

5-02 BITUMINOUS SURFACE TREATMENT

5-02.1 Description

This Work shall consist of constructing a single or multiple course bituminous surface treatment (BST) in accordance with these Specifications and in conformity with the lines and cross-sections shown in the Plans or as designated by the Engineer.

5-02.1(1) New Construction

This method of treatment requires two applications of asphalt emulsion and three applications of aggregate. The initial application of asphalt emulsion is a prime coat applied to an untreated Roadway that is followed with an application of aggregate. The second application of asphalt emulsion is the tack coat and is followed with two additional applications of aggregate.

5-02.1(2) Seal Coats

This method require the placing of one application of asphalt emulsion and one or more sizes of aggregate as specified to an existing pavement to seal and rejuvenate the surface and to produce a uniform Roadway surface with acceptable nonskid characteristics.

5-02.1(3) Pavement Sealers – Fog Seal

This method of treatment requires an application of asphalt emulsion over an existing or newly constructed pavement as specified.

5-02.2 Materials

Materials shall meet the requirements of the following sections:

Cationic Emulsified Asphalt	9-02.1(6)
Aggregates for Bituminous Surface Treatment	9-03.4

Aggregate to be used for bituminous surface treatment shall be of the type and size called for in the Plans or in the Proposal.

The asphalt emulsion to be used shall be the product which is called for in the Special Provisions, the Proposal, or shown in the Plans, and may be conditionally accepted at the source.

5-02.3 Construction Requirements

5-02.3(1) Equipment

The equipment used by the Contractor shall be subject to approval by the Engineer before its use.

The distributor shall be capable of uniformly applying asphalt emulsion at the required application temperature and rate. Temperature measuring devices shall be capable of reporting the temperature of asphalt emulsion in the tank and also the temperature of the asphalt emulsion being applied to the Roadway. A tachometer shall be required to accurately control the application of asphalt emulsion. Distributors shall be equipped with an adjustable spray bar with pressure pump and gauge. The power for operating the pressure pump shall be supplied by a power unit which will provide a uniform spray from each of the nozzles across the spray bar and extensions. The distributor truck shall have a volume control gauge. All reading devices and gauges shall be easily accessible by Inspectors from the ground.

Rollers for seal coats shall be self-propelled pneumatic tired rollers. Rollers for new construction shall be a combination of self-propelled pneumatic tired rollers and smooth-wheeled rollers. Each roller shall not weigh less than 12-tons and shall be capable of providing constant contact pressure. Operation of the roller shall be in accordance with the manufacturer's recommendations.

Aggregate spreading equipment shall be self-propelled, supported on at least four pneumatic tires, with an approved device for accurately metering and distributing the aggregate uniformly over the Roadway surface. Spreading equipment shall be so equipped that the operator has positive width control. This control shall allow the operator to adjust the spreading width of aggregates in 6-inch increments without stopping the machine.

Brooms shall be motorized and capable of controlling vertical pressure.

Other equipment necessary to satisfactorily perform the Work as specified herein or as designated by the Engineer shall be subject to approval by the Engineer before its use in the Work.

Additional units shall be used in the Work when, in the opinion of the Engineer, it is considered necessary in order to fulfill the requirements of these Specifications, or to complete the Work within the time specified.

5-02.3(2) Preparation of Roadway Surface

5-02.3(2)A New Construction

The existing Roadway surface shall be shaped to a uniform grade and cross-section as shown in the Plans, or as designated by the Project Engineer.

The Roadway shall be dampened, bladed and rolled until the entire Roadway surface shows a uniform grading and conforms to the line, grade, and cross-section shown in the Plans, or as staked. During the operation of blading and rolling, water shall be applied, if necessary, in the amount and at the locations designated by the Project Engineer.

The entire surface shall be rolled with a smooth-wheeled or pneumatic-tired roller, or both, as designated by the Engineer, except that the final rolling shall be accomplished with a smooth-wheeled roller as specified in [Section 5-02.3\(1\)](#). Rolling shall continue until the entire Roadway presents a firm, damp and unyielding surface.

