SP- 236025
(New)

SPECIAL PROVISIONS
FOR
HIGH FRICTION SURFACE TREATMENT

Buchanan County
STP-S-C010(120--5E-10

Effective Date
December 17, 2024

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

236025.01 DESCRIPTION.

Construct a High-Friction Surface Treatment (HFST) on a hot-mix asphalt or Portland cement concrete pavement surface to restore or enhance the skid resistance.

236025.02 MATERIALS.

A. General.

1. Prior to construction, provide certification for both the binder and aggregate that states the material meets the requirements listed in Tables 236025.02-1 and 236025.02-2.

2. Store all materials in a clean, dry environment and in accordance with the manufacturer's recommendations.

3. Obtain SDS, Product Data Sheets, and other information pertaining to the safe practices for the storage, handling, and disposal of the materials, and to their health hazards. Provide a copy of this information to the Engineer.

B. Binder.

1. The binder shall consist of a two-part thermosetting polymer resin compound which holds the aggregate firmly in position.

2. Binder components shall be packaged in suitable, well-sealed containers clearly labeled as to the type of material and the ratio of the components to be mixed by volume. Any special instructions regarding the mixing shall be included.

3. The label shall show binder or hardener components brand name, name of manufacturer, lot or batch number, temperature range for storage, expiration date, and the quantity contained therein.

4. The binder shall conform to the following requirements:

Table 236025.02-1: Epoxy Requirements

Property	Requirement	Test Method
Viscosity, Poises	7 - 30	ASTM D 2556
Gel Time, minutes	10 min.	AASHTO M 235, Class C
Ultimate Tensile Strength, psi	2500 – 5000	AASHTO M 235, Class C
Elongation at Break Point, %	30 - 70	AASHTO M 235
Compressive Strength, psi	1000 min (3 hrs) 5000 min (7 days)	ASTM C 579
Water Absorption, %	1 max.	AASHTO M 235
Thermal Compatibility	Pass	ASTM C 884
Compressive Modulus, psi	90,000 max.	ASTM D 695
Durometer Hardness (Shore D)	60 – 80	ASTM D 2240
Cure Rate (Dry through time), hours	3 max.	ASTM D 1640, 55 mils wet thickness @ 75º F
Mixing Ratio	*	Per Manufacturer
Adhesive Strength, psi @ 24 hr.	250 min. or 100% substrate failure	ASTM D 4541

*Provide manufacturer's recommendations to Engineer prior to construction.

C. Aggregate.

1. The aggregate shall consist of calcined bauxite material that is clean, dry, and free from foreign material.

2. Deliver the aggregate to the construction site in clearly labeled packaging that protects the aggregate from any contaminants on the job site and from exposure to rain or other moisture.

3. The label shall show the aggregate brand name, name of manufacturer, lot or batch number, conditions for storage, location of processing, and the quantity contained therein.

4. The aggregate shall conform to the following requirements:

Table 236025.02-2: Bauxite Aggregate Requirements

Property	Requirement	Test Method
Moisture Content, %	0.2 max.	AASHTO T 255
Aluminum Oxide, %	87 min.	ASTM C 25
LA Abrasion Test, %	20.0 max.	AASHTO T 96 (D Grading)
Aggregate Gradation Sieve Designation No. 4 No. 6 No. 16	 Percent Passing (Min.) 100 95.0 – 100.0 0.0 – 5.0	AASHTO T 27

D. Equipment.

1. **Truck Mounted Application Machine.**
   Use an approved self-propelled truck mounted application machine capable of continuously

and thoroughly mixing polymeric resin binder components to the ratio recommended by the polymeric resin manufacturer at a minimum coverage rate of 15 gallons per minute. The machine shall include an aggregate drop spreader capable of mechanically continuously spreading bauxite aggregate at a minimum rate of 11 pounds per square yard in varying widths of up to 12 feet.

2. **Portable Shot Blast Equipment.**
   Use approved portable shot blast equipment to remove curing compound and prepare Portland cement concrete surfaces prior to application of the polymeric resin.

3. **Regenerative Air Sweeper.**
   Use a self-propelled Regenerative Air Sweeper (RAS) with power brooms capable of cleaning the existing pavement and removing loose aggregate without dislodging the bonded HFST aggregate. The vacuum head shall have a minimum width of 6 feet and blast re-circulated, filtered air at a minimum rate of 20,000 cubic feet per minute. The RAS must be capable of recycling loose aggregate into clean, uncontaminated, and dry aggregate. The RAS must be capable of being used without water to ensure a dry surface will be maintained during sweeping prior to HFST placement.

236025.03 CONSTRUCTION

A. Contractor Qualifications.
Provide documentation showing HFST or equivalent experience on at least three projects with Iowa DOT or other state or local highway agencies.

B. Quality Control Plan.

1. Submit a Quality Control (QC) Plan to the Engineer for approval at least 14 days prior to the pre-construction meeting. The QC Plan shall show proposed methods to control the equipment, materials, mixing, and paving operations to ensure conformance with these specifications. Discuss the QC Plan requirements at the pre-construction and progress meetings. The QC Plan shall contain at a minimum the following information:
   a. Key personnel and contact information.
   b. List of manufacturer recommendations for storage of material, weather restrictions, curing time, and opening to traffic.
   c. Cleaning and maintenance schedule for truck mounted application machine, including metering and monitoring devices.
   d. Corrective actions that will be taken for unsatisfactory construction practices and deviations from specifications.
   e. The QC Plan shall designate a QC Manager, who shall have full authority to institute any action necessary for the successful operation of this QC Plan. The QC Manager shall be on the jobsite at all times during placement of the HFST.

