

(5) **Smoothness.** The final surface shall be free from roller marks. The finished surfaces of each course of the pavement, except the finished surface of the final course, shall not vary more than  $\frac{3}{4}$  in when evaluated with a 16 ft straightedge. The finished surface of the final course of pavement shall not vary more than  $\frac{1}{4}$  in when evaluated with a 16 ft straightedge. The lot size shall be 2,000 square yards. Smoothness measurements shall be made at 50 ft intervals and as determined by the Engineer. In the longitudinal direction, a smoothness reading shall be made at the center of each paving lane. In the transverse direction, smoothness readings shall be made continuously across the full width of the pavement. However, transverse smoothness readings shall not be made across designed grade changes. At warped transition areas, straightedge position shall be adjusted to measure surface smoothness and not design grade transitions. When more than 15 percent of all measurements within a lot exceed the specified tolerance, the Contractor shall remove the deficient area to the depth of the final course of pavement and replace with new material. Skin patching shall not be permitted. Isolated high points may be ground off providing the course thickness complies with the thickness specified on the plans. High point grinding will be limited to 15 sq yd. Areas in excess of 15 sq yd will require removal and replacement of the pavement in accordance with the limitations noted above.

(6) **Grade.** The finished surface of the pavement shall not vary from the gradeline elevations and cross sections shown on the plans by more than  $\frac{1}{2}$  in (12.70 mm). The finished grade of each lot will be determined by running levels at intervals of 50 feet (15.2 m) or less longitudinally and all breaks in grade transversely (not to exceed 50 feet) to determine the elevation of the completed pavement. The Contractor shall pay the cost of surveying of the level runs that shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer. The lot size shall be 2,000 square yards. When more than 15 percent of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates  $\frac{3}{4}$  in or more from planned grade, the Contractor shall remove the deficient area to the depth of the final course of pavement and replace with new material. Skin patching shall not be permitted. Isolated high points may be ground off providing the course thickness complies with the thickness specified on the plans. The surface of the ground pavement shall have a texture consisting of grooves between 0.090 and 0.130 in wide. The peaks and ridges shall be approximately  $\frac{1}{32}$  in higher than the bottom of the grooves. The pavement shall be left in a clean condition. The removal of all of the slurry resulting from the grinding operation shall be continuous. The grinding operation should be controlled so the residue from the operation does not flow across other lanes of pavement. High point grinding will be limited to 15 sq yd. Areas in excess of 15 sq yd will require removal and replacement of the pavement in accordance with the limitations noted above.

c. **Percentage of Material Within Specification Limits (PWL).** The percentage of material within specification limits (PWL) shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

d. **Outliers.** All individual tests for mat density and air voids shall be checked for outliers (test criterion) in accordance with ASTM E 178, at a significance level of 5 percent. Outliers shall be discarded, and the PWL shall be determined using the remaining test values.

**Table 5 Marshall Acceptance Limits For Stability, Flow, Air Voids, Density**

TEST PROPERTY	Pavements Designed for Aircraft Gross Weights Less Than 60,000 Lb or Tire Pressures Less Than 100 PSI	
	Specification Tolerance Limits	
Number of Blows	50 blows	
	L	U
Stability, minimum (pounds)	1000	--
Flow, 0.01-inch	8	20
Air Voids Total Mix (%)	2	5
Mat Density (%)	96.3	--
Joint density (%)	93.3	--

The criteria in Table 5 is based on production processes which have a variability with the following standard deviations:

Surface Course Mat Density (%), 1.30

Base Course Mat Density (%), 1.55

Joint Density (%), 2.1

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 98 percent with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 97.5 percent with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 96 percent with 2.1% or less variability.

#### **401-5.3 RESAMPLING PAVEMENT FOR MAT DENSITY.**

**a. General.** Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the Engineer. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-5.1b and 401-5.2b(1). Only one resampling per lot will be permitted.

(1) A redefined PWL shall be calculated for the resampled lot. The number of tests used to calculate the redefined PWL shall include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

**b. Payment for Resampled Lots.** The redefined PWL for a resampled lot shall be used to calculate the payment for that lot in accordance with Table 6.