Immediately before the prime coat of asphalt emulsion is applied, the Roadway surface shall be in the following condition: firm and unyielding, damp, free from irregularities and material segregation, and true to line, grade, and cross-section.

No traffic will be allowed on the prepared surface until the prime coat of asphalt emulsion and aggregate is applied.

5-02.3(2)B Seal Coats

The existing bituminous surface shall be swept with a power broom until it is free from dirt or other foreign matter. Hand push brooms shall be used to clean omissions of the power broom. In addition to power and hand brooms, the use of other equipment may be necessary to thoroughly clean the Roadway prior to the application of asphalt emulsion. Berms created by the removal of dirt or other foreign matter shall be evenly distributed over the fore slope.

Repair of existing pavement shall be done in accordance with Section 5-04. The HMA in repaired areas shall be fog sealed. HMA repaired areas may require a second fog seal depending on surface texture as required by the Project Engineer. The pavement surface shall be dry prior to fog sealing.

5-02.3(2)C Pavement Sealing – Fog Seal

Where shown in the Plans or directed by the Engineer, the Contractor shall apply a fog seal. Before application of the fog seal, all surfaces shall be thoroughly cleaned of dust, soil, pavement grindings, and other foreign matter. The existing pavement surface shall be dry.

5-02.3(2)D Soil Residual Herbicide

Where shown in the Plans, soil residual herbicide shall be applied in accordance with Section 5-04. Application of the BST shall begin within 24-hours after application of the herbicide.

5-02.3(3) Application of Asphalt Emulsion and Aggregate

Upon the properly prepared Roadway surface, asphalt emulsion of the grade specified in the Special Provisions shall be uniformly applied with distributors and specified aggregates spread at the following rates:

Application Rate			
	Undiluted Asphalt Emulsion (gal.per sq. yd.) Applied	Aggregate Size (In.)	Aggregates (lbs. per sq. yd.) Applied
New Construction			
Prime Coat	0.35-0.65	½-U.S. No. 4 or ¾-½	25-45
Tack Coat Choke Stone	0.35-0.60	½-U.S. No. 4 U.S. No. 4-0	25-40 4-6
Seal Coats			
⅝-inch	0.40-0.65	⅝-U.S. No. 4 U.S. No. 4-0	25-45 4-6
½-inch Choke Stone	0.35-0.55	½-U.S. No. 4 U.S. No. 4-0	20-35 4-6
¾-inch – No. 4	0.35-.55	¾- U.S. No. 4	20-30
¾-inch No. 10	0.20-0.40	¾- U.S. No. 10	18-30
Pavement Sealing			
Fog Seal	0.02-0.05	N/A	N/A

The Project Engineer will determine the application rates. The second application of asphalt emulsion (tack coat) may be applied the next day, or as approved by the Project Engineer.

Longitudinal joints will be allowed at only the centerline of the Roadway, the center of the driving lanes, or the edge of the driving lanes.

To ensure uniform distribution of asphalt emulsion and that the distributor is correctly calibrated, the Contractor shall provide a minimum 1,000-foot test strip when beginning a BST section.

To avoid gaps and ridges at transverse junctions of separate applications of asphalt emulsion and aggregate, the Contractor shall spread sufficient building paper over the treated surface to ensure that the distributor will be functioning normally when the untreated surface is reached. If ordered by the Project Engineer, the joints shall be cut back to a neat edge prior to placing the building paper.

Should ridges, overlaps, or gaps occur at transverse joints, the Contractor shall repair the defects to the satisfaction of the Project Engineer. In lieu of repair the Engineer may elect to accept the completed joints and will deduct from monies due or that may become due the Contractor, the sum of \$200 for each joint where the deviations described above are found. Should longitudinal joints occur outside the centerline of the Roadway, the center of the driving lanes, or the edge of the driving lanes, the Contractor shall repair the defects to the satisfaction of the Project Engineer.

