NTPEP Committee Work Plan for

Evaluation of Snowplowable Raised Pavement Markers

NTPEP Designation: SRPM-13-01
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INTRODUCTION

The National Transportation Product Evaluation Program (NTPEP) was established to minimize the amount of duplicative testing of transportation materials performed by AASHTO member states by providing a process where manufacturer/suppliers submit their products to NTPEP for laboratory and field testing. The results of the testing are then shared with member Departments for their use in product quality verification.

This practice provides the NTPEP member departments information on the permanent snowplowable raised pavement marker testing program. In keeping with the NTPEP philosophy of purely testing materials, no conclusions are provided with the test results. The evaluation of the test results is left up to each member department. The states that are involved in field exposure and laboratory testing snowplowable raised pavement markers are Ohio, Georgia and Florida.

Ohio is the lead state and is responsible for the acquisition of the plowable raised pavement markers for testing and the oversight of the test result data entry into DataMine, the web-based data base program. Ohio also operates a test deck site for the collection of data on plowable raised pavement markers exposed to outdoor environmental conditions. Georgia and Florida performs initial laboratory testing and assists by performing additional laboratory testing on the plowable raised pavement markers both before and after field exposure.

1. SCOPE

1.1 This standard practice covers the requirements and testing criteria for the National Transportation Product Evaluation Program (NTPEP) evaluation of permanent snowplowable raised pavement markers. The National Transportation Product Evaluation Program (NTPEP) serves the member departments of the American Association of State Highway and Transportation Officials (AASHTO).

1.2 The results of this program may be used for product quality verification by individual member Departments. If used for quality verification, a letter of certification from the snowplowable raised pavement marker (SPRPM) manufacturer indicating testing was conducted by NTPEP that supports published values may be required by member Departments.
1.3 This standard practice may involve hazardous materials, operations, and equipment. It does not purport to address all safety problems associated with its use. It is the responsibility of the user of this standard practice to establish the appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. REFERENCED DOCUMENTS

2.1 ASTM Standards:
- ASTM D 4383, Specification for Plowable, Raised Retroreflective Pavement Markers

3. TERMINOLOGY

3.1 Coefficient of Luminous Intensity ($R_1$) – This term is used to specify the performance of retroreflective devices. It considers the retroreflected luminous intensity as a function of the perpendicular illuminance incident on the device. It is recommended for use in describing performance of RPMs, taillight reflex reflectors and roadway delineators.

3.2 NTPEP Manager – The AASHTO/NTPEP administrative manager.

3.3 Lead State Coordinator – The Ohio DOT representative responsible for oversight of the program, including planning, sample acquisition, Data Mine Reviews, and Data Mine releases to the manufacturer.

4. SUMMARY OF PRACTICE

On a yearly basis (summer), snowplowable raised pavement marker manufacturers submit their products to be tested. Raised pavement marker samples are initially tested for retroreflectivity, color and visual appearance. Samples are then placed on actual roadway test decks and exposed to traffic and environmental conditions for a total of two years. Samples are tested and evaluated at the 6, 12, 18 and 24 month time periods. Georgia DOT and Florida DOT conduct an initial laboratory evaluation of all raised pavement markers submitted. This testing includes Retroreflectivity, Compressive Strength, Lens Integrity, Abrasion Resistance and Holder Ramp Hardness. Florida DOT also tests roadway samples for retroreflectivity after 12 and 24 months. Test result data is entered into the web-based DataMine program initially and after each test period.

5. SIGNIFICANCE AND USE

5.1 This standard practice utilizes laboratory and field testing to determine snowplowable raised pavement marker properties and evaluate the performance (new and trafficked/weathered) of the snowplowable raised pavement markers. This practice is intended to determine the physical properties and performance of snowplowable raised pavement markers. Acceptability of each product based upon the data generated as a result of the testing and evaluation in this practice is the responsibility of the user.

6. APPLICATION FOR PRODUCT TESTING

6.1 Submittal of Product Evaluation Form(s) and other information.
The manufacturer will submit electronically to the NTPEP Manager the Product Evaluation Form (PEF), product literature, MSDS information, and program payment for each product submitted for testing. (See Note 2 below for submittal deadline). After review of the PEF(s) for completeness and accuracy, the NTPEP Manager will work with the Lead State Coordinator to decide on the products to be tested. The NTPEP Manager will then advise the manufacturer within two weeks of receipt of the PEF the products approved for testing.

6.2 Assignment of Test Number

A test number shall be assigned to each product approved for testing. The test number shall indicate the Snowplowable Raised Pavement Marker designation (SPRPM), the year of submission, and a sequential sample number (SPRPM-Year-OH-Sample No.) For example, SPRPM-2014-OH-09.