**c. Outliers.** Check for outliers in accordance with ASTM E 178, at a significance level of 5 percent.

**401-5.4 LEVELING COURSE.** Any course used for truing and leveling shall meet the requirements of paragraph 401-3.2, 401-5.2b(1) for air voids and 401-5.2b(2), but shall not be subject to the density requirements of paragraph 401-5.2b(1) for mat density and 401-5.2b(3). The leveling course shall be compacted with the same effort used to achieve density of the test section. The truing and leveling course shall not exceed a nominal thickness of 1-½ in (37.5 mm). The leveling course is the first variable thickness lift of an overlay placed prior to subsequent courses.

### **CONTRACTOR QUALITY CONTROL**

**401-6.1 GENERAL.** The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that affect the quality of the pavement including, but not limited to:

- a. Mix Design
- b. Aggregate Grading
- c. Quality of Materials
- d. Stockpile Management
- e. Proportioning
- f. Mixing and Transportation
- g. Placing and Finishing
- h. Joints
- i. Compaction
- j. Surface Smoothness
- k. Personnel

### I. Laydown Plan

The Contractor shall perform quality control sampling, testing, and inspection during all phases of the work and shall perform them at a rate sufficient to ensure that the work conforms to the contract requirements, and at minimum test frequencies required by paragraph 401-6.3 and Section 100 of the General Provisions. As a part of the process for approving the Contractor's plan, the Engineer may require the Contractor's technician to perform testing of samples to demonstrate an acceptable level of performance.

No partial payment will be made for materials that are subject to specific quality control requirements without an approved plan.

**401-6.2 TESTING LABORATORY.** The Contractor shall provide a fully equipped asphalt laboratory meeting the requirements of paragraph 401-3.5 and 401-4.2a(2) located at the plant or job site. The Contractor shall provide the Engineer with certification stating that all of the testing equipment to be used is properly calibrated and will meet the specifications applicable for the specified test procedures.

**401-6.3 QUALITY CONTROL TESTING.** The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

**a. Asphalt Content.** A minimum of two tests shall be performed per lot in accordance with ASTM D 6307 or ASTM D 2172 for determination of asphalt content. The weight of ash portion of the test, as described in ASTM D 2172, shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture. The asphalt content for the lot will be determined by averaging the test results.

The use of the nuclear method for determining asphalt content in accordance with ASTM D 4125 is permitted, provided that it is calibrated for the specific mix being used.

**b. Gradation.** Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D 5444 and ASTM C 136 (dry sieve). When asphalt content is determined by the nuclear method, aggregate gradation shall be determined from hot bin samples on batch plants, or from the cold feed on drum mix or continuous mix plants, and tested in accordance with ASTM C 136 (dry sieve) using actual batch weights to determine the combined aggregate gradation of the mixture.

**c. Moisture Content of Aggregate.** The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C 566.

**d. Moisture Content of Mixture.** The moisture content of the mixture shall be determined once per lot in accordance with ASTM D 1461.

**e. Temperatures.** Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the bitumen in the storage tank, the mixture at the plant, and the mixture at the job site.

**f. In-Place Density Monitoring.** The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D 2950.

**g. Additional Testing.** Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

**h. Monitoring.** The Engineer reserves the right to monitor any or all of the above testing.

**401-6.4 SAMPLING.** When directed by the Engineer, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

**401-6.5 CONTROL CHARTS.** The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for aggregate gradation and asphalt content.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

- a. **Individual Measurements.** Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation and asphalt content. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits For Individual Measurements		
Sieve	Action Limit	Suspension Limit
¾ in (19.0 mm)	0%	0%
½ in (12.5 mm)	+/-6%	+/-9%
¾ in (9.5 mm)	+/-6%	+/-9%
No. 4 (4.75 mm)	+/-6%	+/-9%
No. 16 (1.18 mm)	+/-5%	+/-7.5%
No. 50 (0.30 mm)	+/-3%	+/-4.5%
No. 200 (0.075 mm)	+/-2%	+/-3%
Asphalt Content	+/-0.45%	+/-0.70%

- b. **Range.** Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of  $n = 2$ . Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for  $n = 3$  and by 1.27 for  $n = 4$ .

Control Chart Limits Based On Range (Based On $n = 2$ )	
Sieve	Suspension Limit
½ in (12.5 mm)	11 percent
¾ in (9.5 mm)	11 percent
No. 4 (4.75 mm)	11 percent
No. 16 (1.18 mm)	9 percent
No. 50 (0.30 mm)	6 percent
No. 200 (0.075 mm)	3.5 percent
Asphalt Content	0.8 percent

- c. **Corrective Action.** The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when

a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

- (1) One point falls outside the Suspension Limit line for individual measurements or range; or
- (2) Two points in a row fall outside the Action Limit line for individual measurements.

