

ITEM P-609 SEAL COATS AND BITUMINOUS SURFACE TREATMENTS

DESCRIPTION

GENERAL NOTE: Although this type of surface sealant is approved for use on general aviation airports, we remind the user that this method of treatment may leave excessive amounts of loose aggregate on the surface of the pavement.

609-1.1 This item shall consist of a bituminous surface treatment as a wearing course composed of [a single application][multiple applications] of bituminous material and aggregate cover placed on the prepared primed base or properly cured wearing surface, in accordance with these specifications, and shall conform to the dimensions and typical cross section shown on the plans.

609-1.2 QUANTITIES OF MATERIALS PER SQUARE YARD. The approximate amounts of materials per square yard (square meter) for the bituminous surface treatment shall be as provided in Table 1 for the treatment specified on the plans or in the special provision. The exact amounts to be used shall be determined by the Engineer.

TABLE 1. QUANTITIES OF MATERIALS

Application No.	Quantity of Aggregate lb/sq yd (kg/sq m)	Quantity of Asphalt gal/sq yd (l/sq m)	Type of Asphalt ¹
1	40-50 (21.7-27.1)	0.35-0.45 (1.58-20.3)	Asphalt Cement
		0.40-0.50 (1.81-2.26)	Emulsified Asphalt
2	20-25 (10.9-13.6)	0.15-0.25 (0.68-1.13)	Asphalt Cement
		0.20-0.35 (0.90-1.58)	Emulsified Asphalt
3	15-20 (8.1-10.9)	0.15-0.20 (0.68-0.90)	Emulsified Asphalt

¹ See Table 3 for grades of asphalt and spraying temperatures.

The quantities of asphalt shown in Table 1 cover the average range of conditions that include primed granular bases and old pavement surfaces. The quantities and types of materials should take into consideration local conditions and experience.

The lower application rates shown in Table 1 should be used for aggregate having gradations on the fine side of the specified limits. The higher application rates should be used for aggregate having gradations on the coarse side of the specified limits.

The asphalt content selected should reflect the condition of the pavement. If the pavement is highly oxidized, badly cracked, or coarse more asphalt should be used.

MATERIALS

609-2.1 AGGREGATE MATERIALS. The aggregate material shall be either crushed stone, crushed gravel, or crushed slag. The cover material shall be screenings; sand may be used when specified.

If the material is to be crushed stone, it shall be manufactured from sound, hard, durable rock of accepted quality and crushed to specification size. All strata, streaks, and pockets of clay, dirt, sandstone, soft rock, or other unsuitable material accompanying the sound rock shall be discarded and not allowed to enter the crusher.

If the material is to be crushed gravel, it shall consist of hard, durable, fragments of stone or gravel of accepted quality and crushed to specification size. All strata, streaks, and pockets of sand, excessively fine gravel, clay, or other unsuitable material including all stones, rocks, and boulders of inferior quality shall be discarded and not allowed to enter the crusher. The crushing of the gravel shall result in a product in which the material retained on the separate No. 4, 3/8 inch, and 1/2 inch (4.75 mm, 9 mm, and 12 mm) sieves shall have at least 75% of particles with at least one fractured face.

Crushed slag shall be air-cooled, blast furnace slag, reasonably uniform in density and quality, and shall weigh not less than 70 pounds per cubic foot (1.12 mg/cubic meter) as determined by ASTM C 29.

The crushed aggregate shall not contain more than 8%, by weight, of elongated or flat pieces and shall be free from wood, roots, vegetable, organic, or other extraneous matter. The crushed coarse aggregate shall have a percentage of wear not more than 40 at 500 revolutions, as determined by ASTM C 131.

The aggregate shall show no evidence of disintegration or show a total loss greater than 12% when subjected to five cycles of the sodium sulphate accelerated soundness test specified in ASTM C 88.

The crushed aggregate for the applications shall meet the requirements for gradation given in Table 2 when tested in accordance with ASTM C 136.

TABLE 2. REQUIREMENTS FOR GRADATION OF AGGREGATE

Aggregate for first application	
Sieve Designation (square openings)	Percentage by Weight Passing Sieves
1 inch (25.0 mm)	100
3/4 inch (19.0 mm)	90-100
1/2 inch (12.5 mm)	20-55
3/8 inch (9.5 mm)	0-15
No. 4 (4.75 mm)	0-5
Aggregate for second application	
Sieve Designation (square openings)	Percentage by Weight Passing Sieves
1/2 inch (12.5 mm)	100
3/8 inch (9.5 mm)	85-100
No. 4 (4.75 mm)	10-30
No. 8 (2.36 mm)	0-10
No. 16 (1.18 mm)	0-5
Aggregate for third application	
Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8 inch (9.5 mm)	100
1/4 inch (6.2 mm)	90-100
No. 4 (4.75 mm)	60-85
No. 8 (2.36 mm)	0-25
No. 16 (1.18 mm)	0-5
No. 200 (0.075 mm)	0-2

The gradations in the table represent the limits that shall determine suitability of aggregate for use for the specified applications from the sources of supply. The final gradations decided on, within the limits designated in the table, shall be uniformly graded from coarse to fine.

