prevention task involves consideration of a number of factors, as indicated in Nixon and Williams (2001). The factors are in essence performance measurements of the ice-control products, and as such can be easily incorporated into a specification document to allow for selection of the best ice-control products for a given agency to use in its winter maintenance activities.

Once performance measures for de-icing or anti-icing chemicals have been specified, this allows the creation of a quality control program for the acceptance of those chemicals. This study presents a series of performance measurement tests for ice-control products, and discusses the role that they can play in such a quality control program. Some tests are simple and rapid enough that they can be performed on every load of ice-control products received, while for others, a sampling technique must be used. An appropriate sampling technique is presented. Further, each test is categorized as to whether it should be applied to every load of ice-control products or on a sampling basis.

The study includes a detailed literature review that considers the performance of ice-control products in three areas: temperature related performance, product consistency, and negative side effects. The negative side effects are further broken down into three areas, namely operational side effects (such as chemical slipperiness), environmental side effects, and infrastructural side effects (such as corrosion of vehicles and damage to concrete). The review indicated that in the area of side effects the field performance of ice-control products is currently so difficult to model in the laboratory that no particular specification tests can be recommended at this time. A study of the impact of ice-control products on concrete was performed by Professor Wang of Iowa State University as a sub-contract to this study, and has been presented to the Iowa Highway Research Board prior to this report.

Five possible specification tests were examined in further detail in this study, three of which (ice melting capacity, freeze point determination, and ice penetration tests) pertained to temperature related performance, whilst the other two (specific gravity and viscosity) pertained to product consistency. A detailed description of how to conduct each test is given. Results from all five tests on seven ice-control products (supplied by various State Departments of Transportation) are presented. Based on the experience gained in conducting this testing, it was decided that the ice penetration test was not a useful specification test but that the other four tests would provide valuable information if used as part of a quality control program for ice-control products.

The study recommends a process whereby these four tests (specific gravity, viscosity, ice melting capacity, and freeze point determination) can be used to ensure that a product both is what it is supposed to be, and performs as it is meant to perform. The process requires that every load of product delivered have a sample taken and stored. Further, the specific gravity of each load of product must be measured prior to product acceptance. The other three specification tests do not need to be performed for each load of product delivered. The frequency with which these tests are to be performed depends on the degree to which prior deliveries of product from a given supplier have met specifications. Results from these four specification tests should be reported by each supplier as part of their bid documentation.

In conclusion, the study presents a method that allows an agency to have a high degree of confidence in the performance not only of the ice-control products currently used by the agency, but also of any new ice-control products that might be introduced in the future. Further, this confidence can be achieved with relatively little effort and cost.