

Special Specification 4013

High Friction Surface Treatment



1. DESCRIPTION

- 1.1. Furnish and apply a high friction surfacing system in accordance with this Specification and the Lines and details shown on the plans.
- 1.2. Ensure the manufacturer's representative is present at the construction site to train Department and Contractor personnel before placing the surface treatment and remains available during application as necessary.

2. MATERIALS

- 2.1. **General.** Furnish a high friction surface treatment containing polymer binder capable of retaining a bauxite aggregate topping under vehicular traffic conditions.
- 2.2. **Polymer Binder Resin System.** Provide a binder resin system recommended by the manufacturer as suitable for use on the intended pavement surface and for the potential range of atmospheric exposure.

Table 1
Polymer Binder Resin System Requirement

Property	Test Method	Requirement
Viscosity	ASTM D-2556	7 - 30 poises
Gel Time	ASTM C-881	10 minutes min
Ultimate Tensile Strength	ASTM D-638	2500 - 5000 psi
Elongation at break point	ASTM D-638	30 - 70 %
Durometer Hardness (shore D)	ASTM D-2240	60-80
Compressive Strength	ASTM C-579	1,000 psi min at 3 hours 5,000 psi min at 7 days
Cure Rate (Dry through time)	ASTM D-1640	3 hours max
Water Absorption	ASTM D-570	1% max
Adhesive Strength @ 24 hour	sASTM C-1583	250 psi min or 100% substrate failure

- 2.3. **Aggregate Topping.** Furnish an aggregate topping that is a calcium bauxite consisting of a 1-3mm gradation. Ensure the aggregate is delivered to the construction site in clearly labeled 55 lb. bags or 2200 lb. super sacks. Provide aggregate that is clean, dry, and free from foreign matter. Provide aggregate that meets the requirements of Table 2.

Table 2
Aggregate Requirements

Property	Test Method	Requirement
Aggregate Grading		No. 6 Percentage Passing 95% min. No.16 Percentage Passing 5% max.
Aggregate Abrasion Value Loss at 100 rev.	LA Abrasion ASTM C-131	10% max.
Aggregate Acid Insolubility	Tex-512-J	Greater than 90%
Aggregate Magnesium Soundness	Tex-411-A (Stockpile gradation)	30% max.
Aluminum Oxide Content	ASTM C-25	87% min

- 2.4. **Certification.** Provide an independent laboratory report showing that the polymeric binder meets the requirements of this section. Submit certification from the manufacturer that the aggregate topping meets the above requirements. Submit documentation of the in-place friction characteristics (minimum 65 FN40R in accordance with ASTM E274) of aggregate bonded to a vehicular bearing surface using the polymer binder. Submit a list of projects with owner's contact information on which a minimum of 10,000 sq. yd. of high friction aggregate and polymeric binder was placed within the past three years. A sample of the resin binder or components lot/batch shall be supplied upon request.

3. CONSTRUCTION

- 3.1. **General.** Do not apply the modified polymer binder on a wet surface, when the ambient or surface temperature is below 45 °F or above 105 °F unless the manufacturer provides test data demonstrating the physical properties of Table 1 when cured at representative ambient temperatures. Do not apply the polymer binder when the anticipated weather conditions would prevent the proper application of the surface treatment as determined by the manufacturer's representative.
- 3.2. **Preparation.** For applications on new pavements, install the high friction polymer binder and aggregate topping a minimum of 30 days after placing the underlying and adjacent asphalt pavement to reduce the likelihood of "tracking."

Protect utilities, drainage structures, curbs, and any other structure within or adjacent to the treatment location against the application of the surface treatment materials. Cover and protect existing pavement markings that are adjacent to the application surfaces as directed. Remove existing or temporary pavement markings that conflict with the surface application in accordance with Item 677, "Eliminating Existing Pavement Markings and Markers," except for Measurement and Payment.

Clean asphalt pavement surfaces using mechanical sweepers and high pressure air wash with sufficient oil traps. Mechanically sweep all surfaces to remove dirt, loose aggregate, debris, and deleterious material. Vacuum sweep or air wash using a minimum of 180 cfm of clean and dry compressed air, all surfaces to remove all dust, debris, and deleterious material. Maintain air lance perpendicular to the surface and the tip of the air lance within 12 inches of the surface.