**401-6.6 QUALITY CONTROL REPORTS.** The Contractor shall maintain records and shall submit reports of quality control activities daily, in accordance with the Contractor Quality Control Program described in General Provisions, Section 100.

## METHOD OF MEASUREMENT

**401-7.1 MEASUREMENT.** Plant mix bituminous concrete pavement shall be measured by the number of tons (kg) of bituminous mixture used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

## BASIS OF PAYMENT

**401-8.1 PAYMENT.** Payment for a lot of bituminous concrete pavement meeting all acceptance criteria as specified in Paragraph 401-5.2 shall be made based on results of tests for [smoothness,] mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1a for mat density and air voids and 401-8.1c for smoothness, subject to the limitation that:

The total project payment for plant mix bituminous concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons (kg) of bituminous mixture used in the accepted work (See Note 1 under Table 6).

The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**a. Basis of Adjusted Payment.** The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100 percent or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100 percent or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100 percent.

**Table 6. Price Adjustment Schedule<sup>1</sup>**

Percentage of Material Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject <sup>2</sup>
<sup>1</sup> Although it is theoretically possible to achieve a pay factor of 106 percent for each lot, actual payment above 100 percent shall be subject to the total project payment limitation specified in paragraph 401-8.1.	
<sup>2</sup> The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50 percent of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.	

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1. Payment in excess of 100 percent for accepted lots of bituminous concrete pavement shall be used to offset payment for accepted lots of bituminous concrete pavement that achieve a lot pay factor less than 100 percent.

**b. Payment.** Payment will be made under:

Item P-401-8.1	Bituminous Surface Course, 2" Thick, ¾" Maximum Aggregate – per ton
Item P-401-8.2	Bituminous Surface Course, 1 ½" Thick, ½" Maximum Aggregate – per ton
Item P-401-8.3	Bituminous Surface Course, Leveling Course, ½" Maximum Aggregate – per ton

**TESTING REQUIREMENTS**

ASTM C 29	Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	Materials Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	Specific Gravity and Absorption of Coarse Aggregate
ASTM C 131	Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 183	Sampling and the Amount of Testing of Hydraulic Cement
ASTM C 566	Total Evaporable Moisture Content of Aggregate by Drying
ASTM D 75	Sampling Aggregates
ASTM D 979	Sampling Bituminous Paving Mixtures
ASTM D 995	Mixing Plants for Hot-Mixed Hot-Laid Bituminous Paving Mixtures
ASTM D 1073	Fine Aggregate for Bituminous Paving Mixtures
ASTM D 1188	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM D 1461	Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D 2041	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2172	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2419	Sand Equivalent Value of Soils and Fine Aggregate
ASTM D 2489	Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D 2726	Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D 2950	Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D 3203	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures

ASTM D 3665	Random Sampling of Construction Materials
ASTM D 3666	Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D 4125	Asphalt Content of Bituminous Mixtures by the Nuclear Method
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4791	Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4867	Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D 5444	Mechanical Size Analysis of Extracted Aggregate
ASTM D 6926	Preparation of Bituminous Specimens Using MARSHALL Apparatus
ASTM D 6927	MARSHALL Stability and Flow of Bituminous Mixtures
ASTM E 11	Wire-Cloth Sieves for Testing Purposes
ASTM E 178	Dealing with Outlying Observations
ASTM E 1274	Measuring Pavement Roughness Using a Profilograph
AASHTO T 30	Mechanical Analysis of Extracted Aggregate
AASHTO T 110	Moisture or Volatile Distillates in Bituminous Paving Mixtures
The Asphalt Institute's Manual No. 2 (MS-2)	Mix Design Methods for Asphalt Concrete

### MATERIAL REQUIREMENTS

ASTM D 242	Mineral Filler for Bituminous Paving Mixtures
ASTM D 946	Penetration Graded Asphalt Cement for Use in Pavement Construction
ASTM D 3381	Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 4552	Classifying Hot-Mix Recycling Agents
AASHTO M320	Performance Graded Asphalt Binder

**END OF ITEM P-401**

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## ITEM P-602

### BITUMINOUS PRIME COAT

#### DESCRIPTION

**602-1.1** This item shall consist of an application of bituminous material on the prepared base course in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

#### MATERIALS

**602-2.1 BITUMINOUS MATERIAL.** The types, grades, controlling specifications, and application temperatures for the bituminous materials are given in Table 1. The Engineer shall designate the specific material to be used.

