

## SECTION 02608 – EMULSIFIED ASPHALT SEAL COAT

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS:

- A. The General Provision of the contract, including the General Provisions for Construction Projects (2016), Special Provisions, and General Requirements of the Specifications, apply to the work specified in this section.
- B. This Section shall be in accordance with FAA Specification Item P-608 – Emulsified Asphalt Seal Coat, as included as an attachment to this Section.

#### 1.2 SUMMARY

Work under this Section includes the requirements for the construction of Emulsified Asphalt Seal Coat as shown on the Plans.

#### 1.3 REFERENCES:

- A. FAA Specification Item P-608 – Emulsified Asphalt Seal Coat as modified herein.
- B. Section 02401, Asphalt Mix Pavement, Surface Course.
- C. Section 02403, Asphalt Mix Pavement, Base and Surface Course.

#### 1.4 SUBMITTALS

Prior to commencing Work in this Section, the Contractor shall submit the following information according to Section 01300, Submittals.

- A. Test reports and certificate of compliance for aggregate material.
- B. Test reports and certificate of compliance for asphalt emulsion material.
- C. Test reports and certificate of compliance for polymer material.
- D. Proposed application rate including residual rate.
- E. Friction test data as required by FAA Item P-608.

## PART 2 – PRODUCTS

### 2.1 SEAL COAT

Seal Coat shall conform to Section 02608 Emulsified Asphalt Seal Coat, FAA Item P-608.

## PART 3 – EXECUTION

### 3.1 SEAL COAT

- A. The Contractor shall apply seal coat in accordance with FAA Specification Item P-608, and as modified herein, to the existing pavement surfaces shown on the plans or damaged by the Contractor or as directed by the Engineer.

## PART 4 - MEASUREMENT AND PAYMENT

### 4.1 METHOD OF MEASUREMENT

- A. Method of measurement and payment shall be in accordance with FAA Specification Item P-608, paragraph 608-7.1.

### 4.2 BASIS OF PAYMENT

- A. Basis for payment shall be in accordance with FAA Specification Item P-608, paragraph 608-8.1.

## PART 5 - MEASUREMENT AND PAYMENT

### 5.1 FAA SPECIFICATIONS

- A. P-608, Emulsified Asphalt Seal Coat.

END OF SECTION 02608

## ITEM P-608 EMULSIFIED ASPHALT SEAL COAT

### DESCRIPTION

**608-1.1** This item shall consist of the application of a emulsified asphalt surface treatment composed of an emulsion of natural and refined asphalt materials, water and a polymer additive, for taxiways and runways with the application of a suitable aggregate to maintain adequate surface friction; and airfield secondary and tertiary pavements including low-speed taxiways, shoulders, overruns, roads, parking areas, and other general applications with or without aggregate applied as designated on the plans. The terms seal coat, asphalt sealer, and asphalt material are interchangeable throughout this specification. The term emulsified asphalt means an emulsion of natural and refined asphalt materials.

### MATERIALS

**608-2.1 Aggregate.** The aggregate material shall be a dry, clean, dust and dirt free, sound, durable, angular shaped manufactured specialty sand, such as that used as an abrasive, with a Mohs hardness of 6 to 8. The Contractor shall submit the specialty sand manufacturer's technical data and a manufacturer's Certificate of Analysis (COA) indicating that the specialty sand meets the requirements of the specification to the RPR prior to start of construction. The sand must be approved for use by the RPR and shall meet the following gradation limits when tested in accordance with ASTM C136 and ASTM C117:

**Aggregate Material Gradation Requirements<sup>1</sup>**

Sieve Designation (square openings)	Individual Percentage Retained by Weight
No. 10 (2.00 mm)	0
No. 14 (1.41 mm)	0-4
No. 16 (1.18 mm)	0-8
No. 20 (850 µm)	0-35
No. 30 (600 µm)	20-50
No. 40 (425 µm)	10-45
No. 50 (300 µm)	0-20
No. 70 (212 µm)	0-5
No. 100 (150 µm)	0-2
No. 200 (75 µm)	0-2

<sup>1</sup> Locally available sand or abrasive material that is slightly outside of the gradation requirements may be approved by the RPR with concurrence by the seal coat manufacturer for the use of locally available sand or abrasive material. The RPR and manufacturer's field representative should verify acceptance during application of Control strips indicated under paragraph 608-3.2.

