

FIBER REINFORCED BITUMINOUS MEMBRANE SURFACE TREATMENT SPECIFICATIONS

1. DESCRIPTION. The work shall consist in the construction of a fiber reinforced bituminous membrane surface treatment known as “**FiberMat – Type A**” as a Stress Absorbing Membrane, SAM and as “**FiberMat- Type B**” when used as a Stress Absorbing Membrane Interlayer, SAMI. 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 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.

Asphalt emulsion, aggregate and in-place chopped fibers are combined to form a versatile treatment, ideal for sealing as a SAM and arresting severely alligator cracked surfaces. The in-place chopped fiber gives the surface an improved tensile strength and resilience.

When applied within the pavement structure the fiber reinforced bituminous membrane surface treatment acts as a SAMI for the treatment of reflective cracking prior to the construction or placement of subsequent layers.

2. MATERIALS

2.01 Bituminous Materials

- A. The emulsified asphalt shall be CRS-2 (3% Latex Rubber Solids by weight of asphalt cement) in accordance with AASHTO M 208 Table 1.
- B. The emulsified asphalt latex additive shall be Butonol NX 1138 or equivalent conforming to the following specifications:

Monomer Ratio (Butadiene/Styrene)	(76 +/- 2 / 24 +/- 2)
Solids, min %	63
pH of Latex	4.1 – 4.5
Brookfield Viscosity	250 – 2000
Density, pounds per gallon	7.8 +/- 0.2

2.02 Aggregates. Aggregate shall consist of 100% crushed ledge having durable particles. The percent wear of aggregate shall not exceed 35% as determined by AASHTO T-96. All aggregate shall be thoroughly washed and stockpiled for a minimum of 5 working days before use. The aggregate shall be treated prior to application with Liquid Asphalt Material MC 30 or MC 70 at the rate of 0.2% to 0.5% residual asphalt to ensure uniform treatment of all aggregate. Proper pre-treatment shall be obtained by a twin shafted Pugmill with a Digital Readout Belt scale. When tested in accordance with AASHTO T 27 and AASHTO T11, the aggregate shall meet one of the following gradations:

2.3.1 Gradation for 3/8” cover aggregate

Sieve Size	Percent Passing
1/2 inch	100
3/8 inch	95-100
No. 4	15-35
No. 8	0-5
No. 200	0-2

2.3.2 Gradation for 1/2” cover aggregate

Sieve Size	Percent Passing
3/4 inch	100
1/2 inch	90-100
3/8 inch	40-70
No. 4	0-15
No. 8	0-5

2.03 Fiber. The glass fiber is E Class from an approved source determined by the license holder. The glass fiber spools are supplied internally wound, in coils or cheeses. Typically the spools are cut in-place into nominally 60mm,(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 120g/sqm, (4oz), with additional asphalt emulsion rates of spread, depending on the site requirements.

3. CONSTRUCTION DETAILS

3.01 FIBER REINFORCED BITUMINOUS MEMBRANE SURFACE TREATMENT

- A. Weather and Seasonal Limitations.** The fiber reinforced bituminous membrane surface treatment may be applied on a dry or damp surface, but should not be laid where there is standing water or on a wet surface. Application should only be undertaken when the surface temperature is at least 10°C, (50°F), and rising, subject to site inspection. Greater initial traffic speed control may be required in certain circumstances, for example when the surface temperature is low.

The fiber reinforced bituminous membrane surface treatment shall be placed during the period May 1st to the third Saturday in September. Application outside of these times is permissible only with the approval of the contractor and local Engineer.

- B. Equipment.** The following equipment shall be required:

1. Asphalt Distributor.

The asphalt distributor shall contain suitable mechanical circulating and heating mechanisms to provide a uniform approved temperature of the entire mass of material. The distributor shall be equipped with a radar type sensor used to measure ground speed, and feed a Digital Volumetric Accumulator capable of measuring liters applied and distance traveled. It shall be capable of applying asphalt material in accurately measured quantities at any rate between 0.5 to 9.1 liters per square meter, (0.1 to 2.0 gallons per square yard), of roadway surface, at any length of spray bar up to 4.9 meters, (16 feet). The distributor shall be capable of maintaining a uniform rate of distribution of asphalt material regardless of change in grade, width or direction of the road. It shall be equipped with an electronic control for setting asphalt pump discharge rate and on/off switching of spray for nozzles in 0.30 meter, (one foot), increments which shall be located in the truck cab. The spray nozzles and pressure system shall provide a sufficient and uniform fan-shaped spray of asphalt material throughout the entire length of the spray bar at all times while operating. The spray shall completely cover the roadway surface receiving the treatment.

