

**CITY OF COLUMBUS
PUBLIC SERVICE DEPARTMENT
TRANSPORTATION DIVISION**

**SUPPLEMENTAL SPECIFICATION 1512
FIBER REINFORCED BITUMINOUS MEMBRANE SURFACE TREATMENT
(FIBER-SAMI)**

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FIBER REINFORCED BITUMINOUS MEMBRANE SURFACE TREATMENT (FIBER-SAMI)

1512.01 Description

This work shall consist of furnishing all materials, equipment, labor and preparation necessary for the application of a Fiber Reinforced Bituminous Membrane Surface Treatment used as a stand alone finished surface (Type A) or as a Stress Absorbing Membrane Interlayer (SAMI) (Type B). The applied material shall completely seal the entire pavement surface and provide a uniform textured surface, suitable for placement of hot mixed asphalt, micro-surfacing or as a finished surface.

This is accomplished by using a specific applicator, which can be mounted on an asphalt distributor modified for applying the surface treatment of bituminous binder reinforced with glass fibers. The applicator comprises of an open bottomed spray bar housing fan or blower for producing a down draft in the housing, and at least one spray bar mounted on the housing and adapted to extend transversely in the direction of movement of the asphalt distributor on which the unit can be mounted.

A number of nozzles spaced longitudinally along the spray bar for spraying bituminous material, means of controlling the nozzles, and a number of sources for dispensing the cut glass fibers through the open bottomed housing to the surface of the bituminous material previously sprayed shall also be included.

1512.02 Materials

POLYMER MODIFIED BITUMINOUS BINDER

<u>EMULSION PROPERTY</u>	<u>MIN.</u>	<u>MAX.</u>	<u>TEST METHOD</u>
S.F. VISCOSITY, 50 C (sec)	100	250	ASTM D 244
PERCENT SOLIDS (%) [*]	65	---	ASTM D 244
STORAGE STABILITY, 24 hrs. (%)	---	1.0	ASTM D 244
SIEVE TEST, #20 mesh (%)	---	0.1	ASTM D 244
<u>RESIDUE PROPERTY</u>	<u>MIN.</u>	<u>MAX.</u>	<u>TEST METHOD</u>
PENETRATION, 100g, 5 sec, 25 C (dmm)	100	200	ASTM D 5
ELASTIC RECOVERY, 10 C, 10 cm (%) ^{**}	50	---	ASTM D 113

* By distillation or evaporation

** The specimen is extended 20 cm. The extended area is severed in the middle using a pair of shears. After 1 hour, at the test temperature the severed ends are returned to contact and the ductilometer reading is made again. The sample must recover at least 50 percent of the original 20 cm distance.

The polymer modifier shall be a SBS or a SBR type polymer. The minimum amount of solid or dry polymer modifier shall 3%, based upon the asphalt weight. The polymer

materials shall be milled or blended into the asphalt or blended through the emulsion mill as the emulsion is being produced.

COURSE AGGREGATE

The course aggregate shall be 100% crushed material from quarried stone, natural gravel or other high quality aggregate and meet the following requirements:

PHYSICAL REQUIREMENTS

<u>TEST</u>	<u>DESCRIPTION</u>	<u>SPECIFICATION</u>
AASHTO T96	L.A. Abrasion Test	40% max.
S1029*	Deleterious Material	1.0 max.
S1021*	Crushed Pieces	100%
AASHTO T104	Sodium Sulfate Soundness Test, 5 Cycle	15

GRADING REQUIREMENTS – ASTM C-117

SIEVE SIZE	TYPE A	TYPE B
1 inch (25mm)	100	100
¾ inch (19mm)	100	100
½ inch (12.5mm)	95-100	95 -100
No. 4 (4.75mm)	5-25	5 - 25
No. 8 (2.36mm)	0-10	0-10
No. 200 (75um)	2	2

FIBER

The glass fiber is E Class from an approved source. The glass fiber spools are supplied internally wound, in coils or cheeses. The spools are cut in-place into 60 mm, (2.38”) lengths which are distributed uniformly across and between the two parallel applications of modified asphalt emulsion. Glass fiber spread rates are up to 120 g/m², (4oz.), with additional asphalt emulsion rates of spread, depending upon the site requirements.

1512.03 Equipment

All equipment required for performance of the work shall be approved before construction is to begin, and shall be maintained in satisfactory operating condition. The Contractor shall furnish an accurate thermometer, hand brooms and other small tools and equipment essential for the completion of the work.