All costs involved in making the corrections to defects described above shall be borne by the Contractor and no payment will be made for this Work.

Omissions (skips) by the distributor or tire marks on the uncovered asphalt emulsion shall be immediately covered by hand patching with the same grade of asphalt emulsion and aggregate used on the project.

The area covered by any one spread of asphalt emulsion shall be no more than can be covered with aggregate within 1-minute from the time of application upon any part of the spread. If field conditions warrant, this time may be increased as designated by the Project Engineer.

Unless otherwise designated by the Project Engineer, asphalt emulsion shall be spread toward the source of aggregate to avoid injury to the freshly treated surface.

Before application to the Roadway, asphalt emulsion shall be heated to the temperature determined by the Project Engineer, but within the following limits:

Type and Grade of Asphalt Emulsion	Distributor Spraying Min. °F or as recommended by the Manufacturer	Temperature Max. °F
New Construction and Seal Coats:		
CRS-1, CRS-2, CRS-2P, CMS-2	125	205
CMS-2S, CMS-2h	125	185
Fog Seal:		
CSS-1, CSS-1h, STE-1	70	140

Fog seals shall be uniformly applied to the pavement. The finished application shall be free of streaks and bare spots. CSS-1 and CSS-1h emulsified asphalt may be diluted at a rate of one part water to one part emulsified asphalt unless otherwise directed by the Project Engineer.

Fog sealing shall be applied no sooner than 3-days, but no later than 14-days after new construction or seal coat. If required, newly placed aggregates shall be swept prior to the fog seal application. Rebrooming for fog seal applications shall be paid under "Additional Brooming", per hour as specified in [Section 5-02.5](#).

5-02.3(4) Change in Grades of Asphalt Emulsion

At any time during the progress of the Work, the Project Engineer may order the use of other grades of asphalt emulsion in substitution of the grades specified in the Special Provisions if the intent of the Specifications will be better attained.

If the invoice price of the grade substituted is higher or lower than that of the grade specified, the difference will be paid by the item Asphalt Emulsion Price Adjustment added to the unit Contract price for asphalt emulsion, or if lower, it will be deducted from the unit Contract price.

5-02.3(5) Application of Aggregates

All aggregate stockpiles shall be watered down to provide aggregates that are uniformly damp at the time of placement on the Roadway.

After the asphalt emulsion has been spread evenly over the Roadway surface, aggregates of the type specified shall be evenly applied to the Roadway surface by spreader equipment.

The aggregate shall be spread in one operation in such a manner that an 8-inch strip of asphalt emulsion is left exposed along the longitudinal joint to form a lap for the succeeding applications of asphalt emulsion. If necessary, thin or bare spots in the spread of aggregate shall be corrected immediately by re-spreading with the chip spreader or by hand spreading the aggregate.

A minimum of 3 pneumatic tired rollers providing a minimum of 2 complete coverages to the Roadway immediately behind the spreading equipment for the coarse aggregate shall be required.

The maximum rate of roller travel shall be limited to 8 mph.

The Contractor shall apply choke aggregates to the Roadway with additional spreading equipment immediately following the initial rolling of the coarse aggregate unless otherwise specified in the Contract documents or ordered by the Project Engineer. Excess aggregate shall be removed from the Roadway. A minimum of 1 pass with a pneumatic roller shall be made across the entire width of the applied choke aggregate.

The operation of trucks hauling aggregate from the stockpile shall be so regulated that no damage, as determined by the Project Engineer, will result to the Highway or the freshly applied asphalt surface.

The completed surface shall be allowed to cure and then broomed as soon as practical.

If brooming causes rock to be turned or if the Project Engineer determines that additional cure is needed, the Contractor shall broom the Roadway when directed by the Project Engineer. If, after completion of the initial brooming, the Project Engineer determines the need to remobilize for additional brooming, the Contractor shall rebroom the areas designated by the Project Engineer. The Contractor shall apply water for dust control during brooming operations when safety or environmental concerns arise, or as otherwise determined by the Project Engineer.

