

FY 2009 RESEARCH PROBLEM STATEMENT

Use this form to submit a problem statement

Submittal via E-mail is preferred: Save the form and give it a new, descriptive name, then send to:

barnie.p.jones@odot.state.or.us

ODOT Research Unit
200 Hawthorne Ave. SE, Suite B-240
Salem, OR 97301-5192

Office Phone: (503) 986-2700
FAX Phone: (503) 986-2844

TITLE

CM-09-03 Guidelines for the Use of Magnesium Chloride in Oregon

PROBLEM (Description of need)

Magnesium chloride is an effective anti-icing and deicing chemical. Consequently, ODOT districts apply the chemical in compliance with the public's expectations for snow- and ice-free roads. Currently there are no specific policies as to the application and use of magnesium chloride. Laboratory studies, using accelerated exposure conditions, have demonstrated that deicing chemicals cause deterioration of mortar and concrete specimens. As part of an on-going pooled fund study, work is being done to identify mineralogical changes resulting from exposure to magnesium chloride. Laboratory work, up to this point, has focused on testing new concrete and mortar specimens. The effects of magnesium chloride on existing new and old pavements is unknown. Furthermore, the correlation between existing laboratory results and the effects magnesium chloride solution have on PCC pavement and bridge decks has not been made. The increasing use of magnesium chloride in Oregon especially without a statewide application procedure may result in accelerated and unplanned deterioration of concrete highway components in the future. Oregon needs guidelines that provide effective deicing and anti-icing while minimizing damage to our infrastructure.

PROPOSED RESEARCH, DEVELOPMENT OR TECHNOLOGY TRANSFER ACTIVITY

The research approach would include: quantification of cumulative magnesium chloride exposure; correlation of exposure value to mineralogical changes in field specimens; utilization of laboratory tests results to establish a damage threshold; comparative analysis of field concrete with that of the laboratory specimens; and association of field application practices with damage.

A state-wide survey would be conducted to establish the quantity, concentration, and frequency of application of magnesium chloride chemical used for the various winter conditions in Oregon. A method of quantifying magnesium chloride exposure would be developed so that an exposure value could be determined for any site location. Determining factors would include the age of the site, the application practice, and possibly other factors such as weather and traffic volume, if appropriate or significant.

Concrete pavement and bridge decks, with an identifiable level of magnesium chloride exposure, would be cored to: characterize its mineralogical composition; assess the type and amount of distress or degradation present; and establish magnesium and chloride profiles. These field data would establish the change in mineralogy and composition as a function of magnesium chloride exposure.

A damage threshold would need to be established. The threshold would characterize concrete damage due to mineralogical changes, not stress damage due to corroding rebar (rebar corrosion has been extensively described in previous literature). Past and ongoing research would be reviewed to establish associations between mineralogy, magnesium and chloride levels, and damage. If necessary, further laboratory tests would be conducted to generate information that would establish this relationship between mineralogy, composition, and damage threshold. By combining the field data analysis with the damage threshold information, the relationship between magnesium chloride exposure (and therefore application practice) and onset of damage would be established.

BENEFITS

The research would produce a guideline for applying magnesium chloride to Oregon roads that balances effective anti-icing and deicing with infrastructure preservation. Optimizing the application of magnesium chloride can delay the onset of damage and thereby reduce the costs of maintaining Oregon's highway system.

CONTACT PERSON:

FOR RESEARCH UNIT USE ONLY

Name, address phone number and e-mail	Amanda Bush <i>ODOT Research Analyst</i> 200 Hawthorne SE, B-240 Salem, OR 97301 amanda.bush@odot.state.or.us	<i>NCHRP</i> <i>SPR</i> <i>POOLED FUND</i> <i>STATE</i> <i>OTHER</i>
Keith Johnston <i>ODOT Structural Services Engineer</i> 800 Airport Rd SE Salem , OR 97301-4798 Keith.R.Johnston@odot.state.or.us 503.986.3053		

PLEASE RENAME THE COMPLETED FORM WITH A SHORT NAME RELATING TO THE RESEARCH TOPIC.
Submittal of this form via E-mail is preferred. Send to: barnie.p.jones@odot.state.or.us