
Standard Specification for High Friction Surface Treatment for Asphalt and Concrete Pavements Using Calcined Bauxite

AASHTO Designation: M 354-24^{1,2}

Adopted without Revisions: 2024

Technical Subcommittee: 4c, Markings and Coatings



**American Association of State Highway and Transportation Officials
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1. SCOPE
- 1.1.

This specification covers laboratory performance of materials for High Friction Surface Treatments (HFST) for asphalt and concrete pavements. The HFST is comprised of a minimum of a single layer of a binder resin system and surface-applied aggregate.
- 1.2.

Binder resin systems include low modulus epoxy, methyl methacrylate (MMA), and polyester resins.
- 1.3.

High friction surface applied aggregate is refractory grade calcined bauxite aggregate.
- 1.4.

This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all the safety concerns associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. REFERENCED DOCUMENTS

- 2.1.

AASHTO Standards:

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M 235M/M 235, Epoxy Resin Adhesives

■

M 339M/M 339, Thermometers Used in the Testing of Construction Materials

■

R 76, Reducing Samples of Aggregate to Testing Size

■

T 27, Sieve Analysis of Fine and Coarse Aggregates

■

T 255, Total Evaporable Moisture Content of Aggregate by Drying
- 2.2.

ASTM Standards:

■

C305, Standard Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency

■

C579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

■

C778, Standard Specification for Standard Sand

■

C881/C881M, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

■

C884/C884M, Standard Test Method for Thermal Compatibility between Concrete and an Epoxy-Resin Overlay

- D570, Standard Test Method for Water Absorption of Plastics
- D638, Standard Test Method for Tensile Properties of Plastics
- D695, Standard Test Method for Compressive Properties of Rigid Plastics
- D2240, Standard Test Method for Rubber Property—Durometer Hardness
- D2471-99, Standard Test Method for Gel Time and Peak Exothermic Temperature of Reacting Thermosetting Resins (withdrawn 2008; no replacement)
- D2556 and D2556-11, Standard Test Method for Apparent Viscosity of Adhesives Having Shear-Rate-Dependent Flow Properties Using Rotational Viscometry
- D3278, Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
- D7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in Micro-Deval Apparatus
- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
- E573, Standard Practices for Internal Reflection Spectroscopy
- E1621, Standard Guide for Elemental Analysis by Wavelength Dispersive X-Ray Fluorescence Spectrometry
- E879, Standard Specification for Thermistor Sensors for General Purpose and Laboratory Temperature Measurements
- E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers
- E2877, Standard Guide for Digital Contact Thermometers

2.3. *International Electrotechnical Commission Standards:*

- IEC 60584-1: 2013 Thermocouples - Part 1: EMF Specifications and Tolerances
- IEC 60751: 2008 Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors

3. TERMINOLOGY

- 3.1. *binder resin system*—a polymeric resin used to bond a surface-applied aggregate to an asphalt or concrete pavement.
- 3.2. *high friction surface treatment (HFST)*—a binder resin system and surface-applied aggregate utilized to increase the coefficient of friction of an asphalt or concrete pavement.
- 3.3. *prime coat*—a polymeric resin that is used to fill cracks and voids in existing pavement surface that is compatible with the binder resin system.
- 3.4. *qualifying agency*—the organization or entity that is soliciting/specifying the material for use.
- 3.5. *refractory grade calcined bauxite aggregate*—non-metallurgical “refractory grade” high-quality bauxite rock is calcined at 2900 to 3000°F which produces a dense, high purity, stable aggregate. Refractory Grade has a high Alumina content (85 percent minimum Al_2O_3), very low alkali content and low impurities.

4. SUMMARY OF SPECIFICATION

- 4.1. This specification describes the properties of materials used within a HFST for asphalt and concrete pavements.

- 4.1.1. The HFST is comprised of a minimum of a single layer binder resin system that firmly retains a surface applied aggregate.
- 4.1.2. The HFST may be applied by mechanical or manual techniques to either asphalt or concrete pavements.

5. SIGNIFICANCE AND USE

- 5.1. The HFST is used primarily for restoring or enhancing the frictional properties of a pavement surface.
- 5.2. Recommended locations for HFST installations include horizontal curves, intersections, exit-entrance ramps, steep grades, bridges, and other identified areas where increased friction is warranted.
- 5.3. Even though an HFST can provide improved friction on bridge decks, they are not intended for preservation type sealing projects.

6. MATERIALS

- 6.1. *Binder Resin Systems:*
 - 6.1.1. *Binder Resin System*—Binder resin systems shall be recommended by the manufacturer as suitable for use on the intended pavement surface and for the range of atmospheric exposure at that location.
 - 6.1.2. *Prime Coat*—A primer shall be used before application of the binder resin system when recommended by the manufacturer.
 - 6.1.3. The properly proportioned and mixed binder shall conform to the requirements of Table 1, Low Modulus Epoxy; Table 2, Methyl Methacrylate (MMA); and Table 3, Polyester Resins. See Section 7 for sample preparation and testing procedures.