Clean concrete pavement surfaces by shot blasting and vacuum sweeping. Shot blast all surfaces to remove all curing compounds, loosely bonded mortar, surface carbonation, and deleterious material. The prepared surface shall comply with the International Concrete Repair Institute (ICRI) standard for surface roughness CSP 5. After shot blasting, vacuum sweep or air wash, with a minimum of 180 cfm of clean and dry compressed air, all surfaces to remove all dust, debris, and deleterious material. Maintain air lance perpendicular to the surface and the tip of the air lance within 12 inches of the surface.

Treat joints and cracks greater than 1/4 in. in width and depth with the mixed polymer specified in this specification. Once the polymer in the pre-treated areas has gelled, the high friction polymer binder and aggregate topping installation may proceed.

- 3.3. **Mixing and Application of Polymer Binder and Aggregate Wearing Course.** Utilize one of the following methods to apply the polymer binder and aggregate wearing course, as shown in plans.

- 3.4. **Mixing and Application Methods .** Utilize one of the following methods to apply the resin binder and aggregate wearing course, in accordance with manufacturer's recommendations. Application method 1 shall be utilized on areas greater than 250 feet in length.

- 3.5. **Automated Continuous Application.** The applicator shall continuously mix, meter, monitor and apply the resin binder and high friction aggregate in one continuous application pass.

The applicator vehicle shall be equipped with an inbuilt data management unit which is capable of producing real time data flow showing the volume of resin, the resin mil thickness on average throughout the application width, the volume of aggregate applied throughout the application width. The automated continuous application vehicle will have continuous pumping and portioning devices that blend the polymer binder within a controlled system. The polymer binder shall be blended and mixed in the ratio per the manufacturer's specification (+/- 2% by volume); the polymer binder shall be continuously applied once blended. The application vehicle should be capable of applying the minimum polymer binder spread rate.

The high friction aggregate shall be applied by the same automated continuous application vehicle that applies the resin binder to the pavement section. The automatic aggregate spreader shall be capable of applying up to a continuous 12 foot width application. The high friction aggregate shall be applied within 3 seconds (+/- 1 sec) of the base polymer binder application onto the pavement section, from a minimum height of 12 inches from above the pavement section surface, at the minimum spread rate.

No exposed wet spots of the polymer binder shall be visible once the aggregate is installed. The operations should proceed in such a manner that will not allow the mixed material to separate, cure, dry, be exposed or otherwise harden in such a way as to impair retention and bonding of the high friction surfacing aggregate, walking, standing or any form of contact or contamination with the wet uncured resin will result in that section of resin being removed and replaced at your expense.

- 3.6. **Hand Mixing and Application.** For areas deemed to be low volume and areas less than 250 feet in length, hand-mix the resin binder in accordance to the manufacturer's recommendations. Uniformly spread the resin binder onto the surface using a serrated edge squeegee. Immediately broadcast the high friction surfacing aggregates until refusal.

The excess aggregate can be reused; the aggregate shall be reclaimed by a mechanical sweeper, the recovered aggregate must be clean, uncontaminated and dry.

Excess and loose aggregate must be removed from the traveled way and shoulders by street sweeping. Application of HFST on highway ramps requires a second street sweeping 24-48 hours after application on the ramp.

Utilities, drainage structures, curbs, and any other structures within or adjacent to the treatment location must be protected against the application of the HFST materials.

When magnesium phosphate concrete is placed prior to the HFST bridge deck overlay, the magnesium phosphate concrete must be placed at least 72 hours prior to placing the polymer resin binder.

When modified high alumina based concrete is placed prior to the HFST bridge deck overlay, the polymer resin binder must not be placed on the concrete until at least 30 minutes after final set of the modified high alumina based concrete.

Expansion joints and deck drains must be adequately isolated prior to applying HSFT.

Before opening HFST areas to public traffic, test for the coefficient of friction per ASTM E1911. Provide results to the Engineer the same working day the tests are performed.

4. MEASUREMENT

- 4.1. High Friction Surface Course will be measured by the square yard of completed and accepted work. No deduction will be made for the areas occupied by manholes, inlets, drainage structures, pavement markings, or by any public utility appurtenances within the area.
- 4.2. This is a plans quantity item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2, "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

- 5.1. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "High Friction Surface Course." This price is full compensation for surface preparation, furnishing, preparing, hauling and placing materials including epoxy binder, removing existing pavement markings and excess aggregate as needed, and for labor, tools, equipment, and incidentals.