
USACE / NAVFAC / AFCESA / NASA UFGS-32 01 13.00 20 (February 2012)

Preparing Activity: NAVFAC NEW

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2012

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SECTION 32 01 13.00 20

EMULSIFIED ASPHALT SEAL COATS [WITH] [WITHOUT] AGGREGATE 02/12

NOTE: This guide specification covers the requirements for emulsified asphalt surface coatings (not coal tars products) for low volume roads, parking areas, airfield secondary and tertiary pavements (low-speed taxiways, shoulders, overruns), and other general applications with or without aggregate applied on the applied coating. An emulsified asphalt seal coat without aggregate, more commonly called a 'fog seal', can be considered for use on pavements with low to moderate weathered surfaces (as defined by ASTM D5340).

This specification can be used for high volume or high speed roads, taxiways and runways only with the incorporation of a suitable aggregate in order to maintain adequate surface friction and only with the written approval of the cognizant NAVFAC (Echelon III), AFCEA MAJCOM or TSMCX Pavement Engineer. At present, only the GSB-88 seal coat product with aggregate should be considered for use on airfield runway pavements.

There are numerous emulsified asphalt seal coat products available through commercial vendors, some proprietary and some generic ASTM specification types. This specification includes requirements for both generic and proprietary products that have been demonstrated to the Government to be acceptable for use. The project designer is encouraged to specify generic products to their fullest practical extent. Proprietary products cited herein may be specified as acceptable alternates for generic products, or, when both approved by the cognizant NAVFAC (Echelon III), AFCEA MAJCOM or TSMCX Pavement Engineer and determined to be justified for use in a contract document, specified as required proprietary products.

If used on Design/Build projects involving high volume or high speed roads or any airfield pavement, this section shall be prepared by the Government RFP

preparer and shall not be further edited by the Contractor's Designer of Record.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

UFC 3-250-03, "Standard Practice Manual for Flexible Pavements" should be used for guidance in preparing these specifications.

1.1 MEASUREMENT AND PAYMENT PROCEDURES

NOTE: Payment and Measurement shall be made on a unit price bases with the test section determined application rate for emulsion and aggregate. Therefore, this requires that the contract documents reflect unit pricing for the asphalt emulsion and aggregate, if used.

Measure the quantities of emulsified asphalt and aggregate used in the accepted work and to be paid for, provided that the measured quantities are not more than 10 percent over the test section determined application rate. Any amount of emulsified asphalt and aggregate more than 10 percent over the test section determined application rate for each application will be deducted from the measured quantities except for irregular areas where hand spraying of the bituminous material [and hand spreading of the aggregate] is necessary.

1.1.1 Emulsified Asphalt Measurement Methods

NOTE: When the emulsified asphalt material is measured in liters (gallons), the appropriate ASTM method will be retained for the type of emulsified asphalt specified.

The amount of emulsified asphalt to be paid for will be measured in L at

15.6 degrees C gallons at 60 degrees F. Correct volumes measured at temperatures other than 15.6 degrees C 60 degrees F in accordance with ASTM D1250 using a coefficient of expansion of 0.00045 per degree C 0.00025 per degree F for asphalt emulsion.

[The amount of aggregate to be paid for will be measured in metric tons tons of dry aggregate. Measurement of the materials shall be by approved weigh scales.]

1.1.2 Payment

Base bids on the average specified application rates for emulsified asphalt and aggregate used in production. The test section shall be used to determine actual production application rates.

