

SECTION 404 BITUMINOUS SURFACE TREATMENT

404.01 Description. This work consists of constructing one or more courses of bituminous material and aggregate upon the completed and accepted foundation or existing surfacing.

MATERIALS

404.02 Asphalt. The asphalt for bituminous surface treatment shall be RC-70 or CRS-1 for the prime coat and RC-250 or CRS-2 for seal coats. All material shall conform to the requirements of [Section 811](#) or [817](#) whichever is applicable.

The material used shall be applied within the following temperature limits:

<i>Material</i>	<i>Limits</i>
RC-70	80 to 150 EF (27 to 66 NC)
RC-250	100 to 175 EF (38 to 79 NC)
CRS-1	70 to 140 EF (21 to 60 NC)
CRS-2	125 to 185 EF (52 to 85 NC)

404.03 Coarse Aggregate. Coarse aggregate shall conform to the following requirements:

- a. Coarse aggregate for the initial treatment may consist of crushed slag composed of clean, tough, durable pieces of air-cooled blast-furnace slag, reasonably uniform in density and quality, and free of glassy particles, coke, dirt, or other objectionable matter.
- b. Crushed slag in dry condition shall weigh not less than 70 lb/ft; (1120 kg/m;) when tested according to AASHTO T 19/T 19M, Rodded Method.
- c. Coarse aggregate for initial treatment may also be crushed stone or crushed gravel weighing not less than 95 lb/ft; (1520 kg/m;) when tested according to AASHTO T 19/T 19M and conforming to the requirements of [Section 805](#).
- d. he slag, crushed stone, or crushed gravel shall conform to the grading requirements of [Section 813](#), Delaware No. 57 or 67.
- e. Coarse aggregate for the two treatments following the initial application shall consist of crushed chips composed of crushed stone, crushed gravel, or crushed slag, conforming to the requirements of [Section 813](#), Delaware No. 8.

404.04 Fine Aggregate. Sand for tack coat shall conform to the requirements of [Section 804](#).

EQUIPMENT

404.05 Distributors. The distributors used shall be capable of uniformly applying the bituminous material in liquid form. Devices to control the pressure, volume, and temperature shall be provided. Each distributor shall have an approved calibration chart, be equipped with an approved sampling device, and conform to the following:

- a. *Pressure.* The pressure shall be supplied by a positive displacement pump or air compressor. The pressure shall be uniform throughout the entire width of spray. If pressure is supplied by an air compressor, automatic controls must be provided to maintain sufficient and even pressure throughout the application of an entire load.

- b. *Temperature.* The distributor shall be equipped with a heating system that applies heat uniformly across the width of the tank. Provisions shall be made for circulating or agitating the material whenever necessary while heating. The distributor shall be equipped with a thermometer marked in degrees Fahrenheit (Celsius) of sufficient range to determine the actual temperature of the material.
- c. *Tachometer.* All distributors shall be provided with an approved tachometer recording feet (meters) per minute with a tabulation of feet (meters) per load with adjustments. Each load tabulation shall start at zero. There shall also be a totaling tabulation of this instrument.
- d. *Volume.* A tachometer shall give correct readings of the speed, and the volumetric efficiency of the distributor shall ensure the correct volume at various speeds. Tests shall be required to prove the volumetric efficiency of the distributor at various speeds as directed by the Engineer.
- e. *Circulating System.* All pump distributors shall be equipped with a circulating system designed to maintain a homogenous liquid while circulating in the distributor tank. This circulating system shall also be arranged to circulate the material in the tank truck before application.

Air distributors shall be equipped with a device for agitating the bituminous material in the tank trucks when necessary.

- f. *Tests.* Necessary tests shall be made to determine the accuracy of all pressure gauges, tachometers, and pump efficiencies. The tests shall be made by the Contractor when and as required.
- g. *Spray Bars.* Each distributor shall be equipped with spray bars capable of applying material uniformly throughout the entire length of the spray bars when they are extended. Spray bar extensions shall be provided for applying up to a 24N (7.3 m) width in one operation. Spray bars shall be equipped with a cleaning device and a shut-off valve to prevent dribbling, dripping, or streaking.
- h. *Tank Capacity Gauge.* A float or other approved type tank capacity gauge shall be furnished to indicate the volume in the tank in not less than 25 gal (100 L) units. The gauge shall have adjustments for correction.

Tanks shall have a minimum capacity of 750 gal (2800 L).

If the Engineer deems that the equipment applying the material is inadequate or fails to comply with all regulations, the Engineer will order the equipment to be removed from the job and require that another unit be placed on the work.

404.06 Mechanical Spreader. The Contractor shall furnish and operate at least one approved mechanical spreader capable of receiving the material to be spread and being accurately adjusted to distribute the aggregate uniformly at a regulated truck speed.

404.07 Broom Drag. A broom drag shall be furnished and used on the initial application of coarse aggregate. The broom drag shall be a non-revolving type, at least 15N (4.5 m) in length, and shall have at least four rows of brooms. One row must be at each end of the drag.

404.08 Rollers. The Contractor shall furnish and operate at least two power rollers. One power roller shall be three-wheeled, rated by the manufacturer to be between 5 and 8 tons (4500 and 7300 kg). The other power roller shall be a self-propelled, pneumatic-tired roller of approved design and weight, unless otherwise directed.

The tires of the rubber tire roller shall be uniformly inflated. The difference between the pressure in any two tires shall never be greater than 5 psi (35 kPa). The Contractor shall provide means for checking the tire pressure on the job at all times.