The cover aggregate used in the third application shall be a light-colored material whose color and reflectivity shall be approved by the Engineer.

The aggregate to be used shall show no evidence of stripping or swell when tested in accordance with AASHTO T 182. The use of antistrip agents for the control of stripping shall be used if necessary.

609-2.2 BITUMINOUS MATERIAL. The types, grades, controlling specifications, and application temperatures for the bituminous materials are shown in Table 3. The Engineer shall designate the specific material to be used.

TABLE 3. BITUMINOUS MATERIALS

Type and Grade	Specification	Spraying Temperature ¹	
		Deg. F	Deg. C
Asphalt Cement			
AC 2.5, AC-5	ASTM D 3381	275+	135+
AR-1000, 2000	ASTM D 3381	280+	140+
120-150, 200-300	ASTM D 946	270+	130+
Emulsified Asphalt			
RS-1	ASTM D 977	70-140	20-60
RS-2	ASTM D 977	125-175	50-80
MS-1, HFMS-1	ASTM D 977	70-160	20-70
CRS-1	ASTM D 2397	125-175	50-80
CRS-2	ASTM D 2397	125-175	50-80

¹ The maximum temperature for asphalt cements shall be below that at which fogging occurs.

CONSTRUCTION METHODS

609-3.1 WEATHER LIMITATIONS. Bituminous material shall be applied only when the existing surface is dry and the atmospheric temperature is above 60°F (15°C). No material shall be applied when rain is imminent or when dust or sand is blowing.

609-3.2 OPERATION OF PITS AND QUARRIES. The aggregate material shall be obtained from sources approved by the engineer. The Contractor shall make all necessary arrangements for obtaining the material, and all work involved in clearing and stripping pits or quarries and handling unsuitable material shall be performed by the Contractor at his/her own expense. The material in the pits shall be handled so that a uniform and satisfactory product shall be secured. Unless otherwise directed, pits shall be adequately drained and shall be left in a neat and presentable condition with all slopes dressed uniformly. Quarries shall be left as neat and presentable as practicable.

609-3.3 EQUIPMENT AND TOOLS. The Contractor shall furnish all equipment, tools, and machines necessary for the performance of the work.

a. Pressure Distributor. The distributor shall be designed, equipped, maintained, and operated so that bituminous material at even heat may be applied uniformly on variable widths of surface at the specified rate. The allowable variation from the specified rate shall not exceed 10 percent. Distributor equipment shall include a tachometer, pressure gages, volume-measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

b. Aggregate Spreader. The aggregate spreader shall be a self-propelled mechanical spreader or truck-attached mechanical spreader capable of uniformly distributing aggregate at the specified rates.

c. **Roller.** The roller shall be a pneumatic-tired roller with an effective rolling width of at least 60 inches (152 cm) and capable of exerting a minimum contact pressure of 40 pounds per square inch (280,000 newtons per square meter).

d. **Power Broom.** A power broom and/or blower shall be provided for removing loose material from the surface to be treated.

609-3.4 PREPARING UNDERLYING COURSE. The surface of the underlying course shall be prepared, shaped, and conditioned to a uniform grade and section, as shown on the plans and as specified. Loose dirt and other objectionable material shall be removed from the surface.

On those type of bases where a prime coat is required and specified, the prime shall be applied and satisfactorily cured before starting the bituminous surface treatment.

When specified, the Contractor shall be required to patch, with premixed material, any holes or other malformations deviating from the true cross section and grade. The premixed material shall be made of the bituminous material specified in the proposal or plans and prepared by the method as directed by the Engineer. All small patches shall be thoroughly hand tamped while the large patches shall be rolled with a power or pneumatic roller.

609-3.5 APPLICATION OF BITUMINOUS MATERIAL. Bituminous material shall be applied upon the properly prepared surface at the rate and temperature specified using a pressure distributor to obtain uniform distribution at all points. To insure proper drainage, the strips shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope. During all applications, the surfaces of adjacent structures shall be protected in such manner as to prevent their being spattered or marred. Bituminous materials shall not be discharged into borrow pits or gutters or upon the airport area.

609-3.6 APPLICATION OF AGGREGATE MATERIAL. Immediately after the application of the bituminous material or when directed, the aggregates at the rate specified for each designated application shall be spread uniformly over the bituminous material. Trucks spreading aggregate shall be operated backward so that the bituminous material will be covered before the truck wheels pass over it. The aggregate shall be spread in the same width of application as the bituminous material and shall not be applied in such thickness as to cause blanketing. Back-spotting or sprinkling of additional aggregate material, and pouring additional bituminous material over areas that show up having insufficient cover or bitumen, shall be done by hand whenever necessary. Additional spreading of aggregate material shall be done by means of a motor-patrol grader equipped with broom moldboard, a broom drag, or a power broom, as directed by the Engineer.

