PROJECT WORK PLAN FOR THE
FIELD AND LABORATORY EVALUATIONS
RAISED PAVEMENT MARKERS
&
MARKER ADHESIVES

July 2009
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PERMANENT NON-PLOWABLE RAISED PAVEMENT MARKERS
PROJECT WORK PLAN
National Transportation Product Evaluation Program
June 2009

1. SCOPE

1.1 This project work plan covers the procedures used by the National Transportation Product Evaluation Program (NTPEP) to evaluate permanent non-plowable raised pavement markers. The work plan includes sampling procedures, laboratory testing, field testing, and reporting information.

1.2 The NTPEP is a voluntary program whereby manufacturers may choose to have their products evaluated for a fee that is used primarily to cover the costs of the evaluation and producing its associated reports. The NTPEP reports the results of these evaluations, but does not accept or reject products. However, transportation officials may choose to use the results of the evaluations in the development and maintenance of an approved product list. The Raised Pavement Marker Project Panel also recommends a retest for permanent non-plowable raised pavement markers if marker configuration changes or every five years, whichever comes first. There shall be no product name or a model change allowed after the Product Evaluation Form (PEF) has been submitted to AASHTO/NTPEP.

1.3 The NTPEP is a technical service program of the American Association of State Highway and Transportation Officials (AASHTO). This document and other documents produced by NTPEP may not be reproduced without the express written permission of AASHTO.

2. REFERENCED DOCUMENTS

2.1 ASTM D4280 “Specification for Extended Life Type, Nonplowable, Prismatic, Raised, Retroreflective Pavement Markers”

3. SAMPLING REQUIREMENTS

By August of each year, a sample of 200 markers of each type approved to be tested will be taken from each manufacturer's stock by a representative of the member department doing the testing or by an authorized representative. Experimental permanent non-plowable raised pavement markers may be installed as part of the field test. There shall only be one experimental product allowed for each manufacturer per test deck location. There will be no laboratory data conducted on this product and only the field test data will be reported. In the event a permanent non-plowable raised pavement marker is submitted as an experimental material, a sample of 160 markers will be taken from each manufacturer’s stock by a representative of the member department doing the testing or by an authorized representative.
4. LABORATORY TESTING

4.1 Dimensions: The marker's base dimensions 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.

4.2 Coefficient of Luminous Intensity: If the marker receives a recommendation to receive testing, 80 markers submitted will be tested for initial specific intensity. The specific intensity of each reflective surface will be tested in accordance with ASTM D4280, Section 9.1. Abrasion resistant markers shall also be tested in accordance with ASTM D4280, Section 9.1.1. All instruments used to collect coefficient of luminous intensity measurements shall have up to date, one year calibration certifications.

4.3 Compressive Strength: Five markers will be selected for compressive strength testing in accordance with ASTM D4280, Section 9.2.2. Failure shall consist of either (1) breakage or significant deformation of the marker; or (2) significant delamination of the shell and the filler material. The load at failure shall be recorded.

4.4 Lens Cracking: Markers having a hard, abrasion-resistant lens surface shall also be subjected to lens impact strength testing in accordance with ASTM D4280, Section 9.4.1. Five markers shall be selected at random for lens impact strength.

4.5 Temperature Resistance: Temperature cycling tests shall be conducted on five samples in accordance with ASTM D4280, Section 9.4.2.

4.6 Flexural Strength (Type F markers): Five markers will be selected for flexural strength testing in accordance with ASTM D4280, Section 9.2.1. Failure shall consist of either (1) complete rupture; or (2) other loss of integrity evidenced by a sudden decrease in load. The load at failure shall be recorded.

4.7 Abrasion Resistance: Abrasion resistance shall be conducted in accordance with ASTM D4280, Section 9.5.

5. FIELD TESTING

5.1 Site Selection: Test sites for clear/red RPM’s shall consist of both asphaltic concrete and Portland cement concrete pavements. 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

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Test sites for amber/amber RPM’s shall consist of both asphaltic concrete and Portland cement concrete pavements. Sites will generally have the following characteristics:

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

Test installations will be completed in October of each year. There will be a total of 160 RPM’s installed with 80 RPM’s placed on a Portland cement concrete pavement and 80 RPM’s placed on an asphaltic concrete pavement. In addition, a total of 160 control markers, selected by the testing state, will be placed throughout the test deck locations. If a large number of markers are submitted, the normal spacing may be altered.

