

## RESEARCH BRIEF

# Eliminating Ice, Snow and Fog on Snowplow Windshields

Snowplow drivers work under challenging conditions. They operate and navigate large vehicles while winter storms are still in progress, dealing with poor visibility and treacherous roadways. They drive for hours at a time, often at night, under stressful conditions. To compound their challenges, windows and mirrors on snowplow trucks often become covered with snow, ice, fog and frost during winter storms, obscuring the operators' field of vision and raising safety concerns.

In 2002, the University of Iowa conducted a study of lane awareness systems. Although snowplow fogging and icing problems were not the focus of the study, the project's survey of plow drivers revealed that 80% of respondents experienced problems with window icing and fogging.

## Need for Research

Many strategies exist for combating icing and fogging problems, but staff at individual DOTs may not be aware of all of them, especially if they have used the same type of equipment for many years. A research project was needed to compile information about strategies used at agencies across the country, and to disseminate this information to DOTs in snowy states.

## Objectives and Methodology

This project's goal was to compile the most effective designs, technologies, materials and practices for keeping snowplow glass and mirror surfaces clean of winter precipitation inside and out. Researchers' tasks included:

- Performing a literature search of research and engineering sources. Researchers identified current and completed research related to icing and fogging on snowplows, as well as products that have applications to the problems.
- Conducting phone interviews with winter maintenance professionals. Through these conversations, researchers identified seven specific types of icing and fogging problems encountered on winter maintenance vehicles.
- Developing and distributing two Web-based surveys about icing and fogging problems and their potential solutions. One survey targeted winter maintenance professionals, including shop managers, maintenance supervisors, and fleet managers. The other survey targeted truck and equipment manufacturers.

## Results

More than 200 people responded to the Web-based surveys, representing 30 states and five foreign countries. Their responses—including over 450 written comments—overwhelmingly confirmed that drivers are experiencing the problems discussed in the surveys: fogging on the interior of windshields and side windows, icing on the exterior of windshields and side windows, ice buildup on windshield wipers, and icing on exterior mirrors. At least 82% of the respondents had experienced each problem, and in most cases they considered the problems to be significant.

This research identified a number of strategies that agencies across the country are using to address icing and fogging problems. Researchers grouped the strategies into three categories: short-term, which can be implemented with a relatively small investment; long-term, which generally involve changing specifications for future truck and equipment purchases; and emerging strategies, which were unfamiliar to most survey respondents and need further testing.

Respondents identified several strategies for combating each problem. These included:

- **Interior fogging:** Air conditioning to dry the air; aftermarket accessory fans to increase airflow

### Investigator



"We found several solutions for each icing and fogging problem, both inexpensive fixes and longer-term strategies."

—Patrick Casey  
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### Co-investigators

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## Project Champion



"This research will help agencies learn from each other's successes in combating this serious safety problem."

**-Tim Jackson**  
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Survey respondents identified several strategies for eliminating snow and ice buildup on truck windshields, including plow deflectors and flaps, heaters and defrosters, heated windshields, chemical glass treatments, and winter-grade wipers.

- **Ice and snow on windshields:** Plow deflectors and other modifications to prevent snow from blowing over the top of the plow; standard heating/defrosting system to melt buildup; chemical glass treatments; washer fluid solutions; heated windshields
- **Ice and snow on side windows:** Power windows (especially for the passenger side) to clear buildup; side-window wipers and defrosters
- **Blow-over:** Plow deflectors, plow flaps, hood-mounted wind deflectors, larger plows with appropriate curvature, adjusting the plow angle
- **Ice buildup on windshield wipers:** Winter-grade wipers, heated wiper blades, vertical or top-mounted wipers, aftermarket accessories that mechanically remove buildup
- **Icing on side mirrors:** Heated mirrors

This project's final report includes graphs that compare survey respondents' assessments of multiple solutions to each problem, and an appendix of written comments that offer more detail on respondents' experiences with combating icing and fogging.

## Benefits

By synthesizing the experiences of winter maintenance professionals across the country and internationally, this research allows all interested agencies to benefit from each other's successes in solving these problems. As a first step in disseminating this information, all survey respondents will receive a copy of the project's final report.

In addition, by involving over 200 winter maintenance professionals from 70 agencies in the survey, this research project helped raise the visibility of icing and fogging issues in the winter maintenance community. If maintenance managers become more vocal about requesting icing and fogging solutions from truck and equipment manufacturers, they can convey to manufacturers that there is a substantial market for solutions to these problems.

## Further Research

The results of this project demonstrate a need for additional research involving controlled field tests of strategies for addressing icing and fogging problems. In addition to formal research projects, the investigators recommend that individual agencies test the solutions they feel are most promising and share those test results nationally.

To facilitate this information sharing, Clear Roads has developed an online evaluation form that provides a standard format for agencies to share the results of their own product tests. Clear Roads will maintain a database of all submitted test results on its Web site at [www.clearroads.org](http://www.clearroads.org).

This brief summarizes project CR2005-01, "Synthesis of Best Practices for Eliminating Fogging and Icing on Winter Maintenance Vehicles," produced through the Clear Roads winter maintenance pooled fund project, #TPF-5(092). Clear Roads' lead state is Wisconsin DOT, 4802 Sheboygan Ave., Madison, WI 53707. Thomas Martinelli of Wisconsin DOT is the Clear Roads Technical Advisory Committee Chair (thomas.martinelli@dot.state.wi.us).

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