Introduction:

The NTPEP program has successfully supplied material performance data to AASHTO member departments for these products for several years. With the reduction in staffing that, most departments continue to experience the NTPEP data has become an integral part of many members departments qualification process. With few exceptions, developing criteria for product qualification has been a difficult task for individual states. This guide is offered as information for AASHTO member departments for interpretation and use of the data generated through the NTPEP evaluation program.

This document has been developed as a consensus document within the Raised Pavement Marker (RPM) Technical Committee. State and industry representatives have collaborated on the parameters listed herein to provide a conservative assessment of the expected performance of raised pavement marker submitted for evaluation in this program.

Key Aspects of the Program:

Within the NTPEP Committee, there is a RPM Technical Committee. Members of this committee are industry representatives along with member Departments of Transportation personnel with raised pavement marker expertise. The industry representatives have input in the development of committee documents; however, they are not voting members of the committee.

The RPM program consists of lab and a field-testing. The lab portion includes a battery of tests, which are run in accordance with ASTM. Presently three state DOT test labs conduct the testing. The Florida DOT is responsible for testing the Retro reflectivity and Abrasion Resistance (before and after) the field test. The Georgia DOT is responsible for testing Lens Cracking, Compressive Strength, and temperature resistance test. The Ohio DOT is responsible for testing Holder Ramp Hardness of the castings.

The field-testing portion involves the installation of 160 raised pavement markers and 160 for Adhesive (Hot Applied or Epoxy). Eighty are installed on an asphalt pavement and eighty are installed on concrete pavement. Products are subjectively evaluated initially and every 6 months for 2 years.

All performance data collected through these evaluations is reported through an online data base - Datamine. Access to proprietary data is limited to the submitting manufacturer and the member departments of transportation.

While NTPEP works to make the product evaluation process comprehensive and meet the requirements for AASHTO member departments, all test data should be carefully reviewed by the specifying agency and in the context of field experience with these products.
Review of Evaluations and Significance of Lab Data Generated

Dimensions:
The marker’s base dimension and the angle between the base and the lens face shall be measured. It will also be noted whether the marker has an abrasion resistant lens surface.

**Compressive Strength:**
Five markers will be tested in accordance with ASTM D4280, Section 9.2.2. The load applied is 6000 lbs. The markers are required to show no breakage or significant deformation according to this specification.

Lens Cracking:
Five markers will be subject to lens impact testing and five more to temperature cycling in accordance with ASTM D4280, Section 9.4.1. Five markers shall be selected at random for lens impact strength.

Resistance to temperature Cycling:
Temperature cycling test shall be conducted on five markers in accordance with ASTM D 4280, Section 9.4.2

Flexural Strength (Type F markers):
Five markers will be selected for flexural strength testing in accordance with ASTM D 4280, Section 9.2.1. Failure shall consist of either (1) complete rupture; or (2) other loss integrity evidenced by a sudden decrease in load. The load at failure shall be recorded.

Temporary Markers:
If the marker receives a recommendation to receive testing, all markers submitted will be tested for initial coefficient of luminous intensity, ASTM D4280, section 9.1

Hardness: Five Markers will be used for hardness in accordance with ASTM D 2240

Color: The color of reflective lens of one marker will be reported as CIE tristimulus values and chromaticity coordinates for white markers. ASTM D 4280, section 6.2.4.

Chip Seal:
A random sample of 5 markers will be tested for hardness in accordance with ASTM D 2240 Hardness testing will be performed on both the marker body and protective cover.

Laboratory Evaluation of Standard and Flexible Adhesive:
Standard Bituminous Adhesive if recommended for testing, a sample will be tested in the laboratory in accordance with ASTM D 4280, Annex A1
Flexible Bituminous Adhesive shall be subjected to the following tests:

<table>
<thead>
<tr>
<th>Property</th>
<th>Method</th>
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<tbody>
<tr>
<td>Penetration 25°C</td>
<td>ASTM D 5</td>
</tr>
<tr>
<td>Softening Point</td>
<td>ASTM D 36</td>
</tr>
<tr>
<td>Brookfield Viscosity 204°C</td>
<td>ASTM D 3236</td>
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<tr>
<td>Ductility @ 25°C 5 mm/min</td>
<td>ASTM D 113</td>
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<tr>
<td>Asphalt @ 4°C 1 mm/min</td>
<td>ASTM D 113</td>
</tr>
<tr>
<td>Asphalt Compatibility</td>
<td>ASTM D 5329</td>
</tr>
<tr>
<td>Flexibility</td>
<td>As explained in Test</td>
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</tbody>
</table>

**Review of Evaluations and Significance of Field Data Generated**

**Site Selection Criterial:**
Test site for clear / red raised pavement markers and marker adhesives shall consist of both Asphalt and Portland Cement concrete pavements. Site shall generally have the following characteristics:

- Fully access controlled freeway
- Should not require crack sealing or extensive patching during the evaluation.
- Average ADT over 35,000
- Generally free of horizontal and vertical curves
- Speed limit between 80 and 120 km/hr. (50 and 75 mph)

Test Site for amber / amber raised pavement markers shall consist of both Asphaltic concrete and Portland concrete pavements. Sites will generally have the following characteristics:

- Secondary state route
- Average Daily Traffic less then 35,000

**Field Observations of raised pavement markers and Adhesives:**

- Marker case condition 5 4 3 2 1 0
- Lens or reflective surface 5 4 3 2 1 0
- Night Visibility 5 4 3 2 1 0

**Marker Case Condition:**

- 5 – Excellent; Completely intact. “Like New” Condition
- 4 – Good, Minor scrapes/scratches visible on close examination of surfaces
- 3 – Fair, Some cuts but none larger than 10mm
- 2 – Poor, Some cuts larger then 10mm
- 1 – Very Poor, showing significant wear, no longer protecting reflector
- 0 – Missing or damaged beyond use
**Lens or Reflective Surface Condition**

- 5 – Excellent; Completely intact, Bright, in “Like New” Condition
- 4 – Good, Clear visible from greater than 100 m (328 ft)
- 3 – Fair, Some loss in reflectivity, barely visibly from 100 m (328)
- 2 – Poor, Significant loss of reflectivity, visible from 50 m (165 ft)
- 1 – Very Poor, Significant of reflectivity, barely visible, discoloration
- 0 – Missing or totally Nonreflective

**Temporary Markers**

- **Coefficient of Luminous Intensity**: If the marker receives a recommendation to receive testing, all markers submitted will be tested for initial coefficient of luminous intensity, ASTM D4280, section 9.1
- Hardness: Five Markers will be used for hardness in accordance with ASTM D 2240
- Color: The color of reflective lens of one marker will be reported as CIE tristimulus values and chromaticity coordinates for white markers. ASTM D 4280, section 6.2.4.

**Chip Seal:**

- **Hardness**: A random sample of 5 markers will be tested for hardness in accordance with ASTM D 2240
  Hardness testing will be performed on both the marker body and protective cover.