5.2 Installation: The manufacturer shall supply all material, equipment and labor to install markers. Traffic control will be furnished by the testing facility. The manufacturer may select the adhesive type. The manufacturer’s representative will also certify that their RPM’s were installed to their satisfaction. RPM test decks shall be installed in the right outside lane or the centerline depending on the RPM color.

5.3 Field Observations: Testing will commence upon completion of installation and continue for a period of two years. Field observations will be made every six months and the following data will be gathered:

- Marker case condition
  - 5 – Excellent; Completely Intact, “Like New” Condition
  - 4 – Good; Minor Scraps and Scratches
  - 3 – Fair; Obvious Damage but still Functional
  - 2 – Poor; Major Damage, Marginally Functional
  - 1 – Very Poor; Non-functional
  - 0 – Missing

- Lens surface condition
  - 5 – Excellent; Completely Intact, “Like New” Condition
  - 4 – Good; Minor Scraps and Scratches
  - 3 – Fair; Some Abrasion and Scars
  - 2 – Poor; Scarring over Large Areas
  - 1 – Very Poor; Non-functional
  - 0 – Missing

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5.4 **Coefficient of Luminous Intensity**: Laboratory specific intensity measurements will be taken on 10% of the installed RPM’s biannually in accordance with ASTM D4280, Section 9.1. These markers will be removed by a means, which will not damage the marker case or lens face. All instruments used to collect coefficient of luminous intensity measurements shall have up to date, one year calibration certifications.

6. **REPORTING**

The testing states will compile and summarize the data into an interim report after one year of RPM installation and a final report after two years of RPM installation. The reports are then forwarded to the NTPEP Coordinator for distribution. The following data will be included in all reports:

- initial photos of each marker or ID type (views - top, bottom, and front/side)
- average annual daily traffic count (AADT) at the test site
- number of lanes at the test site
- percentage of truck traffic at the test site
- rainfall data during the test period at the test site
- extreme high and low temperatures during the test period at the test site
- laboratory test data
- a general description of the test deck
- age of the test deck pavement surface
- type of marker adhesive
- field observations

7. **TIMELINE**

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 – Lab Evaluation
- October – November 15th – Field Installation
- 6-Month Field Evaluation – Six months (+ or – 1 week) from date of installation
- 6-Month Availability of Data to Manufacturers – three months from field evaluation date
- 6-Month Review of Data by Manufacturers – 30 days
- 12-Month Field Evaluation – 12 months (+ or – 1 week) from date of installation
- 12-Month Availability of Data to Manufacturers – three months from field evaluation date
- 12-Month Review of Data by Manufacturers – 30 days
- Interim report – within 30 days of manufacturers review
- 18-Month Field Evaluation – 18 months (+ or – 1 week) from date of installation

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• 18-Month Availability of Data to Manufacturers – three months from field evaluation date
• 18-Month Review of Data by Manufacturers – 30 days
• 24-Month Field Evaluation – 24 months (+ or – 1 week) from date of installation
• 24-Month Availability of Data to Manufacturers – three months from field evaluation date
• 24-Month Review of Data by Manufacturers – 30 days
• Final report – within 30 days of manufacturers review
SNOWPLOWABLE RAISED PAVEMENT MARKERS
PROJECT WORK PLAN
National Transportation Product Evaluation Program
June 2009

1. SCOPE

1.1 This project work plan covers the procedures used by the National Transportation Product Evaluation Program (NTPEP) to evaluate permanent plowable raised pavement markers. The work plan includes sampling procedures, laboratory testing, field testing, and reporting information.

1.2 The NTPEP is a voluntary program whereby manufacturers may choose to have their products evaluated for a fee that is used primarily to cover the costs of the evaluation and producing its associated reports. The NTPEP reports the results of these evaluations, but does not accept or reject products. However, transportation officials may choose to use the results of the evaluations in the development and maintenance of an approved product list. The Raised Pavement Marker Project Panel also recommends a retest for snowplowable pavement markers if marker configuration changes or every five years, whichever comes first. There shall be no product name or a model change allowed after the Product Evaluation Form (PEF) has been submitted to AASHTO/NTPEP.