**Table 1 Bituminous Material**

Type and Grade	Specification	Application Temperatures <sup>1</sup>	
		Deg. F	Deg. C
Emulsified Asphalt			
SS-1, SS-1h	ASTM D 977	70-160	20-70
MS-2, HFMS-1	ASTM D 977	70-160	20-70
CSS-1, CSS-1h	ASTM D 2397	70-160	20-70
CMS-2	ASTM D 2397	70-160	20-70
Cutback Asphalt			
RC-30	ASTM D 2028	80+	30+
RC-70	ASTM D 2028	120+	50+
RC-250	ASTM D 2028	165+	75+

<sup>1</sup> The maximum temperature for cutback asphalt shall be that at which fogging occurs.

<sup>1</sup> The maximum temperature for cutback asphalt shall be that at which fogging occurs.

#### CONSTRUCTION METHODS

**602-3.1 WEATHER LIMITATIONS.** The prime coat shall be applied only when the existing surface is dry or contains sufficient moisture to get uniform distribution of the bituminous material, when the atmospheric temperature is above 60 °F (15 °C), and when the weather is not foggy or rainy. The temperature requirements may be waived, but only when so directed by the Engineer.

**602-3.2 EQUIPMENT.** The equipment used by the Contractor shall include a self-powered pressure bituminous material distributor and equipment for heating bituminous material.

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 gauges, 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.

If the distributor is not equipped with an operable quick shut off valve, the prime operations shall be started and stopped on building power. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the owner.

A power broom and/or blower shall be provided for any required cleaning of the surface to be treated.

**602-3.3 APPLICATION OF BITUMINOUS MATERIAL.** Immediately before applying the prime coat, the full width of the surface to be primed shall be swept with a power broom to remove all loose dirt and other objectionable material.

The bituminous material including solvent shall be uniformly applied with a bituminous distributor at the rate of 0.25 to 0.50 gallons per square yard (1.20 to 2.40 liters per square meter) depending on the base course surface texture. *The Contractor may propose a lower application rate for review and approval by the Engineer.* The type of bituminous material and application rate shall be approved by the Engineer prior to application.

Following the application, the primed surface shall be allowed to dry not less than 48 hours without being disturbed or for such additional time as may be necessary to permit the drying out of the prime coat until it will not be picked up by traffic or equipment. This period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the surfacing has been placed. Suitable precautions shall be taken by the Contractor to protect the primed surface against damage during this interval, including supplying and spreading any sand necessary to blot up excess bituminous material.

**602-3.4 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, must be submitted and approved before use of such material begins. The Contractor shall require the manufacturer or producer of the bituminous materials to furnish material subject to this and all other pertinent requirements of the contract. Only satisfactory materials, so demonstrated by service tests, shall be acceptable.

The Contractor shall furnish vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The test reports shall contain all the data required by the applicable specification. If the Contractor applies the prime material prior to receipt of the tests reports, payment for the material shall be withheld until they are received. If the material does not pass the specifications it shall be replaced at the contractor's expense. 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 basis for final acceptance. All such test reports shall be subject to verification by testing samples of materials received for use on the project.

**602-3.5 FREIGHT AND WEIGH BILLS.** Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified weigh bills when materials are received in any other manner, of the bituminous 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 freight bills and weigh bills shall be furnished to the Engineer during the progress of the work.

## METHOD OF MEASUREMENT

**602-4.1** ~~The bituminous material for prime coat shall be measured by the gallon. 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. There will be no separate measurement for this item.~~

## BASIS OF PAYMENT

**602-5.1** ~~Payment shall be made at the contract unit price per gallon for bituminous prime coat. This price shall be full compensation for furnishing all materials and for all preparation, delivering, and applying the materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.~~

Payment will be made under:

Item P-602-5.1 Bituminous Prime Coat per gallon

*There will be no separate payment for this item.*

### TESTING REQUIREMENTS

ASTM D 1250	Petroleum Measurement Tables
Asphalt Institute Manual MS-6 Table IV-3	Asphalt Pocketbook of Useful Information (Temperature-Volume Corrections for Emulsified Asphalts)

### MATERIAL REQUIREMENTS

ASTM D 977	Emulsified Asphalt
ASTM D 2028	Cutback Asphalt (Rapid Curing Type)
ASTM D 2397	Cationic Emulsified Asphalt

**END OF ITEM P-602**

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## ITEM P-603

### BITUMINOUS TACK COAT

#### DESCRIPTION

**603-1.1** This item shall consist of preparing and treating a bituminous or concrete surface with bituminous material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

#### MATERIALS

**603-2.1 BITUMINOUS MATERIALS.** The bituminous material shall be either cutback asphalt, emulsified asphalt, or tar and shall conform to the requirements of Table 1. The type, grade, controlling specification, and application temperature of bituminous material to be used shall be specified by the Engineer.