The Contractor shall provide a certification showing particle size analysis and properties of the material delivered for use on the project. The Contractor's certification may be subject to verification by testing the material delivered for use on the project.

**608-2.2 Asphalt Emulsion.** The asphalt emulsion shall meet the properties in the following table:

**Concentrated Asphalt Emulsion Properties**

Properties	Specification	Limits
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	20 – 100 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	57% minimum
Sieve Test	ASTM D6933	0.1% maximum
24-hour Stability	ASTM D6930	1% maximum
5-day Settlement Test	ASTM D6930	5.0% maximum
Particle Charge <sup>1</sup>	ASTM D7402	Positive 6.5 maximum pH

<sup>1</sup> pH may be used in lieu of the particle charge test which is sometimes inconclusive in slow setting, asphalt emulsions.

The asphalt material base residue shall contain not less than 20% gilsonite, or uitaite and shall not contain any tall oil pitch or coal tar material and shall contain no less than one percent (1%) polymer.

**Tests on Residue from Distillation or Evaporation**

Properties	Specification	Limits
Viscosity at 275°F (135°C)	ASTM D4402	1750 cts maximum
Solubility in 1, 1, 1 trichloroethylene	ASTM D2042	97.5% minimum
Penetration	ASTM D5	50 dmm maximum
Asphaltenes	ASTM D2007	15% minimum
Saturates	ASTM D2007	15% maximum
Polar Compounds	ASTM D2007	25% minimum
Aromatics	ASTM D2007	15% minimum

The asphalt emulsion, when diluted in the volumetric proportion of one part concentrated asphalt material to one part hot water shall have the following properties:

### One-to-One Dilution Emulsion Properties

Properties	Specification	Limits
<b>In Ready-to-Apply Form, one part concentrate to one part water, by volume</b>		
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	5 – 50 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	28.5% minimum
Pumping Stability <sup>1</sup>		Pass

<sup>1</sup> Pumping stability is tested by pumping one pint (475 ml) of seal coat diluted one (1) part concentrate to one (1) part water, at 77°F (25°C), through a 1/4-inch (6 mm) gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

### Two-to-One Dilution Emulsion Properties

Properties	Specification	Limits
<b>In Ready-to-Apply Form, two parts concentrate to one part water, by volume</b>		
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	5 – 50 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	38% minimum
Pumping Stability <sup>1</sup>		Pass

<sup>1</sup> Pumping stability is tested by pumping one pint (475 ml) of seal coat diluted one (1) part concentrate to one (1) part water, at 77°F (25°C), through a 1/4-inch (6 mm) gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the emulsified asphalt delivered to the project. If the asphalt emulsion is diluted at other than the manufacturer's facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt emulsion properties.

The COA shall be provided to and approved by the RPR before the emulsified asphalt is applied. The furnishing of the vendor's certified test report for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

The asphalt material storage and handling temperature shall be between 50°F - 160°F (10°C - 70°C) and the material shall be protected from freezing, or whenever outside temperature drops below 40°F (4°C) for prolonged time periods.

Contractor shall provide a list of airport pavement projects, exposed to similar climate conditions, where this product has been successfully applied within at least 5 years of the project.

**608-2.3 Water.** Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use. Water used in making and diluting the emulsion shall be potable, with a maximum hardness of 90ppm calcium and 15ppm magnesium; deleterious iron, sulfates, and phosphates maximum 7ppm, and less than 1ppm of organic byproducts. Water shall be a minimum of 140°F (60°C) prior to adding to emulsion.

**608-2.4 Polymer.** The polymer shall meet the properties in the following table:

### Polymer Properties

Properties	Limits
Solids Content	47% to 65%, Percent by Weight
Weight	8.0 to 9.0 pounds/gallon (1.07 to 1.17 kg/L)
pH	3.0 to 8.0
Particle Charge	Nonionic/Cationic
Mechanical Stability	Excellent
Film Forming Temperature, °C	+5°C, minimum
Tg, °C	22°C, maximum

The manufacturer shall provide a copy of the Certificate of Analysis (COA) for the polymer used in the seal coat; and the Contractor shall include the COA with the emulsified asphalt COA when submitting to the RPR.