1.3 The NTPEP is a technical service program of the American Association of State Highway and Transportation Officials (AASHTO). This document and other documents produced by NTPEP may not be reproduced without the express written permission of AASHTO.

2. REFERENCED DOCUMENTS

2.1 ASTM D4383 “Specification for Plowable, Raised Retroreflective Pavement Markers”

3. SAMPLING REQUIREMENTS

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: 60 complete RPM’s 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

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After the samples are selected at random, the manufacturer/supplier shall have the products delivered to the Lead State Manager with the following information attached or written on the shipping container:

1) Product tracking identifier (e.g., SPRPM (2005OH)-xx) that will be assigned by the NTPEP Coordinator.
2) Batch or lot number established by the manufacturer/supplier.

4. LABORATORY TESTING

4.1 Coefficient of Luminous Intensity: Forty reflectors of each color will be tested for initial specific intensity in accordance with ASTM D4383, Section 10.1. All instruments used to collect coefficient of luminous intensity measurements shall have up to date, one year calibration certifications.

4.2 Abrasion resistance: Abrasion resistance shall also be tested on five reflectors in accordance with ASTM D4383, Section 10.2.

4.3 Compressive Strength: Five reflectors will be tested in accordance with ASTM D4383, Section 10.5. If a reflector only consists of a reflective face and does not have a base, this test will not be conducted.

4.4 Holder Ramp Hardness Test: Five holders will be tested in accordance with ASTM D4383, Section 10.6.

4.5 Lens Cracking: Five reflectors will be subject to lens impact testing and five more to temperature cycling in accordance with ASTM D4383, Section 10.4.

5. FIELD TESTING

5.1 Site Selection: 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 635 mm (25 inch) per year controlled by a combination of
  - plowing salt, and grits (cinders or sand).
  - speed limit between 80 and 120 km/hr (50 and 75 mph)

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5.2 **Installation:** The manufacturer will supply all materials, labor, and equipment to completely install their RPM’s. At the time of installation the manufacturer will provide written instructions for the proper installation of the RPM’s. 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 RPM’s were installed in accordance with the 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 the 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 that 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 sixty RPM’s will be divided into 6 groups of 10 units. Thirty RPM’s will be installed on Portland cement concrete pavement and thirty RPM’s will be installed on asphalt concrete pavement. Each group of 10 units will be randomly placed in the test sections.

5.3 **Field Observations:** Testing will commence upon completion of the installation and continue for two years. Field observations will be made biannually of each remaining marker. At the 1-year evaluation period, nine markers from the asphalt location and nine markers from the concrete location will be removed from the castings and laboratory tested for retroreflectivity. At the 2-year evaluation period, the remaining markers will be removed and laboratory tested for retroreflectivity. 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

**Housing:**

5 = Excellent, Completely intact, in “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

**Lens:**

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5 = Excellent, Completely intact, in “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

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

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

6. REPORTING

The testing states will compile and transmit all data to the lead state for summarizing into a complete RPM testing report to the NTPEP coordinator. At the completion of the test period, the NTPEP coordinator will issue a final report. The following data will be included in all reports:

- initial photos of each marker or ID type (views - top, bottom, and side)
- average annual daily traffic count (AADT) and number of lanes at each test site
- percentage of truck traffic at each test site
- type of plow blades used during the testing period
- type of marker adhesive
- number of days of plowing each week
- number of days sand and cinders were used each week
- millimeters of snow and rain during testing period at each site
- extreme high and low temperatures during testing period at each site
- laboratory test data
- biannual field ratings

8. TIMELINE

The following schedule will be used in the evaluation of permanent non-plowable raised pavement markers:
- July 1st – Product Submittal
- August 1st – Samples Received

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• September – Lab Evaluation
• October – November 15th – Field Installation
• 6-Month Field Evaluation – Six months (+ or – 1 week) from date of installation
• 6-Month Availability of Data to Manufacturers – three months from field evaluation date
• 6-Month Review of Data by Manufacturers – 30 days
• 12-Month Field Evaluation – 12 months (+ or – 1 week) from date of installation
• 12-Month Availability of Data to Manufacturers – three months from field evaluation date
• 12-Month Review of Data by Manufacturers – 30 days
• Interim report – within 30 days of manufacturers review
• 18-Month Field Evaluation – 18 months (+ or – 1 week) from date of installation
• 18-Month Availability of Data to Manufacturers – three months from field evaluation date
• 18-Month Review of Data by Manufacturers – 30 days
• 24-Month Field Evaluation – 24 months (+ or – 1 week) from date of installation
• 24-Month Availability of Data to Manufacturers – three months from field evaluation date
• 24-Month Review of Data by Manufacturers – 30 days
• Final report – within 30 days of manufacturers review

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1. **SCOPE**

1.1 This project work plan covers the procedures used by the National Transportation Product Evaluation Program (NTPEP) to evaluate temporary raised pavement markers. The work plan includes sampling procedures, laboratory testing, field testing, and reporting information.