Note 1 – Snowplowable Raised Pavement Marker (SPRPM) numbers that are assigned to a Manufacturer’s product will not change for the life of the test. There shall be no product name or model change allowed after the Product Evaluation Form (PEF) has been submitted.

Note 2 – Product Evaluation Form(s) Submittal Deadlines - Product Evaluation Forms (PEF) shall be submitted online to the NTPEP Manager by July 1st of the year in which evaluation is to began.

7. SAMPLING PROTOCOL

7.1 By August of the testing year, a representative of the state doing the field test or a member State DOT representative will select at random from the manufacturer's stock the following sample materials:

For Field Testing:
1) 60 complete markers with white/red reflectors.

For Laboratory Testing:
1) 60 reflectors of each color submitted for evaluation (white/red or yellow) unattached from their housings (holders).
2) 5 housings (or holders) without reflectors.

7.2 The lead state coordinator will make arrangements to have the products sampled. Snowplowable raised pavement marker product sampling shall be performed in accordance with the NTPEP raised pavement marker protocol. The manufacturer/supplier shall attach product/material literature and material data safety sheets to the PEF. All collected samples shall be labeled to show the manufacturer’s product code and the manufacturer of material and shall be shipped by and at the manufacturer’s expense via a carrier with a freight tracking system. Samples shall be shipped to the NTPEP Lead State Coordinator. Samples shall be labeled by the sampling agency with the SPRPM reference number.

8. LABORATORY EVALUATIONS

8.1 **Coefficient of Luminous Intensity**: If the marker receives a recommendation to receive testing, 40 markers submitted will be tested for initial specific intensity in accordance with ASTM D 4383, Section 10.1. All instruments used to collect coefficient of luminous intensity
measurements shall have current one year calibration certifications.

8.2 **Abrasión Resistance:** Abrasion resistance shall also be tested on five reflectors in accordance with ASTM D 4383, Section 10.2.

8.3 **Compressive Strength:** Five reflectors will be tested in accordance with ASTM D 4383, Section 10.5. If a reflector only consists of a reflective face and does not have a base, this test will not be conducted.

8.4 **Holder Ramp Hardness Test:** Five holders will be tested in accordance with ASTM D 4383, Section 10.6.

8.5 **Lens Cracking:** Five reflectors will be subjected to lens impact testing and five more to temperature cycling in accordance with ASTM D 4383, Section 10.4.

9. **FIELD EVALUATIONS**

9.1 **Site Selection**

9.1.1 Two test sites will be selected. One shall have an asphaltic concrete pavement and the other shall have a Portland cement concrete pavement. Sites will generally have the following characteristics:
- Fully access controlled freeway
- Should not require crack sealing or extensive patching during the evaluation period
- Average Daily Traffic over 35,000
- Generally free of horizontal and vertical curves
- Minimum average snowfall of 25 inches (635 mm) per year controlled by a combination of plowing salt, and grits (cinders and sand)
- Speed Limit between 50 and 75 mph (80 and 120 km/hr)

9.2 **Installation:** The manufacturer shall supply all materials, labor, and equipment to install their snowplowable raised pavement markers. Traffic control, installation scheduling, and a suitable testing site will be provided by the Field Testing State. The manufacturer’s representative will certify that their raised pavement markers were installed in accordance with written instructions and to their satisfaction. If the representative feels their installation was unsatisfactory, they will inform the representative of the field testing state of this fact in writing, within one week of installation. Upon notification, the testing state may drop that manufacturer’s installation from further testing without a refund of fees. If no written notification is received within the first week, the installation will be accepted and included in the field testing. **It should be understood that if premature failure of more than 10% of the installed castings occurs during the first 12 months, the manufacturer shall make provisions to remove remaining castings and repair the pavement surface to the satisfaction of the testing state.**

Each sample of 60 snowplowable raised pavement markers shall be divided into 6 groups of 10 units. 30 markers shall be installed on Portland cement concrete pavement and 30 markers will be installed on asphaltic concrete pavement. Each group of 10 units will be randomly placed in the test sections.

9.3 **Field Observations:** Testing will commence upon completion of installation and continue for two years. Field observations will be made biannually of each remaining marker. The following rating
scale will be used:

- Housing (or Holder) Condition 5 4 3 2 1 0
- Lens Face Condition 5 4 3 2 1 0
- Night Visibility**: 5 4 3 2 1 0

In addition, at the 1-year evaluation period, nine markers from the asphalt location and nine markers from the concrete location will be removed from the casings and laboratory tested for retroreflectivity. At the 2-year evaluation period, the remaining markers will be removed and laboratory tested for retroreflectivity.