Immediately after spreading each application, the aggregate shall be rolled. The rolling shall be continued until no more aggregate material can be worked into the surface. In the construction of the second and third application, blading with the wire-broom moldboard attachment or broom dragging shall begin as soon as possible after the rolling has started and after the surface has set sufficiently to prevent excessive marking. Further blading and rolling on the strip being placed and on adjacent strips previously placed, shall be done as often as necessary to keep the aggregate material uniformly distributed. These operations shall be continued until the surface is evenly covered and cured to the satisfaction of the Engineer.

Succeeding applications shall not be applied until the preceding application has set and in no case until at least 24 hours have elapsed. If dust, dirt, or other foreign matter accumulates on the surface between the applications, the Contractor shall be required to sweep and clean the surface as specified herein. The bituminous material and the aggregate shall be spread upon the clean and properly cured surface and handled as required. Extreme care shall be taken in all applications to avoid brooming or tracking dirt or any foreign matter on any portion of the pavement surface under construction.

All surplus aggregate from the final application shall be swept off the surface and removed prior to final acceptance of the work.

609-3.7 CORRECTION OF DEFECTS. Any defects, such as raveling, low centers, lack of uniformity, or other imperfections caused by faulty workmanship, shall be corrected immediately to the satisfaction of the Engineer.

All defective materials resulting from over-heating, improper handling, or application shall be removed by the Contractor and replaced with approved materials as provided for in these specifications.

609-3.8 BITUMINOUS MATERIAL CONTRACTOR'S RESPONSIBILITY. Samples of the bituminous materials that the Contractor proposes to use, together with a statement as to their source and character, shall be submitted and approval obtained before use of such materials begins.

The Contractor shall furnish vendor's certified test reports for each carload, or equivalent, of bitumen shipped to the project. The report shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing sample materials as received for use on the project.

609-3.9 FREIGHT AND WEIGH BILLS. Before the final estimate is allowed the Contractor shall file with the Engineer receipted bills where railroad shipments are made, and certified weight bills when materials are received in any other manner, of the bituminous and covering materials actually used in the construction covered by the contract. The Contractor shall not remove bituminous material from the tank car or storage tank until the initial outage and temperature measurements have been taken by the Engineer, nor shall the car or tank be released until the final outage has been taken by the Engineer.

Copies of all freight bills and weigh bills shall be furnished to the Engineer during the progress of the work.

METHOD OF MEASUREMENT

609-4.1 The bituminous material shall be measured by the **[gallon(liter)][ton (kg)]**. Volume shall be corrected to the volume at 60°F (15°C) in accordance with ASTM D 1250 for cutback asphalt and Table IV-3 of The Asphalt Institute's Manual MS-6 for emulsified asphalt. Water added to emulsified asphalt will not be measured for payment.

609-4.2 The quantity of aggregate materials for the first application to be paid for shall be the number of tons (kg) of aggregate used for the accepted work.

609-4.3 The quantity of aggregate material for the second application to be paid for shall be the number of tons (kg) of aggregate used for the accepted work.

609-4.4 The quantity of aggregate material for the third application to be paid for shall be the number of tons (kg) of aggregate used for the accepted work.

BASIS OF PAYMENT

609-5.1 Payment shall be made at the contract unit price per **[gallon][ton]** for bituminous material for surface treatment and per ton for the first, second and third aggregate application. These prices shall be full compensation for furnishing all materials and for all preparation, hauling and application of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-609-5.1	Bituminous Material—per [gallon (liter)][ton (kg)]
Item P-609-5.2	First Application Aggregate—per ton (kg)
Item P-609-5.3	Second Application Aggregate—per ton (kg)
Item P-609-5.4	Third Application Aggregate—per ton (kg)

TESTING REQUIREMENTS

ASTM C 29	Unit Weight of Aggregate
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 131	Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T 182	Coating and Stripping of Bitumen-Aggregate Mixtures

MATERIAL REQUIREMENTS

ASTM D 946	Penetration-Graded Asphalt-Cement for Use in Pavement Construction
ASTM D 977	Emulsified Asphalt
ASTM D 1250	Petroleum Measurement Tables
ASTM D 2397	Cationic Emulsified Asphalt
ASTM D 3381	Viscosity-Graded Asphalt-Cement for Use in Pavement Construction
Asphalt Institute Manual MS-6 Table IV-3	Asphalt Pocketbook of Useful Information (Temperature-Volume Corrections for Emulsified Asphalts)

END OF ITEM P-609