1.2 The NTPEP is a voluntary program whereby manufacturers may choose to have their products evaluated for a fee that is used primarily to cover the costs of the evaluation and producing its associated reports. The NTPEP reports the results of these evaluations, but does not accept or reject products. However, transportation officials may choose to use the results of the evaluations in the development and maintenance of an approved product list. The Raised Pavement Marker Project Panel also recommends a retest for temporary raised pavement markers if marker configuration changes or every five years, whichever comes first. There shall be no product name or a model change allowed after the Product Evaluation Form (PEF) has been submitted to AASHTO/NTPEP.

1.3 The NTPEP is a technical service program of the American Association of State Highway and Transportation Officials (AASHTO). This document and other documents produced by NTPEP may not be reproduced without the express written permission of AASHTO.

2. **REFERENCED DOCUMENTS**

2.1 ASTM D2240 “Test Method for Rubber Property - Durometer Hardness”

2.2 ASTM D4280 “Specification for Extended Life Type, Nonplowable, Prismatic, Raised, Retroreflective Pavement Markers”

3. **SAMPLING REQUIREMENTS**

By April of each year, a sample of 200 markers of each type approved to be tested will be taken from the manufacturer’s stock by a representative of the member department doing the testing or by an authorized representative.

4. **LABORATORY TESTING**

4.1 **Coefficient of Luminous Intensity**: If the marker receives a recommendation to receive testing, all markers submitted will be tested for initial specific intensity. The specific
intensity of each reflective surface will be tested in accordance with ASTM D4280, Section 9.1.

4.2 **Hardness:** The case of the marker will be tested for hardness in accordance with ASTM D2240. This requirement is waived for experimental products.

4.3 **Temperature Resistance:** Temperature cycling tests shall be conducted on five samples in accordance with ASTM D4280, Section 9.4.2.

5. **FIELD TESTING**

5.1 **Site Selection:** Test sites may consist of both asphaltic concrete and Portland cement concrete pavements or asphaltic only. The test site will be a 2 or 4 lane State Route with ADT greater than 10,000.

5.2 **Installation:** The manufacturer shall supply all material, equipment, and labor required to install the markers. Test installations will be completed in October of each year. Yellow markers will be placed on the centerline and white markers shall be placed on the edgeline. Temporary markers are to be installed with the manufacturer’s recommended adhesive; 150 markers of each color will be installed on 3 meter centers on the centerline or the edgeline. The manufacturer’s representative will also certify that their markers were installed to their satisfaction.

5.3 **Coefficient of Luminous Intensity:** Specific intensity measurements will be taken monthly on-site using a portable retroreflectometer in accordance with ASTM E1696. All instruments used to collect coefficient of luminous intensity measurements shall have up to date one year calibration certifications.

5.4 **Field Observations:** Field observations will be performed monthly for a period of six months and the following data will be gathered:

- Marker case condition
  - Excellent; Completely Intact, “Like New” Condition
  - Good; Minor Scrapes and Scratches
  - Fair; Obvious Damage but still Functional
  - Poor; Major Damage, Marginally Functional
  - Very Poor; Non-functional
  - Missing

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Reflective Surface Condition

5 – Excellent; Completely Intact, “Like New” Condition
4 – Good; Minor Scrapes and Scratches
3 – Fair; Some Abrasion or Discoloration, but still Functional
2 – Poor; Major Scarring or Discoloration, Marginally Functional
1 – Very Poor; Non-Functional
0 – Missing

6. REPORTING

The testing states will compile and summarize into a complete RPM testing report to the NTPEP coordinator. At the completion of the test period, the NTPEP coordinator will issue a final report. The following data will be included in all reports:

- average annual daily traffic count (AADT) and number of lanes at each test site
- percentage of truck traffic at each test site
- type of marker adhesive
- millimeters of rain during testing period at each site
- extreme high and low temperatures during testing period at each site
- laboratory test data
- monthly field ratings
- a general description and age of the test deck pavement surface
TEMPORARY CHIP SEAL MARKER TEST PROCEDURE
PROJECT WORK PLAN
National Transportation Product Evaluation Program
May 2008

1. SCOPE

1.1 This project work plan covers the procedures used by the National Transportation Product Evaluation Program (NTPEP) to evaluate temporary chip seal markers. The work plan includes sampling procedures, laboratory testing, field testing, and reporting information.

1.2 The NTPEP is a voluntary program whereby manufacturers may choose to have their products evaluated for a fee that is used primarily to cover the costs of the evaluation and producing its associated reports. The NTPEP reports the results of these evaluations, but does not accept or reject products. However, transportation officials may choose to use the results of the evaluations in the development and maintenance of an approved product list. The Raised Pavement Marker Project Panel also recommends a retest for temporary chip seal markers if marker configuration changes or every five years, whichever comes first. There shall be no product name or a model change allowed after the Product Evaluation Form (PEF) has been submitted to AASHTO/NTPEP.

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2. REFERENCED DOCUMENTS

2.1 ASTM D2240 “Test Method for Rubber Property - Durometer Hardness”

2.2 ASTM D4280 “Specification for Extended Life Type, Nonplowable, Prismatic, Raised, Retroreflective Pavement Markers”

3. SAMPLING REQUIREMENTS

By April of each year, a random sample of 200 markers of each type approved to be tested will be taken from the manufacturer's stock by a representative of member department doing the testing or an authorized representative.

4. LABORATORY TESTING

4.1 Coefficient of Luminous Intensity: If the marker receives a recommendation to receive testing, all 200 markers submitted will be tested for initial specific intensity. The specific

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intensity of each reflective surface will be tested in accordance with ASTM D4280, Section 9.1.

4.2 **Hardness:** A random sample of 15 markers will be tested for hardness in accordance with ASTM D2240. Hardness testing will be performed on both the marker body and protective cover.

5. **FIELD TESTING**

5.1 **Site Selection:** The test site shall be a chip seal or slurry seal surface with known ADT. Each test installation shall consist of 200 markers on 3 meter centers. After the surface treatment is completed, the protective covers will be removed and any damage to the markers caused by the surfacing process will be noted.

5.2 **Installation:** The manufacturer shall supply all material, equipment and labor to install the markers and may send a technical representative to observe the marker installation. Traffic control will be furnished by the testing facility. Markers are to be installed according to the manufacturer’s installation instructions. The manufacturer’s representative will also certify that their markers were installed to their satisfaction.

5.3 **Field Observations:** The marker body and reflective surface will each be rated separately. If a marker appears to be missing due to lack of adhesion, it will be noted on the evaluation. One fifth of the markers will be removed each week for retroreflective testing in the laboratory. Field observations will be performed weekly for a period of one month and the following data will be gathered:

- Marker body condition 5 4 3 2 1 0
- Reflective surface condition 5 4 3 2 1 0

**Marker Body Condition**

5 – Excellent; Completely Intact, “Like New” Condition
4 – Good; Minor Scratches and Scratches
3 – Fair; Obvious Damage but still Functional
2 – Poor; Major Damage, Marginally Functional
1 – Very Poor; Non-functional
0 – Missing

**Reflective Surface Condition**

5 – Excellent; Completely Intact, “Like New” Condition
4 – Good; Minor Scratches and Scratches
3 – Fair; Some Abrasion or Discoloration, but still Functional
2 – Poor; Major Scarring or Discoloration, Marginally Functional

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1 – Very Poor; Non-Functional
0 – Missing

6. REPORTING

At the completion of the one-month test period, the testing states will summarize the data into a complete RPM testing report and forward it to the NTPEP coordinator for distribution. The following data will be included in all reports:

- average annual daily traffic count (AADT) and number of lanes at each test site
- percentage of truck traffic at each test site
- type of marker adhesive
- millimeters of rain during testing period at each site
- extreme high and low temperatures during testing period at each site
- laboratory test data
- weekly field ratings
1. SCOPE

1.1 This project work plan covers the procedures used by the National Transportation Product Evaluation Program (NTPEP) to evaluate hot melt adhesives. The work plan includes sampling procedures, laboratory testing, field testing, and reporting information.

