Standard Practice for

NTPEP Evaluation of High Friction and Thin Overlays for Bridges and Pavements

AASHTO Designation: HFTO-01-16
1. SCOPE

1.1 This standard practice covers the requirements and testing criteria for the National Transportation Product Evaluation Program (NTPEP) evaluation of high friction and thin overlays for bridges and pavements (HFTO). 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 to provide AASHTO Member States a list of tested HFTO resins and primers, by type and manufacturer, which have been evaluated in accordance with AASHTO, AASHTO-AGC-ARTBA Task Force 34 and ACI materials specifications and guidelines. Member departments are encouraged to apply this information to improve their specifications or establish approved or prequalified products lists as they deem appropriate for their individual programs.

1.3 This program consists of a battery of laboratory evaluations and 36 month field evaluation. Field test sites will be selected on asphalt pavement, concrete pavement, and concrete bridge deck. These evaluations are intended to assess the product adhesion properties and any improved skid resistance of the applied products.

1.4 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 AASHTO Standards:

2.1.1 AASHTO T27 – Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

2.1.2 AASHTO T84 – Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate

2.1.3 AASHTO T85 - Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate

2.1.4 AASHTO T242-06 Standard Method of Test for Frictional Properties of Paved Surface Using a Full-Scale Tire

2.2 ASTM Standards:

2.2.1 ASTM C114 – Standard Test Methods for Chemical Analysis of Hydraulic Cement
2.2.2 ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

2.2.3 ASTM C1583 - Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)

2.2.4 ASTM D638 – Standard Test Method for Tensile Properties of Plastics

2.2.5 ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness

2.2.6 ASTM D2556-11 – Standard Test Method for Apparent Viscosity of Adhesives Having Shear-Rate-Dependent Flow Properties

2.2.7 ASTM D7428 – Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

2.2.8 ASTM E275 – Practice for Describing and Measuring Performance of Ultraviolet and Visible Spectrophotometers

3. TERMINOLOGY

3.1 *Polymer* - A large molecule composed of many repeated subunits. In this standard this refers to a binder which hardens to a hard, glassy solid.

3.2 *Neat Material* – Mixed Binder with no aggregate.

3.3 *Filled Material* – Mixed Binder with aggregate included.

3.4 *Surface Aggregate* – Aggregate placed on the surface of the uncured polymer to create a skid resistant wearing surface.

3.5 *Extender Aggregate* – aggregate added to the polymer to increase the volume of the polymer concrete.

3.6 *Prime Coat* – A polymeric resin that is used to fill cracks and voids in the existing pavement surface that is compatible with the binder resin system.

3.7 *ICRI* – International Concrete Repair Institute.

4. PROGRAM OVERVIEW

4.1 Overview of the Program:

4.1.1 The NTPEP test facilities evaluate manufacturer’s product(s) according to the applicable testing standards that are listed in this document. The test facilities performing the evaluations are contracted to AASHTO.

4.1.2 Test fees that are paid by the manufacturer for evaluation of their products will be paid to AASHTO. Fees will be based on the cost of laboratory testing and the number of field test applications chosen by the manufacturer. Fees for field testing will include the cost of traffic control and site preparation. The manufacturer is required to submit products within 30 days of acceptance to the program. A manufacturer may have more than one type of aggregate or binder that is used on different surfaces. A change in binder or aggregate constitutes a different product and will require a separate submission. If the products are not submitted for evaluation within this time period a stalled product assessment fee of not less than 15% of the test fee or $500, whichever is greater, per submission will be charged and the remaining test fees will be returned to the manufacturer. At that point the manufacturer will be required to begin the submission process again if they would like to pursue evaluation through the program.
All information generated through this testing program is considered property of AASHTO. Test results will be posted either as a static file online for download or the data will be reported through our online data base and viewable by our Member Departments.

4.2 Participation and Administration of the Program:

4.2.1 Manufacturer participation and AASHTO administration of the program will be governed by the NTPEP Information and Operations Guide. This Guide provides the general requirements for submittal of products and review of data that is generated through testing prior to posting for review by Member Departments. A copy of the Guide is available online at www.NTPEP.org.

4.2.2 The binder manufacturer will be responsible for reviewing the submittal timelines as posted online at www.NTPEP.org. All testing will be performed by contracted laboratories as described above. Submittal and product evaluation timelines are contained in Appendix A of this document.

4.2.3 Samples must be submitted to the designated testing facility in sufficient quantity to conduct all testing, as instructed by the NTPEP representative along with:
- Information showing the manufacturer’s name and description of product;
- Manufacturer test results;
- Sample of the binder and surface aggregate and/or aggregate filler in sufficient quantity to conduct the specified product tests.
- Materials will be limited to two (2) per manufacturer per year. A generic material composition description and MSDS must accompany the submittal for classification purposes. This information will be kept in confidence by NTPEP unless directed otherwise by the manufacturer.

5. LABORATORY TESTING

5.1 Polymer Binder

5.1.1 Viscosity – Perform testing according to ASTM C881. Spindle and speed selection based upon ASTM D2256-11.

5.1.2 Gel Time – Perform testing according to ASTM C881.

5.1.3 Tensile Strength – Perform testing according to ASTM C881. Use type 1 specimen and cure for 7 days.

5.1.4 Tensile Elongation – Perform testing according to ASTM C881. Use type 1 specimen and cure for 7 days.

5.1.5 Tensile Modulus - Perform testing according to ASTM D638. Use type 1 specimen and cure for 7 days.

5.1.6 Absorption – Perform testing according to ASTM C881.

5.1.7 Shore D Hardness – ASTM D2240. Cure specimen for 7 days.

5.1.8 Compressive Strength – Perform testing according to ASTM C881. Cure specimen for 7 days.

5.1.9 Infrared Spectrum - Perform testing according to NTPEP ERB workplan.

5.2 Aggregate

5.2.1 Gradation – Perform testing according to AASHTO T27.
5.2.2 Absorption – Perform testing according to AASHTO T84 or T85.