CONSTRUCTION METHODS.

404.09 Seasonal and Weather Limitations. Surface treatment shall not be applied during the following conditions:

1. on any wet or frozen surface,
2. when the ambient temperature is below 50 °F (10 °C)
3. between October 1 and April 15, without written permission from the Engineer, and
4. when the weather conditions prevent the proper completion of the work, as determined by the Engineer.

404.10 Application. The bituminous surface treatment shall be completed according to the following procedure.

The first application of bituminous material shall not be applied until the moisture content of the foundation is within 2% of the optimum moisture content and the roadway has been properly shaped and approved. An initial application of priming asphalt shall be applied at the rate of approximately 0.5 gal/yd⁵ (2.3 L/m⁵). Then, approximately 50 lb/yd⁵ (27 kg/m⁵) of stone or 40 lb/yd⁵ (22 kg/m⁵) of slag shall be spread from a mechanical spreader. After the initial treatment, two treatments shall be applied using approximately 0.30 gal/yd⁵ (1.4 L/m⁵) of sealing asphalt and from 17 to 20 lb/yd⁵ (9 to 11 kg/m⁵) of crushed chips for each application. If slag is used, approximately 0.35 gal/yd⁵ (1.6 L/m⁵) of sealing asphalt shall be used for each treatment.

404.11 Heating and Application of Bituminous Material. Bituminous materials used for each treatment shall be heated in a manner that ensures even heating of the entire mass and maintained within the specified temperature and pressure range during application. Any material which has been damaged shall be rejected, and any section treated with damaged material shall be removed and replaced.

The bituminous material shall be applied in one application at the rates specified using the pressure distributor for the full width of the treatment, unless otherwise directed.

The nozzles of the spray bar shall be kept clean at all times. If one or more nozzles becomes blocked during the application of bituminous materials, the distributor shall be stopped immediately, and the nozzles shall be cleaned. The streaked areas shall be made uniform using a hand hose or other approved methods.

Joints shall be made by an approved method that ensures proper seal with the preceding application. All excess bituminous material at the transverse junction between distributor loads shall be removed and corrected in a satisfactory manner. If the Contractor is unable to keep the application uniform, the operation shall be discontinued until a more experienced operator or a better distributor, or both, can be provided; or, the Contractor shall take such other precautions as may be necessary to keep the application within specified limits.

When applying bituminous materials adjacent to structures or curbs, the Contractor shall furnish and use effective means of protecting the structures or curbs from discoloration.

404.12 Spreading of Coarse Aggregate. As soon as the bituminous material has been applied, it shall be uniformly covered with the specified amount of coarse aggregate. The aggregates shall be applied immediately after the application of the bituminous material for prime and seal coats.

Spreading shall be done directly from trucks using approved mechanical spreaders. Trucks or spreaders shall not drive on the uncovered bituminous material.

During the spreading of coarse aggregate, a crew equipped with hand brooms shall broom all areas where the aggregate has been unevenly applied. Additional aggregate shall be placed by hand on all areas not properly covered. If directed, the surface shall then be dragged with a light broom drag until a smooth and even surface is obtained.

404.13 Rolling of Coarse Aggregate. Immediately after brooming and dragging, the coarse aggregate shall be rolled in a longitudinal direction with an approved pneumatic-tired roller or rollers. The rolling shall begin at the outer edges of the treatment and progress toward the center, each pass overlapping the previous pass by one-half the width of the roller. This rolling shall be continuous. Enough rollers will be required to complete the rolling operation within one hour after the application of the asphalt. The rolling shall be repeated as often as required to ensure thorough keying of the coarse aggregate into the bituminous material.

404.14 Application of Sand. Sand shall be applied to asphaltic tack coats at the rate of approximately 10 lb/yd⁵ (5.4 kg/m⁵) by means of approved mechanical spreaders or as directed.

404.15 Opening to Traffic. The roadway shall not be opened to traffic after the application of the treatments until bituminous materials have set and the coarse aggregate has embedded sufficiently to prevent picking up or whipping off by traffic.

Signs, barricades, lights, and necessary incidentals for detouring traffic shall be furnished and maintained by the Contractor.

404.16 Method of Measurement. The quantity of bituminous asphalt material will be measured as the number of gallons (liters) applied through calibrated distributors. To determine the number of gallons (liters) applied to the road at the application temperature, the volume of bituminous material in the distributor tank shall be measured while the distributor tank is on a level surface immediately prior to application and immediately following distribution using a rod graduated in 25 gal (100 L) increments.

The actual number of gallons (liters) distributed, corrected to the corresponding volume at 60 EF (16 EC), shall be determined using conversion tables and shall be noted on the tickets.

The quantity of coarse aggregate will be measured as the number of tons (metric tons) placed and accepted. The weight of each load will be determined according to [Subsection 109.01](#).

404.17 Basis of Payment. The quantity of bituminous asphalt material will be paid for at the Contract unit price per gallon (liter). The quantity of coarse aggregate will be paid for at the Contract unit price per ton (metric ton). Price and payment will constitute full compensation for furnishing and storing all materials; for applying bituminous surface treatment materials and spreading, broom dragging, and rolling coarse aggregate; for removal and replacement due to damaged bituminous asphalt and aggregate material; for controlling traffic; and for all labor, equipment, tools, and incidentals required to complete the work.

Any demurrage or loss of time caused by inadequate or non-compliant equipment will be at the Contractor's expense.

Sand will be paid for under Section 756.