1.2 The NTPEP is a voluntary program whereby manufacturers may choose to have their products evaluated for a fee that is used primarily to cover the costs of the evaluation and producing its associated reports. The NTPEP reports the results of these evaluations, but does not accept or reject products. However, transportation officials may choose to use the results of the evaluations in the development and maintenance of an approved products list. The Adhesive Project Panel also recommends a retest for hot melt adhesives if formulation changes or every five years, whichever comes first. There shall be no product name or a model change allowed after the Product Evaluation Form (PEF) has been submitted to AASHTO/NTPEP.

1.3 The NTPEP is a technical service program of the American Association of State Highway and Transportation Officials (AASHTO). This document and other documents produced by NTPEP may not be reproduced without the express written permission of AASHTO.

2. REFERENCED DOCUMENTS

2.1 ASTM D5 “Test Method for Penetration of Bituminous Materials”

2.2 ASTM D36 “Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)”

2.3 ASTM D92 “Test Method for Flash and Fire Points by Cleveland Open Cup”

2.4 ASTM D113 “Test Method for Ductility of Bituminous Materials”

2.5 ASTM D3236 “Test Method for Apparent Viscosity of Hot Melt Adhesives and Coating Materials”


2.7 ASTM D4280 “Specification for Extended Life Type, Nonplowable, Prismatic, Raised, Jul 2009
3. SAMPLING REQUIREMENTS

By April of each year, a random sample of each adhesive approved to be tested in a quantity sufficient to place 200 raised pavement markers will be taken from the manufacturer’s stock by a representative of the member department doing the testing or by an authorized representative. The adhesive should be accompanied by technical documents outlining chemical and functional characteristics as well as recommended application procedures.

4. CLASSIFICATION


4.2 Flexible Bituminous Adhesive: Hot applied thermoplastic bituminous material capable of bonding markers to the pavement without excessive marker movement.

4.3 Non-Bituminous Hot Melt Adhesive: Single component non-bituminous thermoplastic material capable of bonding markers to the pavement without excessive marker movement.

5. LABORATORY TESTING

5.1 Standard Bituminous Adhesive: If the adhesive receives a recommendation for testing, a sample will be tested in the laboratory in accordance with ASTM D4280, Annex A1.

5.2 Flexible Bituminous Adhesive

5.2.1 Properties: Flexible bituminous adhesives shall be subjected to the following tests:

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</table>

5.2.2 Flexibility: Flexibility is to be determined as follows:
The samples are prepared using 3.2 mm thick steel shims that enclose an opening which is 25 mm wide and 100 mm long on a sheet of release paper or a release treated metal plate. The heated adhesive is poured into the opening until it is slightly overfilled. After one hour of cooling the excessive adhesive is trimmed flush with the shims using a hot knife and then the sample is removed from the shims. The trimmed samples are placed in a freezer maintained at \(-7 \pm 1^\circ\text{C}\) for a minimum of four hours. The conditioned samples are removed from the freezer and immediately bent through an arc of 90° at a uniform rate in 10 seconds (9° per second) over a 25-mm diameter mandrel. Record whether cracking occurs in the test sample.

5.3 Non-Bituminous Hot Melt Adhesive

5.3.1 Properties: Non-bituminous, hot-melt adhesives shall be subjected to the following tests:

<table>
<thead>
<tr>
<th>Property</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penetration, 100g, 5 sec., 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>
</tr>
<tr>
<td>Ductility</td>
<td>ASTM D 113</td>
</tr>
<tr>
<td>Flow</td>
<td>ASTM D 5329</td>
</tr>
<tr>
<td>Heat Stability</td>
<td>ASTM D 4499</td>
</tr>
<tr>
<td>Flash point</td>
<td>ASTM D 92</td>
</tr>
<tr>
<td>Flexibility</td>
<td>As explained in Tests for Flexible Bituminous Adhesives</td>
</tr>
</tbody>
</table>

6. FIELD TESTING

6.1 Site Selection: Test sites shall consist of one mile each of asphaltic concrete and Portland cement concrete pavements with a minimum Average Daily Traffic of 35,000. There will be two test installations for each adhesive, one on asphalt pavement and one on Portland cement concrete pavement.

