

RESULTS SUMMARY

The manual developed in this project is designed to help field supervisors and managers improve existing practices for snowplow lighting. It addresses both proactive and key reactive strategies, details their benefits and limitations, and provides specific recommendations for implementation.

PROJECT DETAILS

Project Title: Use of Equipment Lighting During Snowplow Operations

Project Number: CR14-06

Project Cost: \$40,406

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DEVELOPING BEST PRACTICES FOR USE OF EQUIPMENT LIGHTING DURING SNOWPLOW OPERATIONS

Because snowplows often operate during conditions of limited visibility, transportation agencies equip them with lighting that makes them more visible to other drivers, and the roadway more visible to snowplow operators. This includes headlights, work lights and warning lights on both the rear and sides of snowplows to help drivers quickly recognize them. Lighting is also important because snowplows often travel at lower speeds than other traffic.

Need for Research

Despite recent developments in snowplow lighting technologies, a large number of crashes are still caused by the inadequate visibility of winter maintenance vehicles. In 2010, the Ohio Department of Transportation reported 63 crashes statewide involving snowplows during just one month of winter maintenance operations, and 57 crashes during the previous winter. In Michigan, Kent County reports an average of six rear-end crashes each year involving vehicles hitting snowplows. Staff attribute these crashes to the inadequate visibility to drivers of the backs of snowplows.

Consequently, agencies are trying to find the right balance in lighting winter maintenance vehicles: making snowplows as visible as possible to drivers but not so bright that they blind drivers with the resulting glare. Research was needed to help agencies select the right lighting packages and mounting locations for snowplow headlights, work lights and warning lights.

Objectives and Methodology

The goals of this research project were to 1) summarize the best practices used by state departments of transportation and local public works agencies with regard to auxiliary headlights, work lights and warning light technologies in snowplow operations; and 2) make recommendations on the use of various lighting technologies and mounting techniques for snowplow vehicles.



In snowplow headlights, using LED bulbs (top) instead of halogen bulbs (bottom) can improve visibility by allowing operators to more easily see objects at greater distances.

The researchers began by conducting a literature search on snowplow lighting, retroreflective markings, and day-versus-night settings, as well as ways to prevent snow from blowing onto snowplow windshields. The review also documented the impacts of different types of lightbulbs, colors, intensities, mounting locations, flashing patterns and amperage requirements.

The researchers then conducted an online survey of supervisors and managers at state and local winter maintenance agencies concerning best practices and specifications for snowplow equipment lighting. The survey targeted Clear Roads member states as well as other snow and ice control agencies in the United States. The researchers also conducted a similar online survey of state and local snowplow operators. This survey focused on the pros and cons of the kinds of lighting used on equipment operated by respondents.

Finally, the researchers used the literature search and survey information to develop a [best practices guide](#), *Use of Equipment Lighting During Snowplow Operations*.

Results

The survey and literature review results showed that to improve visibility, agencies favor LED bulbs for auxiliary headlights in new vehicles and for retrofits and replacements, although halogen bulbs are still more common on winter maintenance vehicles. However, because LEDs do not produce enough heat to melt snow and ice, they require

a mechanism to keep snow from accumulating on their surfaces, such as wind deflectors or heated lenses. Further, mounting auxiliary headlights away from the operator's line of sight is important to reduce glare caused by LED light reflected by the snow. Using narrow beams mounted at the lowest possible location on the snowplow can help reduce glare.

For warning lights, amber is the color most commonly used by transportation agencies. However, agencies are also using and in some cases testing blue, white and green warning lights. In the survey, operators said they prefer white warning lights because they increase visibility in fog, snowfall or storm conditions. They also indicated that it is important that flashing rear warning lights be spaced apart from steady-burn rear warning lights. Flashing lights help to identify the presence of a plow, while steady-burn lights help drivers estimate the relative speed of the plow.

Survey respondents considered retroreflective tape markings to be very effective at providing an extra level of warning for approaching vehicles. However, during snowplow operations, keeping retroreflective markings clear of snow and visible at all times can be an issue. Finally, respondents noted that excessive brightness caused by warning lights can be resolved by using different settings for daytime and nighttime operations, although this feature is not commonly available on snowplow equipment.

Benefits and Further Research

The manual developed in this project is designed to help field supervisors and managers improve existing practices for snowplow lighting. The manual addresses both proactive and key reactive strategies, details their benefits and limitations, and provides specific recommendations for implementation. The results of this project will also be presented at the 2016 Transportation Research Board annual meeting.

“The best practices manual provides useful guidance for testing new technologies and practices that can improve visibility of snowplows while reducing glare for the traveling public.”

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