9.3.1 Housing:
- 5 – Excellent, Completely intact, “Like New” condition, good adhesion
- 4 – Good, Minor scrapes/scratches visible on close examination of surfaces
- 3 – Fair, Some cuts but none larger than 10 mm
- 2 – Poor, Some cuts larger than 10 mm
- 1 – Very Poor, Showing significant wear, no longer protecting reflector
- 0 – Missing or damaged beyond use

9.3.2 Lens:
- 5 – Excellent, Completely intact, “Like New” condition
- 4 – Good, Minor scrapes/scratches visible on close examination of surfaces
- 3 – Fair, Some abrasion none greater than 5 mm
- 2 – Poor, Some large cuts/cracks/chips greater than 5 mm
- 1 – Very Poor, Showing significant wear, significant discoloration
- 0 – Missing or damaged beyond use

9.3.3 Night Visibility:
- 5 – Excellent, Completely intact, Bright, in “Like New” condition, good adhesion
- 4 – Good, Clearly visible from 100 m (328 ft)
- 3 – Fair, Some loss in reflectivity, barely visible from 100 m (328 ft)
- 2 – Poor, Significant loss in reflectivity, visible from 50 m (165 ft)
- 1 – Very Poor, Significant loss in reflectivity, barely visible, discoloration
- 0 – Missing or totally Nonreflective

** Night visibility will be conducted during complete darkness by viewing the markers at 122 meters (400 ft) from a typical automobile, using low-beam headlights.

10. EVALUATION RESULTS AND DATA

10.1 Test results will be reported to the NTPEP Manager in the web-based data base – DataMine as follows.
- Initial photos of each marker or ID type (views - top, bottom, and side)
- Average daily traffic count (AADT) and number of lanes at the test site
- Percentage of truck traffic at the test site
- Type of marker adhesive
- Type of plow blades used during the testing period
- Number of days of plowing each week
- Number of days sand and cinders were used each week
- Millimeters of snow and rain during the test period at the test site
- Extreme high and low temperatures during the test period at the test site
10.2 Once the data is reviewed by the Lead State coordinator, he will release the data to each manufacturer for their review. When the manufacturer reviews and accepts the data, the manufacturer will release the data to the public.

10.3 Evaluation data will be compiled and made available to all participating states and testing companies through the AASHTO/NTPEP DataMine. This report will include data only. No judgment as to a product’s acceptability will be made in this report. End user participants will establish individual criteria for product acceptability.

10.4 DataMine – This web-based data base can be accessed through the AASHTO-NTPEP website link at www.ntpep.org.

11. EVALUATION FREQUENCY

11.1 Following the initial testing, resubmittal testing frequency is at the option of the manufacturer.

Note 1 - The Raised Pavement Marker Technical Committee recommends a retest for permanent snowplowable raised pavement markers if marker configuration changes or every five years, whichever comes first.

12. TIMELINE

12.1 The following schedule will be used in the evaluation of permanent non-plowable raised pavement markers:

- July 1st – Product submittal
- August 1st – Samples received
- September – Laboratory evaluation
- October – November 15th – Field installation
- 6-Month Field Evaluation – Six months (± 1 week) from date of installation (May 1st)
- 12-Month Field Evaluation – 12 months (± 1 week) from date of installation (November 1st)
- 18-Month Field Evaluation – 18 months (± 1 week) from date of installation (May 1st)
- 24-Month Field Evaluation – 24 months (± 1 week) from date of installation (November 1st)

12.2 The schedule indicating completion dates for DataMine Events is as follows:

<table>
<thead>
<tr>
<th>DataMine Events</th>
<th>Completion Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Laboratory data, 12 and 24 month field data entered by ODOT, GDOT AND FDOT</td>
<td>January 1st</td>
</tr>
<tr>
<td>Data reviewed by GDOT and released to industry – 30 day clock starts</td>
<td>February 1st</td>
</tr>
<tr>
<td>Data reviewed by industry and GDOT notified if data is accepted</td>
<td>February 1st - March 1st</td>
</tr>
<tr>
<td>Industry releases data to public</td>
<td>February 1st - March 1st</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Note: Once data is released from GDOT to industry, the data is auto released to public after 30 days, if the clock is not stopped.</th>
<th>March 1(^{st})</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6 and 18 month field data entered by ODOT</strong></td>
<td>July 1(^{st})</td>
</tr>
<tr>
<td>Data reviewed by GDOT and released to industry – 30 day clock starts</td>
<td>August 1(^{st})</td>
</tr>
<tr>
<td>Data reviewed by industry and GDOT notified if data is accepted</td>
<td>August 1(^{st}) – September 1(^{st})</td>
</tr>
<tr>
<td>Industry releases data to public</td>
<td>August 1(^{st}) – September 1(^{st})</td>
</tr>
<tr>
<td>Note: Once data is released from GDOT to industry, the data is auto released to public after 30 days, if the clock is not stopped.</td>
<td>September 1(^{st})</td>
</tr>
</tbody>
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## 13. KEYWORDS

13.1 DataMine; markers; NTPEP; pavement markers; raised pavement markers