PRESSURE DISTRIBUTOR/FIBER APPLICATOR

The pressure distributor shall have a computerized rate control that automatically adjusts the distributor’s pump to the ground speed. The pressure distributor shall be capable of heating and re-circulating the bituminous binder to the specified temperature. The proper nozzles shall be used for the material and rate specified. There shall be two separate spray bars, one in front of the fiber applicator housing and one following it. The

fiber cutter and distributor shall be an integrated unit. The integrated applicator shall be comprised of an open bottomed spray bar housing, a fan or blower producing a down draft in the housing, and at least one spray bar mounted on the housing and adapted to extend transversely in the direction of movement of the vehicle on which the applicator is mounted. A number of sources for dispensing cut glass fiber through the open bottomed housing to the surface of the binder material previously sprayed shall also be included.

The integrated applicator shall have been calibrated within the previous 12 months for transverse and longitudinal distribution application rates according to ASTM D2995, Practice for Determining Application Rate of Bituminous Applicator or other suitable method. The bituminous fiber applicator shall be equipped, maintained, and operated so that the bituminous materials can be applied at controlled rates from 0.1 l/m² (0.022 gal/SY) to 2.7 l/m² (0.56 gal/SY). The fiber is applied at controlled rates from nominally 30 to 120 g/m² (approx. 1-4 oz/SY). These applications shall be such that a uniform first layer of asphalt emulsion is applied followed by uniform layer of glass fibers that is chopped in-place and covered with a uniform layer of asphalt emulsion.

AGGREGATE SPREADER

The aggregate spreader shall be self-propelled and shall be equipped with hoppers, revolving cylinders and adjustments necessary to produce a uniform distribution of material at the specified rate.

PNEUMATIC TIRE ROLLER

The pneumatic tire rollers shall conform to CMS 401.12 type P-2.

1512.04 Pre-Paving on Site Meeting

A meeting between the Contractor and Engineer will be held at the project site prior to beginning work. The agenda for this meeting will include:

- Review of Contractors detailed work schedule
- Review of the traffic control plan
- Inspection of equipment
- Calibration and adjustment to equipment

1512.05 Weather Limitations

The fiber reinforced bituminous membrane surface treatment shall be placed when the pavement and atmospheric temperature is 50° F or above. Placement is not permitted if it is raining, when the pavement surface is wet, or when temperatures are forecasted to be below 32° F within 24 hours of placement.

1512.06 Construction

The Contractor shall follow the construction methods as described.

1. The Contractor shall establish stations, at 1,000 foot intervals on the entire project, prior to placing the treatment. The stations shall be maintained until the project is completed.
2. Preparation of the surface shall be in accordance with CMS 407.04. The surface shall be cleaned by the Contractor and shall be dry when the bituminous binder is applied. Material cleaned from the surface shall be disposed of in accordance with CMS 203.01.
3. The specified aggregate shall be spread uniformly onto the bituminous binder/fiber within 30 seconds of the bituminous spray and shall be placed in accordance with CMS 409.09, except that three-wheel rollers will not be required.
4. Projects greater than 12,000 sy² shall use a minimum of two rollers. Rollers shall proceed at maximum speed of 5 mph. The entire surface shall receive a minimum of two roller passes. The first roller pass shall be performed within one minute of aggregate spreading.
5. Brooming of the completed surface shall be accomplished prior to unrestricted use by traffic. The entire surface shall be clean of all loose material within 24 hours and prior to placement of surface course material.
6. The Contractor shall protect all utility castings using tarpaper or other approved material. All covers shall be properly fitted to the casting and removed prior to sweeping.

1512.07 Application of the Fiber Reinforced Bituminous Membrane Surface Treatment

Fibers and bituminous materials shall be applied by means of a pressure distributor in a uniform, continuous spread over the section to be treated and within the temperature range, sandwiching the in-place chopped fibers between the two layers of asphalt emulsion. The distributor shall be moving forward at the proper application speed at the time the spray bar and fiber chopper bars are opened. If any skipped areas or deficiencies occur, the operation shall be immediately stopped. Junctions of spreads shall be carefully made to assure a smooth riding surface and the deficient areas corrected in a manner approved by the Engineer.

BITUMINOUS BINDER

The bituminous binder shall be applied at a temperature of 150 F to 180 F, and at the rate specified.

COURSE AGGREGATE

- Stockpiling and loading methods shall permit ready identification of material and to minimize segregation and contamination of the aggregate.
- The moisture content of the course aggregate shall be below 4% and maintained throughout the project.

