CENTER FOR TRANSPORTATION RESEARCH

Determine Use of Alternative Retroreflective Pavement Markers (RPMs) on Highways with Centerline Rumble Strips and Winter Weather Pavement Marking Improvements

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INTRODUCTION

The use of snow plows in northern Texas frequently results in the dislodgement of significant number of retroreflective pavement markers (RPMs). This creates unsafe driving condition during inclement weather added by additional cost for replacing RPMs. The project evaluates two innovative approaches (Rumble stripes and Rumble Inserts) to produce an economical and snow-plowable solution by making the use of preinstalled centerline rumble strips.

APPROACH

Rumble Stripes:

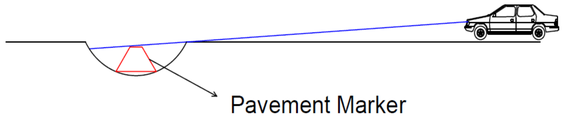
Retroreflective pavement markings applied over the rumble strips in which groove protects the marking from getting damaged by vehicles and snowplow

Rumble Inserts:

Pavement markers installed into the trough of rumble strips

Challenges:

- Length of the groove along the traffic is not long enough to produce adequate visibility of the marker placed inside
- Raising the height of the marker makes it prone to get dislodged by snowplow

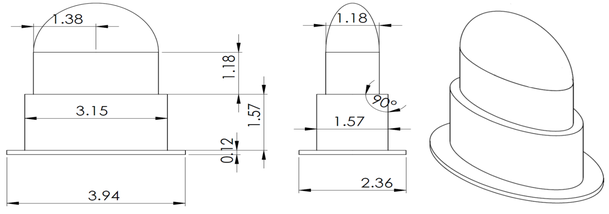


PROPOSED SOLUTIONS (RUMBLE INSERTS)

1. Commercial snow-plowable markers
   - Optimizing the height of maker would make it visible and snow-plowable
2. Flexible memory markers
   - Designed to withstand the load of snowplow and rolling tire
   - Flexible enough to get bent by snowplow
   - Elastic enough to regain its initial position
   - Strongly anchored to prevent from getting dislodged

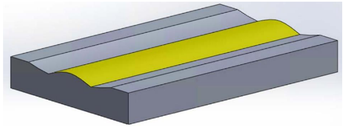
2.1. Flexible post

- Inspired by the flexible delineator post with geometric alterations as required
- Geometric details:
  - Elliptical cross section
  - Thinner upper part to accommodate retroreflective tape
  - Horizontal extension at bottom fixed by a metal plate fastened to the pavement



2.2. Flexible infill

- Flexible elastomer molded in the shape of rumble groove will be adhered to the pavement. A retroreflective surface will be adhered to the top of infill.



MATERIAL SELECTION FOR FLEXIBLE MARKERS

Factors governing the material selection:

- Elastic stored energy
- Yield strain
- Glass transition temperature
- **UV resistance**
- Compressive strength
- Young's modulus
- Tensile/tear strength
- Cost
- Service temperature

Potential materials:

- Epichlorohydrin copolymer (ECO/GECO, 20-45% carbon black, Ethylene vinyl acetate rubber (EVM, 60-70% VA, 30-40% carbon black), Ethylene acrylic rubber (AEM, 30-40% carbon black), Polysulfide rubber (TM, 30-35% carbon black)

DISCUSSION AND CONCLUSION

- The unique snow-plowable configuration for roadway delineation will be an engineering design improvement
- Improved roadway delineation system will have increased service life and safety to the road users
- A significant cost in cutting the groove will be saved by incorporating preinstalled rumble strips
- The use of flexible material will eliminate the damage to the snowplow blade while preventing any kind of hazardous projectile motion even if the marker gets dislodged
- As Texas is exposed to severe UV radiation for 6 months in a year, resistance to UV has been the deciding factor in material selection