**608-2.5 Seal Coat with Aggregate.** The Contractor shall submit friction test data from no less than three of the airport projects identified under 608-2.2. The test data must be from the same project and include technical details on application rates, aggregate rates, and point of contact at the airport to confirm use and success of sealer with aggregate.

Friction test data in accordance with AC 150/5320-12, at 40 or 60 mph (65 or 95 km/h) wet, must include as a minimum; the friction value prior to sealant application; two values, between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value between 180 days and 360 days after the application. The results of the tests between 24 and 96 hours shall indicate friction is increasing at a rate to obtain similar friction value of the pavement surface prior to application, and the long-term test shall indicate no apparent adverse effect with time relative to friction values and existing pavement surface.

Seal coat material submittal without required friction performance will not be approved. Friction tests performed on this project cannot be used as a substitute of this requirement.

### COMPOSITION AND APPLICATION RATE

**608-3.1 Application Rate.** The approximate amounts of materials per square yard (square meter) for the asphalt surface treatment shall be as provided in the table for the treatment area(s) at the specified dilution rate(s) as noted on the plans. The actual application rates will vary within the range specified to suit field conditions and will be recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation.

#### Application Rate

Dilution Rate	Quantity of Emulsion gal/yd <sup>2</sup> (l/m <sup>2</sup> )	Quantity of Aggregate lb/yd <sup>2</sup> (kg/m <sup>2</sup> )
1:1	0.10-0.17 (0.45-0.77)	0.20-0.50 (0.11-0.27)

**608-3.2 Control areas and control strips.** Prior to full application, the control strip must be accepted by the RPR. The surface preparation, personnel, equipment, and method of operation used on the test area(s) and control strip(s) shall be the same as used on the remainder of the work.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying control areas and/or control strips to determine the appropriate application rate of both emulsion and aggregate to be approved by the RPR.

A test area(s) and control strip(s) shall be applied for each differing asphalt pavement surface identified in the project. The test area(s) and control strip(s) shall be used to determine the material application rate(s) of both emulsion and sand prior to full production.

**a. For taxiway, taxilane and apron surfaces.** Prior to full application, the Contractor shall place test areas at varying application rates as recommended by the Contractor's manufacturer's representative to determine appropriate application rate(s). The test areas will be located on representative section(s) of the pavement to receive the asphalt surface treatment designated by the RPR.

**b. For runway and high-speed exit taxiway surfaces.** Prior to full application, the Contractor shall place a series of control strips a minimum of 300 feet (90 m) long by 12 feet (3.6 m) wide, or width of anticipated application, whichever is greater, at varying application rates as recommended by the manufacturer's representative and acceptable to the RPR to determine appropriate application rate(s). The control strips should be separated by a minimum of 200 feet between control strips. The area to be tested will be located on a representative section of the pavement to receive the asphalt surface treatment designated by the RPR. The control strips should be placed under similar field conditions as anticipated for the actual application. The skid resistance of the existing pavement shall be determined for each control strip with a continuous friction measuring equipment (CFME). The skid resistance of existing pavement can be immediately adjacent to the control strip or at the same location as the control strip if testing prior to application. The Contractor may begin testing the skid resistance of runway and high-speed exit taxiway control strips after application of the asphalt surface treatment has fully cured, generally 8 to 36 hours after application of the control strips depending on site and environmental conditions. Aircraft shall not be permitted on the runway or high speed exit taxiway control strips until such time as the Contractor validates that its surface friction meets the maintenance planning friction levels in AC 150/5320-12, Table 3-2 when tested at speeds of 40 and 60 mph (65 and 95 km/h) wet with approved CFME.

If the control strip should prove to be unsatisfactory, necessary adjustments to the application rate, placement operations, and equipment shall be made. Additional control strips shall be placed and additional skid resistance tests performed and evaluated. Full production shall not begin without the RPR's approval of an appropriate application rate(s). Acceptable control strips shall be paid for in accordance with paragraph 608-8.1.