- Course aggregate shall be spread uniformly without ridges or gaps at the specified rates.
- Spreading of the aggregate shall be adjusted to produce a minimum of excess loose particles and shall provide complete coverage after rolling.
- The spreading operation shall be accomplished in such a manner that the tires of trucks or the spreader at no time comes into contact with the newly applied bituminous material.

MATERIAL APPLICATION RATES

**BINDER/FIBER APPLICATION RATE
Gallons per Square Yard**

<u>APPLICATION TYPE</u>	<u>Emulsion</u>	<u>Tolerance</u>	<u>Fiber</u>
Type A	0.40 – 0.55	± 0.02	1 – 4 oz.
Type B	0.40 – 0.60	± 0.02	1 – 4 oz.

Aggregate application rate shall be as determined by the supplier of the Fiber Reinforced Bituminous Membrane Surface Treatment binder and shall produce a completed surface with no exposed binder. The supplier of the Fiber Reinforced Bituminous Membrane Surface Treatment binder shall determine the application rate for emulsion and aggregate, based on the existing pavement condition and aggregate size. This information shall be reported to the Engineer prior to beginning work and shall include an aggregate gradation on the job specific materials.

1512.08 Quality Control

The Contractor to measure compliance shall use the methods described in this section.

- Aggregate gradation
- Aggregate Moisture Content
- Yield Check on Bituminous Binder
- Yield Check on Fiber
- Temperature Check on Bituminous Binder

If the Contractor’s test results exceed any of the identified quality control tolerances, the Engineer shall be immediately notified. The Engineer will review the explanation and the corrective action taken by the Contractor. Another test will be taken and if the results still exceed the quality control tolerance, placement shall stop. The Contractor shall immediately notify the Engineer, and identify the cause of the excessive deviation and detail corrective action necessary to bring the deficiency into compliance. The Engineer will give approval prior to resuming work.

BITUMINOUS BINDER

The application rate shall not exceed a tolerance of 0.02 gallons per square yard from the specified rate, and within the temperature range as specified in 1512.07.

COURSE AGGREGATE

The aggregate shall be clean and uniform, and shall be within the gradation range as specified in 1512.02, Moisture content shall not exceed the tolerance as specified in 1512.07.

1512.09 Documentation

The Contractor shall provide the Engineer a daily report with the following information:

- Control Section/Project Number/County/Route
- Date/Air Temperature/Pavement Temperature
- Bituminous Binder Temperature (3 per day)
- Station Location per Test
- Beginning and Ending Stations
- Yield Check on Bituminous Binder (3 per day)
- Yield Check on Fiber (3 per day)
- Aggregate Gradation & Moisture (1 per day)
- Length/Width/Total Area

Other required documentation shall include:

Bill of lading on aggregate, fiber and bituminous binder, to be provided as requested or at project completion.

1512.10 Acceptance

The Contractor shall inspect the completed Treatments during the application process for any deficiencies. The deficiencies will be limited to flushing, surface patterns and loss of stone retention.

Workmanship shall be inspected for the following:

- Untreated areas (missed)
- No overlap on longitudinal joints
- No overlap on construction joints

All corrective work shall be accomplished prior to resurfacing with bituminous materials, or within 24 hours. The Contractor shall furnish materials, equipment and labor to make corrections at no additional cost to the Contract. The Engineer shall give final approval on inspection and corrective work.

1512.11 Placement of Asphalt Overlay

If the Fiber Reinforced Bituminous Membrane Surface Treatment application is used as an intermediate layer for an asphalt overlay, a minimum period of 24 hours shall be observed prior to the placement of the asphalt surface course after placement of the Fiber Reinforced Bituminous Membrane Surface Treatment material. This time limit may be increased or decreased by the Engineer dependent on ambient temperatures and conditions.

1512.12 Method of Measurement

Fiber Reinforced Bituminous Membrane Surface Treatment will be measured by the square yard as provided for in the Contract Documents. The accepted quantities, measured as provided for above, will be paid for at the contract unit price for Fiber Reinforced Bituminous Membrane Surface Treatment.

1512.13 Basis of Payment

Fiber Reinforced Bituminous Membrane Surface Treatment shall be paid for per square yard for furnishing all preparation, materials, equipment, labor, clean up, and incidentals necessary to complete the work as specified.

<u>Item</u>	<u>Description</u>	<u>Unit</u>
1512	Fiber Reinforced Bituminous Membrane Surface Treatment, Type A	Square Yard
1512	Fiber Reinforced Bituminous Membrane Surface Treatment, Type B	Square Yard