6.2 Installation: Manufacturer will supply all material (including the raised pavement markers), equipment, and labor to install markers. Traffic control will be furnished by testing facility. Each installation will consist of a minimum 100 control markers placed at 3 meter centers along lane lines. Test installations will be completed in October of each year.

6.3 Field Observations: Observations will be made every six months and the following data will be gathered:

- number of markers retained
- number of markers missing

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- average temperature for the test period
- movement of markers
- tracking of adhesive onto face of marker

7. REPORTING

At the completion of the two-year test period, the testing states will summarize the data into an interim report after one year of installation and a final report after the second year of installation. Both reports will be forwarded to the NTPEP coordinator for distribution. The following data will be included in all reports:

- average annual daily traffic count (AADT), number of lanes, and percentage of truck traffic at each test site
- millimeters of rain during testing period at each site
- extreme high and low temperatures during testing period at each site
- laboratory test data and field ratings
1. SCOPE

1.1 This project work plan covers the procedures used by the National Transportation Product Evaluation Program (NTPEP) to evaluate non-plowable raised pavement marker epoxy adhesives. The work plan includes sampling procedures, laboratory testing, field testing, and reporting information.

1.2 The NTPEP is a voluntary program whereby manufacturers may choose to have their products evaluated for a fee that is used primarily to cover the costs of the evaluation and producing its associated reports. The NTPEP reports the results of these evaluations, but does not accept or reject products. However, transportation officials may choose to use the results of the evaluations in the development and maintenance of an approved products list. The Adhesive Project Panel also recommends a retest for epoxy adhesives if formulation changes or every five years, whichever comes first. There shall be no product name or a model change allowed after the Product Evaluation Form (PEF) has been submitted to AASHTO/NTPEP.

1.3 The NTPEP is a technical service program of the American Association of State Highway and Transportation Officials (AASHTO). This document and other documents produced by NTPEP may not be reproduced without the express written permission of AASHTO.

2. REFERENCED DOCUMENTS

AASHTO T237 “Testing Epoxy Resin Adhesive”

3. SAMPLING REQUIREMENTS

By April of each year, a random sample of each adhesive approved to be tested in a quantity sufficient to place 200 raised pavement markers will be taken from the manufacturer’s stock by a member state department of transportation representative. The adhesive should be accompanied by technical documents outlining chemical and functional characteristics as well as recommended application procedures. The epoxy adhesive shall be furnished as two separate components. Each component shall be certified by the manufacturer to have a minimum shelf life of six months.

4. LABORATORY TESTING

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The epoxy system, when mixed according to the manufacturer's recommendations, shall be tested in accordance with AASHTO T237 for the following physical characteristics:

- pot life at 25°C
- bond strength at 1 hour at 25°C
- bond strength at 24 hours at 25°C
- infra-red spectrophotometric analysis

Prior to test the components shall be conditioned for 24 hours at a room temperature of 24°C ± 3°C. After conditioning, each component should be stirred so as to redisperse any settled material. Care should be taken not to contaminate one component with the other.

5. FIELD TESTING

5.1 Site Selection: Test sites shall consist of one mile each of asphaltic concrete and Portland cement concrete pavements with a minimum Average Daily Traffic of 35,000. There will be two test installations for each adhesive, one on asphalt pavement and one on Portland cement concrete pavement.

5.2 Installation: Manufacturer will supply all material (including the raised pavement markers), equipment, and labor to install markers. Traffic control will be furnished by testing facility. Each installation will consist of a minimum 100 control markers placed at 3 meter centers along lane lines. Test installations will be completed in October of each year. Manufacturer’s representative will also certify that their adhesive was installed to their satisfaction.

5.3 Field Observations: Observations will be made every six months and the following data will be gathered:

- number of markers retained
- number of markers missing
- average temperature for period
- movement of markers
- tracking of adhesive onto face of marker

6. REPORTING

At the completion of the test period, the testing states will summarize the data into an interim report after one year of installation and a final report after the second year of installation. Both reports will be forwarded to the NTPEP coordinator for distribution. The following data will be included in all reports:

- average annual daily traffic count (AADT), number of lanes, and percentage of truck traffic at each test site
- millimeters of rain during testing period at each site

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- extreme high and low temperatures during testing period at each site
- laboratory test data and field ratings