## CONSTRUCTION METHODS

**608-4.1 Worker safety.** The Contractor shall obtain a Safety Data Sheet (SDS) for both the asphalt emulsion product and sand and require workmen to follow the manufacturer's recommended safety precautions.

**608-4.2 Weather limitations.** The asphalt emulsion shall be applied only when the existing pavement surface is dry and when the weather is not foggy, rainy, or when the wind velocity will

prevent the uniform application of the material. No material shall be applied in strong winds that interfere with the uniform application of the material(s), or when dust or sand is blowing or when rain is anticipated within eight (8) hours of application completion. The atmospheric temperature and the pavement surface temperature shall both be at, or above 60°F (16°C) and rising. Seal coat shall not be applied when pavement temperatures are expected to exceed 130°F within the subsequent 72 hours if traffic will be opened on pavement within those 72 hours. During application, account for wind drift. Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary to protect against overspray before applying the emulsion. Should emulsion get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the RPR, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Owner.

**608-4.3 Equipment and tools.** The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

**a. Pressure distributor.** The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven hundred (700) feet per minute (213 m per minute). The equipment will be tested under pressure for leaks and to ensure proper set-up before use. The Contractor will provide verification of truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application per nozzle manufacturer, spray-bar height and pressure and pump speed appropriate for the viscosity and temperature of sealer material, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a 12-foot (3.7-m), minimum, spray bar with individual nozzle control. The distributor truck shall be capable of specific application rates in the range of 0.05 to 0.25 gallons per square yard (0.15 to 0.80 liters per square meter). These rates shall be computer-controlled rather than mechanical. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy.

The distributor truck shall effectively heat and mix the material to the required temperature prior to application in accordance with the manufacturer's recommendations.

The distributor shall be equipped with a hand sprayer to spray the emulsion in areas not accessible to the distributor truck.

**b. Aggregate spreader.** The asphalt distributor truck will be equipped with an aggregate spreader mounted to the distributor truck that can apply sand to the emulsion in a single pass operation without driving through wet emulsion. The aggregate spreader shall be equipped with a variable control system capable of uniformly distributing the sand at the specified rate at varying application widths and speeds. The aggregate spreader must be adjusted to produce an even and accurate application of specified aggregate. Prior to any seal coat application, the aggregate spreader will be calibrated onsite to ensure acceptable uniformity of spread. The RPR will observe the calibration and verify the results. The aggregate spreader will be re-calibrated each time the aggregate rate is changed either during the application of test strips or production. The Contractor may consult the seal coat manufacturer representative for procedure and guidance. The sander shall have a minimum hopper capacity of 3,000 pounds (1361 kg) of sand.



Push-type hand sanders will be allowed for use around lights, signs and other obstructions, if necessary.

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

**d. Equipment calibration.** Asphalt distributors must be calibrated within the same construction season in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

**608-4.4 Preparation of asphalt pavement surfaces.** Clean pavement surface immediately prior to placing the seal coat so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film. Remove oil or grease from the asphalt pavement by scrubbing with a detergent, washing thoroughly with clean water, and then treat these areas with a spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with Item P-101, paragraph 101-3.6.

**a. New asphalt pavement surfaces.** Allow new asphalt pavement surfaces to cure so that there is no concentration of oils on the surface.

Perform a water-break-free test to confirm that the surface oils have degraded and dissipated. (Cast approximately one gallon (4 liters) of clean water out over the surface. The water should sheet out and wet the surface uniformly without crawling or showing oil rings.) If signs of crawling or oil rings are apparent on the pavement surface, additional time must be allowed for additional curing and retesting of the pavement surface prior to treatment.

**608-4.5 Emulsion mixing.** The application emulsion shall be obtained by blending asphalt material concentrate, water and polymer, if specified. Always add heated water to the asphalt material concentrate, never add asphalt material concentrate to heated water. Mix one part heated water to one part asphalt material concentrate, by volume.

Add 1% polymer, by volume, to the emulsion mix. If the polymer is added to the emulsion mix at the plant, submit weight scale tickets to the RPR. As an option, the polymer may be added to the emulsion mix at the job site provided the polymer is added slowly while the asphalt distributor truck circulating pump is running. The mix must be agitated for a minimum of 15 minutes or until the polymer is mixed to the satisfaction of the RPR.