**Table 1 Bituminous Material**

Type and Grade	Specification	Application Temperature	
		Deg. F	Deg. C
Emulsified Asphalt			
SS-1, SS-1h	ASTM D 977	75-130	25-55
CSS-1, CSS-1h	ASTM D 2397	75-130	25-55
Cutback Asphalt			
RC-70	ASTM D 2028	120-160	50-70
Tar			
RTCB 5, RTCB 6	AASHTO M 52	60-120	15-50

#### CONSTRUCTION METHODS

**603-3.1 WEATHER LIMITATIONS.** The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is above 60 °F (15 °C). The temperature requirements may be waived, but only when so directed by the Engineer.

**603-3.2 EQUIPMENT.** The Contractor shall provide equipment for heating and applying the bituminous material.

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 gauges, 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.

If the distributor is not equipped with an operable quick shut off valve, the tack operations shall be started and stopped on building paper. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the owner.

A power broom and/or blower shall be provided for any required cleaning of the surface to be treated.

**603-3.3 APPLICATION OF BITUMINOUS MATERIAL.** Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and/or air blast to remove all loose dirt and other objectionable material.

Emulsified asphalt shall be diluted by the addition of water when directed by the Engineer and shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before any of the overlying mixture is placed on the tacked surface.

The bituminous material including vehicle or solvent shall be uniformly applied with a bituminous distributor at the rate of 0.05 to 0.15 gallons per square yard (0.24 to 0.72 liters per square meter) depending on the condition of the existing surface. The type of bituminous material and application rate shall be approved by the Engineer prior to application.

Following the application, the surface shall be allowed to cure without being disturbed for such period of time as may be necessary to permit drying out and setting of the tack coat. This period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the next course has been placed. Suitable precautions shall be taken by the Contractor to protect the surface against damage during this interval.

**603-3.4 BITUMINOUS MATERIAL CONTRACTOR'S RESPONSIBILITY.** Samples of the bituminous material that the Contractor proposes to use, together with a statement as to its source and character, must be submitted and approved before use of such material begins. The Contractor shall require the manufacturer or producer of the bituminous material to furnish material subject to this and all other pertinent requirements of the contract. Only satisfactory materials so demonstrated by service tests, shall be acceptable.

The Contractor shall furnish the vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The tests reports shall contain all the data required by the applicable specification. If the Contractor applies the material prior to receipt of the tests reports, payment for the material shall be withheld until they are received. If the material does not pass the specifications it shall be replaced at the contractor's expense. 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 samples of material received for use on the project.

~~**603-3.5 FREIGHT AND WEIGH BILLS.** Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified weigh bills when materials are received in any other manner, of the bituminous 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 freight bills and weigh bills shall be furnished to the Engineer during the progress of the work.~~

## METHOD OF MEASUREMENT

~~**603-4.1** The bituminous material for tack coat shall be measured by the gallon. Volume shall be corrected to the volume at 60 °F (15 °C) in accordance with ASTM D-1250 for cutback asphalt, ASTM D-633 for tar, 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. *There will be no separate measurement for this item.*~~

## BASIS OF PAYMENT

~~**603.5-1** Payment shall be made at the contract unit price per gallon of bituminous material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

~~Payment will be made under:~~

~~Item P-603-5.1 Bituminous Tack Coat per gallon~~

~~*There will be no separate payment for this item.*~~

**MATERIAL REQUIREMENTS**

ASTM D 633	Volume Correction Table for Road Tar
ASTM D 977	Emulsified Asphalt
ASTM D 1250	Petroleum Measurement Tables
ASTM D 2028	Cutback Asphalt (Rapid-Curing Type)
ASTM D 2397	Cationic Emulsified Asphalt
Asphalt Institute Manual MS-6 Table IV-3	Asphalt Pocketbook of Useful Information (Temperature-Volume Corrections for Emulsified Asphalts)

**END ITEM P-603**