- 2. Aggregate Spreader.** The aggregate spreader shall be hydrostatically driven and self-propelled. It may be equipped with a hydraulically controlled variable adjustable head that is capable of spreading stone in widths from 1.4 to 5.4 meters, (4.5 to 18 feet). The spreader shall be mounted on pneumatic tires and shall apply the treated stone on the road surface in a manner that ensures that the tires do not contact the road surface until after the stone has been applied. The unit shall be equipped with an electronic radar type sensor used to measure ground speed and will automatically adjust the stone application rate depending on width of application and the speed of chip spreader. It shall have the ability to apply stone on any grade from 0 – 6%. The spreader shall be equipped with an integral hopper with a minimum capacity of 4.5 metric tons, (5 tons), of treated stone which shall be filled by trucks in a manner which ensures that the truck tires never come in contact with asphalt-treated road surfaces until the stone has been properly applied. To maintain constant stone application, a self-locking truck hitch will permit towing of aggregate trucks without stopping the chip spreader. It will be capable of maintaining positive engagement over irregular terrain.
- 3. Rollers.** At least two rubber tired and one steel wheeled roller shall be used on each treated surface immediately after the stone has been applied. Each roller shall have a compacting width of not less than 1.5 meters, (5 feet). Each roller shall have a gross weight of not less than 7.2 metric tons, (8 tons), and contact pressure adjustable from 1400 to 2000 kPa, (200 to 300 psi).
- 4. Trucks.** Rear discharge conveyor-fed trucks in sufficient number and size must be used to deliver treated stone to the spreader.
- 5. Self-propelled Rotary Power Broom** A self-propelled rotary power broom shall so be designed, equipped, maintained and operated so that the pavement surface can be swept clean. The broom shall have an adjustment to control downward pressure. The power broom shall meet the approval of the Engineer. In the case where a SAMI is being overlaid the same or following day then a Vacuum sweeper shall be used only.

C. Determination of the Quantities of Materials to be Applied In conjunction with the Engineer the Contractor will decide upon the appropriate rates of asphalt emulsion and fiber for and during the job. Typical rates of application for the asphalt emulsion range from 1.8-2.7L/m² (0.4-0.6 Gal/SY) and fiber application rates from 30-120g/m² (approx. 1-4oz/SY).

- 1** For SAM applications the aggregate shall be of the 6mm, 10mm or 12.5mm maximum size and be added at rates as per conventional chip sealing operations – typically (11-13kg/m² ---approx.19-26lb/SY).

2 For SAMI applications only the 6mm maximum size aggregate is used at typically (6-8kg/m² --- 10-15lb/SY) to blind in the surface if it is to be overlaid within a few weeks. Otherwise higher aggregate application rates are employed and approved with the local engineer.

D. Preparation of Surface. A self-propelled power broom shall be used to clear any loose material from the surface to be treated immediately prior to the application of the fiber reinforced bituminous membrane surface treatment. Any surface-defects such, as potholes shall be repaired prior to commencement of works. Manhole covers, drop inlets, catch basins, curbs and any structure within the roadway area shall be protected against the fiber reinforced bituminous membrane surface treatment. Any cracks greater than ¼” shall be pre-treated with approved hot or cold polymer modified bituminous crack filler. Information on suitable crack fillers for use in-conjunction with the fiber reinforced bituminous membrane surface treatment can be given by the license holder.

E. Application of the fiber reinforced bituminous membrane surface treatment. Fibers and bituminous materials shall be applied by means of 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 quantities of fibers and bituminous materials shall be decided between the Engineer and Contractor dependant on the job site. 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. Overlaps of the membrane shall be made up to 6”.

The fiber reinforced bituminous membrane surface treatment shall not be applied more than 50 meters, (150ft), in advance of the self-propelled chip spreader.

Under no circumstances shall operations proceed in such a manner that the fiber reinforced bituminous membrane surface treatment will be allowed to chill, set-up, dry or otherwise impair retention of the cover aggregate. Traffic will not be allowed to run on the unprotected fiber reinforced bituminous membrane surface treatment.

The distributor, when not spreading, shall be parked so that the spray bar or mechanism will not drip on the surface of the traveled way.

F. Application of the Cover Aggregate. Immediately following the application of the fiber reinforced bituminous membrane surface treatment, cover aggregate shall be spread at the rate agreed between the Engineer and Contractor.

Spreading shall be accomplished in such a manner that the tires of the aggregate spreader at no time contact the uncovered and newly applied fiber reinforced bituminous membrane surface treatment.

Immediately after the cover aggregate is spread, any deficient areas shall be covered by additional material. Pneumatic tire rolling shall begin immediately.

The initial pass shall be completed within 5 minutes of the application of the fiber reinforced bituminous membrane surface treatment and shall be continued until three complete passes are obtained within 30 minutes of the application of the fiber reinforced bituminous membrane surface treatment. Pneumatic tire rollers shall come to a complete stop prior to a change in direction. For overlaps the first pass of aggregate and the space uncovered shall be up to 6". Upon the return pass the aggregate coverage shall be complete and over by up to 6" to insure full coverage of the membrane.

4. METHOD OF MEASUREMENT. Fiber reinforced bituminous membrane surface treatment will be measured by the number of square yards of compacted material in place making no deductions for minor untreated areas such as catch basins and manholes.

5. BASIS OF PAYMENT.

5.01 Fiber reinforced bituminous membrane surface treatment. The unit price bid per square yard per day, plus the addition of any items the Agency requires the Contractor to furnish.