**608-4.6 Application of asphalt emulsion.** The asphalt emulsion shall be applied using a pressure distributor upon the properly prepared, clean and dry surface at the application rate recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation for each designated treatment area. The asphalt emulsion should be applied at a temperature between 130°F (54°C) and 160°F (70°C) or in accordance with the manufacturer's recommendation.

If low spots and depressions greater than 1/2 inch (12 mm) in depth in the pavement surface cause ponding or puddling of the applied materials, the pavement surface shall be lightly broomed with a broom or brush type squeegee until the pavement surface is free of any pools of excess material.

During all applications, the surfaces of adjacent structures shall be protected to prevent their being spattered or marred.

**608-4.7 Application of aggregate material.** Immediately following the application of the asphalt emulsion, friction sand at the rate recommended by the manufacturer's representative and

approved by the RPR from the test area/sections evaluation for each designated application area, shall be spread uniformly over the asphalt emulsion in a single-pass operation simultaneous with the sealer application. The aggregate shall be spread to the same width of application as the asphalt material and shall not be applied in such thickness as to cause blanketing.

Sprinkling of additional aggregate material, and spraying additional asphalt material over areas that show up having insufficient cover or bitumen, shall be done by hand whenever necessary. In areas where hand work is necessitated, the sand shall be applied before the sealant begins to break.

Minimize aggregate from being broadcast and accumulating on the untreated pavement adjacent to an application pass. Prior to the next application pass, the Contractor shall clean areas of excess or loose aggregate and remove from project site.

### **QUALITY CONTROL (QC)**

**608-5.1 Manufacturer's representation.** The manufacturer's representative knowledgeable of the material, procedures, and equipment described in the specification is responsible to assist the Contractor and RPR in determining the appropriate application rates of the emulsion and aggregate, as well as recommendations for proper preparation and start-up of seal coat application. Documentation of the manufacturer representative's experience and knowledge for applying the seal coat product shall be furnished to the RPR a minimum of 10 work days prior to placement of the control strips. The cost of the manufacturer's representative shall be included in the Contractor's bid price.

**608-5.2 Contractor qualifications.** The Contractor shall provide documentation to the RPR that the seal coat Contractor is qualified to apply the seal coat, including personnel, and equipment, and has made at least three (3) applications similar to this project in the past two (2) years.

### **MATERIAL ACCEPTANCE**

**608-6.1 Application rate.** The rate of application of the asphalt emulsion shall be verified at least twice per day.

**608-6.2 Friction tests.** Friction tests in accordance with AC 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces, shall be performed on all runway and high-speed taxiways that received a seal coat. Each test includes performing friction tests at 40 mph and 60 mph (65 or 95 km/h) both wet, 15 feet (4.5 m) to each side of runway centerline with approved continuous friction measuring equipment (CFME). The Contractor shall coordinate testing with the RPR and provide the RPR a written report of friction test results. The RPR shall be present for testing.

### **METHOD OF MEASUREMENT**

**608-7.1** All work under this section will not be measured for payment.

### **BASIS OF PAYMENT**

**608-8.1** Items covered by this section will be paid by lump sum. The contract price paid shall be for full compensation for furnishing and placing all materials and all labor, equipment, tools,

and incidentals necessary for each of the construction phases.

Payment will be made under:

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>
02608.1A	Emulsified Asphalt Seal Coat (Phases 0 through 3)	Lump Sum

### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### ASTM International (ASTM)

ASTM C117	Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D5	Standard Test Method for Penetration of Asphalt Materials
ASTM D244	Standard Test Methods and Practices for Emulsified Asphalts
ASTM D2007	Standard Test Method for Characteristic Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method
ASTM D2042	Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene
ASTM D2995	Standard Practice for Estimating Application Rate of Bituminous Distributors
ASTM D4402	Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D5340	Standard Test Method for Airport Pavement Condition Index Surveys

#### Advisory Circulars (AC)

AC 150/5320-12	Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces
AC 150/5320-17	Airfield Pavement Surface Evaluation and Rating (PASER) Manuals
AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements

### **END OF ITEM P-608**