

Green Warning Lights Make Winter Maintenance Trucks More Visible

PROJECT TITLE

Effectiveness of Green Strobes on Winter Maintenance Vehicles and Equipment

STUDY TIMELINE

June 2019 – July 2020

INVESTIGATORS

Ali Zockaie, Ph.D. Michigan State University

MDOT CONTACTS/CHAMPIONS

Jim Gaus, Project Manager

Melissa Longworth, P.E., Project Manager

PHONE:

517-281-4004

E-MAIL:

MDOT-Research@Michigan.gov

WEBSITE:

Michigan.gov/MDOTResearch

FURTHER RESOURCES

[MDOT - Effectiveness of Green Strobes on Winter Maintenance Vehicles and Equipment \(michigan.gov\)](#)



Researchers tested an array of light configurations to determine which setup maximizes visibility while minimizing glare.

Introduction

Michigan Department of Transportation (MDOT) winter maintenance vehicles perform critical safety work when clearing snow and ice, but their slower speeds in low-visibility conditions put them at risk for collisions. To make the vehicles easier to see, MDOT began using flashing green lights in 2016 in conjunction with traditional amber warning lights. With a variety of placement options and flash patterns to choose from MDOT sought to identify the best configuration for maximum visibility. This study provided robust data that show the most

effective use of amber and green strobes on MDOT's fleet.

Methodology or Action Taken

First, researchers reviewed existing warning light guidance and publications regarding human visual sensitivity to light colors and flashes. Next, they conducted a survey of state transportation agencies to determine current state of practice concerning warning lights on public vehicles. The survey results provided evidence in support of using a color other than amber. Researchers designed four human factor tests: a conspicuity test, where subjects rated how attention-getting each configuration was; an appropriate driving action test, where subjects stated which driving action they preferred to take when encountering a particular warning light configuration; a maximum peripheral detection angle test, where subjects were asked when they could detect each configuration in their peripheral vision; and a glare rating test, where subjects indicated which light configurations created the worst glare at night. 37 warning light configurations were tested using amber and green strobes. Participants observed stationary and moving test vehicles under a variety of conditions, including both day and night and in adverse weather.

Conclusions or Next Steps

The test data showed that an additional green flashing light improves the visibility of MDOT's winter maintenance vehicles but can also add glare if not properly configured. To balance these interests, researchers found that a combination of amber lights in a quad flashing pattern (four times per second) and single flashing green lights on the back or top of the vehicle was the most effective warning configuration. The finding confirmed the effectiveness of MDOT's original warning light configuration, which turned out to be nearly identical to the researchers' recommendations.

Potential Impacts and Benefits

This research provides extensive data about warning light configurations using amber and green strobes, and it offers beneficial guidance which MDOT staff did not have available at the time green strobes were first installed on MDOT's winter maintenance fleet. The study results firmly support how MDOT uses amber and green warning lights, and the final report provides a resource for Michigan cities and counties seeking guidance on adding green lights to their winter maintenance vehicles. As MDOT continues to use green strobes in upcoming winters, the research results will be a valuable resource in expanding and refining its use of this new safety option.