The Contractor shall be held responsible for protecting all surface waters, riparian habitats, or other sensitive areas that may be encroached upon by brooming operations. Materials such as dirt, foreign material, or aggregates removed from these areas shall become the property of the Contractor and shall be disposed of in accordance with [Section 2-03.3\(7\)](#).

The Contractor shall use a pickup broom in all curbed areas, on all bridges, within city limits, within environmentally sensitive areas, and where shown in the Plans both before the application of asphalt emulsion and during the final brooming operation. When the pickup broom does not satisfactorily pickup the aggregate, manual methods shall be used. Materials collected by the pickup broom shall become the property of the Contractor and shall be disposed of in accordance with [Section 2-03.3\(7\)](#).

Aggregates accumulated in intersections and driveways due to brooming operations shall become the property of the Contractor and shall be disposed of in accordance with [Section 2-03.3\(7\)](#).

The Contractor shall notify the Project Engineer when the brooming for each section is considered complete. The Project Engineer will indicate acceptance or inform the Contractor of deficiencies within 24-hours of notification.

5-02.3(6) Additional Asphalt Emulsion and Aggregate

If the application of asphalt emulsion or aggregate, or both, is insufficient or excessive for the required results, the Project Engineer may require the Contractor to make an additional application of one or both materials in accordance with these Specifications, or at the direction of the Project Engineer. Additional asphalt emulsion or aggregate used will be paid for at the unit Contract prices for the materials used.

5-02.3(7) Patching and Correction of Defects

Omissions by the distributor or damage to the treated surface of any coat shall be immediately covered by hand patching with asphalt emulsion in adequate quantities. Holes which develop in the surface shall be patched in the same manner as specified in [Section 5-02.3\(2\)A](#). All costs incurred by the Contractor, in coating omissions and patching, shall be included in the unit Contract prices for the materials used.

Defects such as raveling, lack of uniformity, or other imperfections caused by faulty workmanship shall be corrected and new Work shall not be started until such defects have been remedied.

All improper workmanship and defective materials resulting from overheating, improper handling or application, shall be removed from the Roadway by the Contractor and be replaced with approved materials and workmanship at no expense to the Contracting Agency.

If the Engineer determines a fog seal is necessary at any time during the life of the Contract, the Contractor shall apply a fog seal. The CSS-1 or CSS-1h emulsified asphalt may be diluted with water at a rate of 1-part water to 1-part emulsified asphalt unless otherwise directed by the Project Engineer.

5-02.3(8) Progress of Work

The Contractor shall organize the Work so that no longitudinal joints shall remain open overnight.

5-02.3(9) Protection of Structures

The Contractor shall be responsible for protecting monument covers, sewer lids, manhole covers, water valve covers, drainage grates, inlets, railroad tracks, bridge handrails and expansion joints, guardrails, curbs, road signs, guide posts or other facilities from the application of asphalt emulsion and aggregates. This protective effort is to include uncovering these items the same working day that the completed BST or seal coat construction has passed the protected locations. If needed, drainage inlets shall be

cleaned out immediately after final brooming is completed. All costs incurred by the Contractor in necessary protective measures shall be included in the unit Contract prices for the various Bid items of Work involved.

5-02.3(10) Unfavorable Weather

Asphalt emulsion shall not be applied to a wet Roadway. Subject to the determination of the Project Engineer, asphalt emulsion shall not be applied during rainfall, sand or dust storms, or before any imminent storms that might damage the construction. The Project Engineer will have the discretion as to whether the surface and materials are dry enough to proceed with construction.

