RESEARCH & DEVELOPMENT

NCDOT Research – Snowplowable Pavement Marker Alternatives Evaluation

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16. Abstract

Pavement markers improve the safety of the traveling public. They are used throughout our state to support the traveling public during dark and inclement weather to navigate lanes with improved lane visibility. While effective, NCDOT wants to evaluate alternative snowplowable pavement marker materials, types, and alternatives to determine if there are any options that are safer, easier to install and/or more cost effective once they become more common; as well as result in less maintenance requirements.

A survey was conducted in 2019 to gauge pavement marker use across the country. The department learned that many states had stopped all metal casting snowplowable pavement markers use, some states had stopped all raised pavement markers altogether, and other states were evaluating alternatives to metal casted markers. Based on marker damage impacts when loosened and dislodged and national direction, research was needed to make the best decision for NCDOT going forward to ensure roadway safety as well as reduce the possible occurances of dislodged markers leading to dangerous conditions during those instances. These alternatives are also being considered for wet/night visibility.

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Background

Pavement markers improve the safety of the traveling public. They are used throughout the state to support the traveling public during dark and inclement weather to navigate lanes with improved lane visibility. While effective, NCDOT wants to evaluate snowplowable pavement marker material, types, and alternatives to determine if there are any options that are easier and/or more cost effective to install once they become more common; as well as result in less maintenance requirements.

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Specific Problem or Issue

Along with many other states, NCDOT is moving toward disallowing metal casting snowplowable pavement markers on future construction projects. Three Divisions have already discontinued the use of metal castings. Metal casting markers have been used by NCDOT, however, we have had several instances over the years of these coming loose, damaging vehicles, and causing injuries. As a result, the Department's Signing and Delineation Unit has been researching possible alternatives to the metal casting. The goal will be to test and evaluate the alternatives identified at specific testing locations.

Scope of Work

To assist the Department with this effort, the NC Turnpike Authority will install six different alternatives on Toll NC 147 this Fall. This will allow the different applications to be observed during a winter season and have the potential to be exposed to one or more snow plowing events. There will be four pavement marking line alternatives and two pavement marker alternatives tested.

The pavement marking line alternatives that will be tested are inlaid thermoplastic marking lines, inlaid wet reflective cold applied plastic tape, surface mounted cold applied marking tape and inlaid paint marking lines. The pavement marker alternatives that will be tested are inlaid raised pavement markers and inlaid cradle markers. The alternatives that are inlaid require a specialized groove in the pavement for the marking or marker to remain effective while also protecting it from traffic and potential snowplow blades.

Research Benefits

This research will enhace safety and decrease damage related costs. Re-writing the specifications for pavement markings and pavement markers based on this research project's findings to allow the methods that yield the most positive results will ensure during low visibility events, such as storms and evening hours lanes are easily detected. This will also reduce or eliminate the instances where markers become loose and damage vehicles or reduce the damage severity when these instances do occur.

Based on this, NCDOT will no longer allow the installation of markers with metal casting starting with the October 2021 project letting.

Conclusions

NC 147 had the following treatments installed. Inlaid paint, inlaid raised pavement markers, inlaid molten thermoplastic, inlaid wet reflective cold applied plastic tape, surface mounted wet reflective cold applied plastic, and inlaid cradle markers; however, due to lack of winter weather conditions at the original location, reflectivity readings might not reflect snowplowed conditions. All treatments stayed in place throughout the project and did not have to be redone or repaired. The reflectivity readings averaged 580 mcd/lux/m2 for all white skip line markings after at least one year.

I-85 had the following treatments installed in the Fall of 2019. Inlaid wet reflective cold applied plastic tape, surface mounted wet reflective cold applied plastic, inlaid extruded thermoplastic, and inlaid non-metal casting markers. This location was also not snowplowed. These treatments were recently reviewed and showed similar results to NC147. Again, all treatments stayed in place throughout the project and did not have to be redone or repaired. The reflectivity readings averaged 334 mcd/lux/m2 for all white skip line markings after at least one year.

Although not part of this project, Rock Service Station Rd. outside of Garner was the first test of some of these treatments. Inlaid thermoplastic, inlaid wet reflective cold applied plastic, and inlaid cradle markers were installed in Spring of 2018. This location has been snowplowed at least once. These treatments were recently reviewed, and all treatments are still in place and have not needed to be repaired.

With these results in mind, NCDOT will pursue using more of these treatments. We believe these treatments could be used as alternatives to traditional snow plowable markers that can cause damage if dislodged. Whereas, If pavement markings or cradle markers are dislodged they cause little to no damage.