Transportation Research & Innovation Division

Route 3 Paint Study
Technical Report 19-02
Rt. 3 China to Liberty, Maine 10/17/19

Research & Innovation Office

Study using

Potters Visi-Ultra 355 Glass Beads and Franklin Water-Based Paint

Potters Visi-Ultra 355 Glass Beads and Magnolia MagnoMark H25 Polymer Paint
Introduction

In 2019, The Maine Department of Transportation in collaboration with Potters Industries, Franklin Paints, and Magnolia Paints started a 2-year study. The study was done with 2 different paints, both applied with Potters Visi-Ultra 355 beads. The data is based on retroreflectivity measurements and longevity of paints.

Project Location

The two areas of application were along Route 3 from mile 17.94 to mile 28.66. Each section was approximately 5 miles (full project shown below).

Project Scope

Maine Department of Transportation is dedicated to safety on our roads. This includes a robust striping program through the Maintenance and Operations Bureau of MaineDOT. As such, the Department is always looking toward new products that are cost effective and maximize safety and longevity.
Project Details

Prior to application, the paint trucks that would be applying the Magnolia MagnoMark H25 Polymer paint or Franklin Paint (currently used by MaineDOT) with Potters Visi-Ultra 355 beads were flushed and cleaned including the tanks and lines to avoid contamination of the paints from previously applications. The Potters Visi-Ultra 355 beads are approximately three times larger than standard beads allowing for better visibility during wet conditions (see photo 8, Appendix A). Historically, traditional beads tend to lose their retroreflectivity when roads are wet. The beads were used in both paints being evaluated. The Franklin water-based paint typically fades over the winter with the amount of plowing required to maintain safe roads during the winter months. The Magnolia MagnoMark H25 Polymer paint should provide a longer lasting, more visible line after plowing activities. The paint was applied to a recessed centerline to avoid plow damage to the striping to increase longevity, this practice is used extensively throughout the State of Maine due to the harsh winters. In addition to the recessed centerline, some of the centerline had a sinusoidal “mumble strip” grooved into the recessed area, this is also a common practice as a safety measure to alert motorists if they cross the centerline while driving. Measurements were taken initially, at 3 months and at 6 months. Measurements will be resumed after the winter and will be done according to the timeline shown below and weather permitting.

June 2019
Application and Initial Retroreflectivity Measurements

July 2019
3-Month Retroreflectivity Measurements

August 2019
3-Month Retroreflectivity Measurements

October 2019
6-Month Retroreflectivity Measurements

October 2019
1 ½ Year Retroreflectivity Measurements

October 2020
1 ½ Year Retroreflectivity Measurements

May 2020
First Post-Winter Retroreflectivity Measurements

May 2021
Second Post-Winter Retroreflectivity Measurements
**Testing**

Testing consisted of 4 measurements taken at each 0.5-mile location. This average was used as the reported retroreflectivity. Measurements were made by the manufacturer of the Potters Visi-Ultra 355 beads using a handheld retroreflectometer and MaineDOT using a handheld retroreflectometer. In addition to the handheld retroreflectometers, measurements were also done with a car mounted retroreflectometer, except in October 2019 as it was out of service at that time.

**Results**

As shown below, the reading between the manufacturer’s portable retroreflectometer and MaineDOT’s are comparable at 3 months and 6 months. There were some issues with the first set of MaineDOT’s measurements, this led to a smaller set of data points for the average and the range. This would account for the initial sets of measurements between the manufacturer and MaineDOT being further apart with the portable retroreflectometers. The measurements done by the vehicle retroreflectometer were lower, on average, than either of the handhelds. It has been hypothesized that this is due to the vehicle retroreflectometer having more difficulty taking measurements with a sinusoidal mumble strip. While the data suggests this is true, more investigation needs to be done to confirm this.

Overall, the Magnolia MagnoMark H25 paint with the Visi-Ultra 355 beads has higher retroreflectometer readings than the Franklin paint the State currently uses. When measurements were taken in October, the manufacturer was very satisfied with the adherence of the beads in both paints. In August, it was noted that the Magnolia MagnoMark H25 paint
showed signs of cracking. In October, the cracks were larger and there were definitive signs of adhesion problems with the H25 paint while the Franklin paint did not show any signs of adherence issues. Photos of the paint and beads were used for documentation and can in Appendix A.

**Table 1: Standard Franklin Paint currently used by Maine DOT with Potters Visi-Ultra 355 beads**

<table>
<thead>
<tr>
<th>Retroreflectometer</th>
<th>Initial</th>
<th>3 Months</th>
<th>6 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall</td>
<td>Range</td>
<td>Overall</td>
</tr>
<tr>
<td>Manufacturer Portable</td>
<td>280</td>
<td>199 - 364</td>
<td>220</td>
</tr>
<tr>
<td>MaineDOT Portable</td>
<td>228</td>
<td>196 – 269*</td>
<td>221</td>
</tr>
</tbody>
</table>
| MaineDOT Vehicle | 168     | 151 - 203  | 181      | 168 - 223 | Data not available, retroreflectometer out for repairs.

(* Missing data, value based on available valid data points)

**Table 2: Magnolia MagnoMark H25 polymer paint with Potters Visi-Ultra 355 beads**

<table>
<thead>
<tr>
<th>Retroreflectometer</th>
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<th>3 Months</th>
<th>6 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall</td>
<td>Range</td>
<td>Overall</td>
</tr>
<tr>
<td>Manufacturer Portable</td>
<td>321</td>
<td>263 - 348</td>
<td>310</td>
</tr>
<tr>
<td>MaineDOT Portable</td>
<td>325</td>
<td>325*</td>
<td>310</td>
</tr>
</tbody>
</table>
| MaineDOT Vehicle | 228     | 154 - 292 | 255      | 190 - 304 | Data not available, retroreflectometer out for repairs.

(* Missing data, value based on available valid data points)

**Conclusions**

While the study has not included, the results of the retroreflectivity of the Potters Visi-Ultra 355 beads look promising, this is shown in the data above and the fact that the retroreflectivity readings have not significantly decreased over the first 6 months. More information and data in
the spring will help determine their viability through a winter season. The standard Franklin paint fades with the extensive plowing done throughout harsh Maine winters however, due to the cracking and adhesion issues with the Magnolia MagnoMark paint, there is also concern that the plowing will exacerbate this issue. More data will be available in 2020 and 2021 as the study progresses.

Appendix A

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1.</td>
<td>Franklin Paint with Potters Visi-Ultra 355 beads</td>
</tr>
<tr>
<td>2.</td>
<td>Franklin Paint with Potters Visi-Ultra 355 beads</td>
</tr>
<tr>
<td>3.</td>
<td>Franklin Paint with Potters Visi-Ultra 355 beads</td>
</tr>
<tr>
<td>4.</td>
<td>Franklin Paint with Potters Visi-Ultra 355 beads</td>
</tr>
<tr>
<td>5.</td>
<td>Magnolia MagnoMark H25 and Potters Visi-Ultra 355 beads w/ cracking</td>
</tr>
<tr>
<td>6.</td>
<td>Magnolia MagnoMark H25 and Potters Visi-Ultra 355 beads w/ cracking</td>
</tr>
</tbody>
</table>
7. Magnolia MagnoMark H25 and Potters Visi-Ultra 355 beads w/cracking & adhesion issues


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