The application of any asphalt emulsion to the Roadway shall be restricted to the following conditions:

1. The Roadway surface temperature shall be at least 55°F. The air temperature shall be at least 60°F and rising. The air temperature shall be not less than 70°F when falling and the wind shall be less than 10-miles per hour as estimated by the Project Engineer.
2. The surface temperature shall be not more than 140°F.
3. No asphalt emulsion shall be applied which cannot be covered 1-hour before darkness. The Project Engineer may require the Contractor to delay application of asphalt emulsion until the atmospheric and Roadway conditions are satisfactory.
4. Construction of bituminous surface treatments on any Traveled Way shall not be carried out before May 1 or after August 31 of any year except upon written order of the Project Engineer.

5-02.3(11) Temporary Raised Pavement Markings

During bituminous surface treatment paving operations, temporary raised pavement markings shall be maintained throughout the project. Temporary raised pavement markings shall be installed on the Roadway that was paved that day. Temporary raised pavement markings shall be in accordance with [Section 8-23](#).

5-02.4 Measurement

Processing and finishing will be measured by the mile to the nearest 0.01-mile along the main line Roadway. All related supplemental Roadways and irregular shaped areas will be incidental.

Asphalt emulsion of the grade or grades specified will be measured by the ton in accordance with [Section 1-09](#).

Asphalt for fog seal will be measured by the ton, before dilution, in accordance with [Section 1-09](#).

Aggregate from stockpile for BST will be measured by the cubic yard in trucks at the point of delivery on the Roadway.

Furnishing and placing crushed aggregate will be measured by the cubic yard in trucks at the point of delivery on the Roadway, or by the ton in accordance with [Section 1-09.1](#).

Additional brooming will be measured by the hour.

Water will be measured in accordance with [Section 2-07](#).

No specific unit of measure will apply to the calculated item of asphalt emulsion price adjustment.

5-02.5 Payment

Payment will be made in accordance with [Section 1-04.1](#), for each of the following Bid items that are included in the Proposal:

“Processing and Finishing”, per mile.

The unit Contract price per mile for “Processing and Finishing” shall be full pay for all labor and equipment required for blading, scarifying, processing, leveling, finishing, and the manipulation of aggregates as required. In the event the Proposal does not include a Bid item for “Processing and Finishing” then all costs for processing and finishing shall be included in other related items of Work.

“Asphalt Emulsion (_____)”, per ton.

The unit Contract price per ton for “Asphalt Emulsion (_____)” shall be full pay for furnishing the asphalt emulsion and for all labor and equipment for heating, hauling, and spreading on the Roadway.

“Asphalt for Fog Seal”, per ton.

The unit Contract price per ton for “Asphalt for Fog Seal” shall be full pay for all costs of material, labor, tools and equipment necessary for the application of the fog seal as specified.

“Agg. from Stockpile for BST”, per cubic yard.

The unit Contract price per cubic yard for “Aggregate from Stockpile for BST” shall be full pay for all labor and equipment required for loading, transporting, and placing the material in the finished Work.

“Furnishing and Placing Crushed (_____)”, per cubic yard.

“Furnishing and Placing Crushed (_____)”, per ton.

The unit Contract price per cubic yard or per ton for “Furnishing and Placing Crushed (_____)” shall be full pay for all labor and equipment required for furnishing, transporting and placing the material in the finished Work.

“Additional Brooming”, per hour.

The unit Contract price per hour for “Additional Brooming” shall be full pay for all labor and equipment necessary to rebroom the Roadway as specified.

“Water”, per M gal.

Payment for “Water” shall be in accordance with [Section 2-07.5](#).

“Asphalt Emulsion Price Adjustment”, by calculation

“Asphalt Emulsion Price Adjustment” will be calculated and paid for as described in [Section 5-02.3\(4\)](#).

If the Proposal does not include a Bid item for water, the Contractor shall dampen stockpiled or furnished aggregate as required, and the cost thereof shall be included in other related items of the Work.

Any incidental Work required to complete the bituminous surface treatment that is not specifically mentioned as included with the Bid items above shall be performed by the Contractor and shall be included in the unit Contract prices of the various related Bid items.