5.2.3 Micro-Deval – Perform testing according to ASTM D7428 with changes included in Appendix A.

5.2.4 X-Ray Spectrum – Shall be obtained by X-ray spectrometry rapid test method (such as that used in C114 for determining elemental composition of cement) or (by means of the semi-quantitative / standard less analysis from the instrument software program).

6. FIELD TESTING

6.1 Test Deck (initial, 1, 2, and 3 years)

6.1.1 Bond Strength – Perform testing according to ASTM C1583.

6.1.2 Skid Resistance – Perform according to AASHTO T242-06 at 40 mph with both ribbed. Report both Raw skid data and Transportation Research Center (TRC) corrected skid data.

7. FIELD EVALUATION

7.1 Test Deck Surface Preparation

7.1.1 The State hosting the test deck will be responsible for surface preparation. The goal of the preparation shall be to clean the entire test deck surface by abrasive blasting and other means to remove asphaltic material, oils, dirt, rubber, curing compounds, paint, carbonation, laitance, weak surface mortar and other potentially detrimental materials that may interfere with the bonding or curing of the overlay system.

7.1.2 Surface profile range for concrete shall be between CSP 5 and CSP 7 in accordance with ICRI Guideline #310.2 as compared to surface profile coupons. Surface profile shall be evaluated after cleaning. All dust and other loose material shall be removed prior to overlay. Asphalt surfaces will be cleaned by high pressure air wash. The high pressure air wash will utilize a minimum operating air pressure of 180 CFM, a blowpipe equal to or less than the diameter of the air supply line and a spray pattern perpendicular to the surface with a standoff distance (blowpipe tip to surface) not to exceed 12 inches.

7.2 Installation

7.2.1 Manufacturers will be required to provide sufficient quantities of materials for each field installation with enough extra material to obtain all laboratory testing. Each field installation will be approximately 2,400 square feet. Manufacturers will be required to remove excessive material after the initial set and prior to removal of traffic control. The hosting state has the right to demand additional measures to ensure the safety of the public and the return of traffic to the travel lane at the end of installation.

7.3 Evaluation

7.3.1 Initial field evaluation shall be conducted between 30 to 60 working days after installation. Additional evaluations will occur at 12, 24, and 36 months from the date of installation. Due to safety concerns manufacturers will not be allowed to be present during the field evaluations. The test facility may elect to schedule a date for manufacturers’ review of product performance.

7.3.2 Products will be exposed to three winter seasons and may incur plowing, salting, and brining. Any such weather related events will be tracked.
7.3.3 Photographs will be recorded immediately after installation and at each evaluation period. Delaminated areas will be measured and reported as a percentage of the installed area.

8. EVALUATION FACILITY REQUIREMENTS

8.1 A laboratory that is qualified to perform the specific tests as outlined in the work plan and has on site qualified technicians and equipment necessary to perform the tests per ASTM and ASSHTO standard.

9. REPORT

9.1 Testing data will be compiled and made available to all participating states and testing companies through the NTPEP Datamine. No judgment as to a product’s acceptability will be made in this report. End user participants will establish criteria for product acceptability.

10. EVALUATION FREQUENCY

10.1 Products evaluated in this program must be resubmitted every 5 years (from release of data) for current data to remain available to the manufacturer or the state members of AASHTO.

11. TIMELINE

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12. KEYWORDS

12.1 NTPEP; Polymer Concrete Overlay, High Friction Surface Treatment
APPENDIXES

APPENDIX A

Modifications to ASTM D7428

Replace Section 11 with the following:

11.1. Reference Aggregate—The laboratory will establish an adequate supply of material to use for monitoring testing consistency through the establishment of control limits. A suitable material with an average loss of between 10 and 25 percent shall be established. From this material, 10 samples shall be taken randomly and tested. At any time a new supply is required, this procedure shall be conducted on a new supply.

11.1.1. The mean loss and sample standard deviation of the reference aggregate (see Section 7.1) shall be determined from the 10 tests in Section 11.1.

11.1.2. For continued acceptance of data, individual reference aggregate test data must fall within the range of ±2 standard deviations of the mean percent loss 95 percent of the time. When test data of the reference aggregate is outside the limits, an investigation as to the probable cause shall be conducted. The equipment shall be checked and the testing technique re-examined to detect nonconformance with the test procedure.

11.2. Every 10 samples, but at least every week in which a sample is tested, a sample of the reference aggregate shall be tested. The material shall be taken from a stock supply and prepared according to Section 8. When 20 samples of reference aggregate have been tested, and the results show satisfactory variation, the frequency of testing may be changed to a minimum of one sample every month.

11.3. Trend Chart Use—The percent loss of the last 20 samples of reference aggregate shall be plotted on a trend chart in order to monitor the variation in results (see Figure 2). The Upper and Lower Range Limits are defined as ±2 standard deviations of the mean percent loss established from Section 11.1.1.

![Figure 2—Micro-Deval Abrasion Trend Chart for Reference Aggregate Samples](image-url)