2. A technical expert representative from the binder manufacturer shall be present at the construction site to train construction personnel prior to placing the HFST and shall remain on the project for the first day of placement. After the first day, the representative shall be available during HFST application as necessary.

3. Verify the truck mounted application equipment calibrations prior to each day’s placement activities.

4. The Contractor shall be responsible for the required field quality control sampling and testing in conformance with the approved quality control plan and contract documents. Perform all sampling in the presence of and in locations as directed by the Engineer. Maintain and make

available upon request complete records of sampling, testing, actions taken to correct problems, and quality control inspection results. Any deviation from the approved QC Plan shall be cause for immediate suspension of the operations.

C. Weather Restrictions.

1. Apply Binder:
- **a.** on dry surfaces (including no condensation moisture from construction vehicles in front of the binder application),
- **b.** when the ambient temperature is not expected to fall below 55ºF during placement and curing, and
- **c.** when the surface temperature is below 100ºF

2. If the anticipated weather conditions or pavement surface temperature is not expected to meet the constraints listed above, the manufacturer's recommendations for proper application may be provided for review.

3. Do not place HFST materials when rain is forecast within 24 hours of application.

4. There shall be no visible moisture present on the surface of the pavement at the time of application of the HFST. A plastic sheet left taped in place for a minimum of 2 hours, according to ASTM D 4263, shall be used to identify moisture in the pavement.

D. Preparation.

1. Clean and fill all inadequately sealed joints and cracks 1/4 to 1 3/4 inches wide with a sealant approved by the binder manufacturer, which will bond to the specified binder. Perform crack sealing in accordance with Section 2541 (HMA Surfaces) or Section 2542 (PCC Surfaces) of the Standard Specifications, except that the crack shall only be filled flush to the pavement surface (no over-filling).

2. Completely remove all curing compounds from new Portland cement concrete surfaces using shot blasting equipment prior to installation.

3. Remove existing pavement markings, if not waterborne or solvent based, in areas to be covered with HFST in accordance with Article 2527.03, C of the Standard Specifications.

4. Protect existing pavement markings adjacent to the application area, if they are to remain in place, in accordance with Article 2527.03, C of the Standard Specifications.

5. Clean existing surfaces with a RAS without water for dust suppression, or by other methods approved by the QC Manager and the Engineer prior to application of the binder. Receiving surfaces must be clean, dry, and free of all dust, oil, debris, and any other material that might interfere with the bond between the binder material and existing surfaces.

6. Adequately cover and protect all utilities, drainage structures, curbs, and other items within or adjacent to the treatment location against the application of HFST materials.

E. Binder Application.

Mix the binder components proportionally in accordance with the manufacturer's recommended ratio. Apply the binder by a truck mounted application machine onto the pavement section to be treated within the temperature range specified in varying widths of up to 12 feet wide at a uniform application rate of 3.0 square yards per gallon, with a uniform thickness of 60 mils onto the pavement. Do not allow the binder to separate in the mixing lines, cure, dry, chill, set up, or

otherwise impair retention bonding of the high friction surfacing aggregate. Ensure that no seams are visible in the middle of the traffic lanes of the finished work after application of the surface aggregate. The binder shall not be distributed and spread on the pavement with squeegees except for small irregular areas and tapers. Standing in the wet, uncured binder will result in that section of resin being removed and replaced at no cost to the Contracting Authority.

F. Aggregate Application.

Within 3 seconds ± 1 second after placing the binder, apply the aggregate at a uniform rate of 11 to 15 pounds per square yard. Completely cover the wet binder with aggregate to achieve a uniform surface with no exposed wet spots remaining visible on the surface. A truck mounted application machine aggregate drop spreader must be used. Sprinkle or vertically drop the aggregate from a maximum height of 12 inches above the pavement surface without splashing the wet binder during placement by mechanical means.

G. Curing and Clean-Up.

Allow the treatment to cure in accordance with polymeric resin manufacturer recommendations. Perform two separate clean-up processes by removing the excess aggregate with a RAS on the treated area and adjacent areas. Perform initial clean-up before opening to traffic. Perform secondary clean-up 3 to 5 days after construction.

H. Field Acceptance Testing.

1. Ensure that the coverage rate of the retained aggregate is 11 to 15 pounds per square yard. Remove and re-apply HFST where any patches of exposed polymeric resin exist, at no additional cost to the Contract Authority.

2. Within 90 days after construction, the Engineer will measure the friction characteristics on some or all of the HFST installations, in accordance with ASTM E274. The minimum acceptable friction number (FN40R) is 65. If the minimum is not met, reapply a second layer of HFST according to these specifications at no additional compensation.

236025.04 METHOD OF MEASUREMENT

The Engineer will measure the area of High Friction Surface Treatment placed in square yards.

236025.05 BASIS OF PAYMENT

Payment for High Friction Surface Treatment will be at the contract unit price per square yard. Payment is full compensation for the specified work, including preparation of the concrete surface (including joint sealing), furnishing and applying the polymeric resin, furnishing and applying the bauxite aggregate and any corrective action required.