1.2 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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 C136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C142/C142M	(2010) Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C29/C29M	(2009) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM D1250	(2008) Standard Guide for Use of the Petroleum Measurement Tables
ASTM D140/D140M	(2009) Standard Practice for Sampling Bituminous Materials

ASTM D1474	(2008) Standard Test Method for Indentation Hardness of Organic Coatings
ASTM D2027	(2010) Cutback Asphalt (Medium-Curing Type)
ASTM D2397	(2005) Standard Specification for Cationic Emulsified Asphalt
ASTM D2419	(2009) Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2495	(2007) Standard Test Method for Moisture in Cotton by Oven-Drying
ASTM D2995	(1999; R 2009) Determining Application Rate of Bituminous Distributors
ASTM D3625	(1996; R 2005) Standard Practice for Effect of Water on Bituminous-Coated Aggregate Using Boiling Water
ASTM D4402	(2006) Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D5	(2006e1) Penetration of Bituminous Materials
ASTM D75/D75M	(2009) Standard Practice for Sampling Aggregates
ASTM D977	(2012) Emulsified Asphalt

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 150/5320-12	(1997, Rev C; Change 1-3, 5 and 6) Measurement, Construction and Maintenance of Skid-Resistant Airport Pavement Surfaces
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U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009) Manual of Uniform Traffic Control Devices
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1.3 SYSTEM DESCRIPTION

NOTE: Retain equipment units required for the project and delete all others.

1.3.1 Equipment, Plant and Tools

Equipment, plant and tools used in the work are subject to Government approval and shall be maintained in a satisfactory working condition at all times. Provide equipment which is adequate and has the capability of producing the results specified. Provide calibrated equipment, such as asphalt distributors, scales, batching equipment, spreaders and similar

equipment, that has been recalibrated by an approved calibration laboratory within [1] [_____] month[s] prior to commencing work and every 6 months thereafter, by such laboratory from the date of recalibration, during the term of the contract. Submit an [equipment list](#) with calibration reports.

1.3.2 Asphalt Distributors

Provide distributors that have pneumatic tires of sufficient size and number to prevent rutting, shoving, or otherwise damaging any part of the pavement structure. Design and equip the distributor to distribute the bituminous material in a uniform double or triple lap at the specified temperature, at readily determined and controlled rates from 0.23 to 0.92 L/square meter 0.05 to 0.2 gallons/square yard, with a pressure range of 172.4 to 517.1 kPa 25 to 75 psi with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. These rates shall be computer, rather than mechanical controlled. Include in the distributor equipment a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand-held hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. Equip the distributor to circulate and agitate the bituminous material during the heating process. Provide distributor with an adjustable, both horizontally and vertically, spray nozzle bar. Make normal width of bar application at least 3.7 m 12 feet, with provisions for lesser or larger width when necessary. Equip distributor with a meter having a dial registering meters of travel/sec feet of travel/min. Make both dials visible to the distributor driver. Provide an easily accessible thermometer that constantly monitors the temperature of the seal coat.

NOTE: Delete the following paragraph when no
aggregate is to be used.

1.3.3 Aggregate Spreader

The aggregate-spreading equipment shall be adjustable and capable of uniformly spreading aggregate at the specified rate in a single-pass operation of sealer and aggregate over the surface to be sealed. For high volume roads and pavements trafficked by aircraft, aggregate application shall be from a spreading device attached to the asphalt distributor.

1.3.4 Power Brooms and Power Blowers

Provide power brooms and power blowers suitable for cleaning surfaces to which the seal coat is to be applied.

1.3.5 Vacuum Sweepers

Provide self-propelled, vacuum pickup sweepers capable of removing loose sand, water, and debris from pavement surface.

1.4 SUBMITTALS

NOTE: Review Submittal Description (SD) definitions
in Section 01 33 00 SUBMITTAL PROCEDURES and edit

the following list to reflect only the submittals required for the project.

The Guide Specification technical editors have designated those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Contractor Qualifications[; G][; G, [_____]]

Provide copies of Qualifications.

Material Performance

NOTE: The following Material Performance submittal shall be required for airfield runways and taxiways.

Friction tests previously performed in accordance with FAA Advisory Circular, FAA AC 150/5320-12, at 40 and 60 mph-wet, must be submitted showing, as a minimum; friction value of pavement surface prior to sealant application; two values, test between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value test at no less than 90 days or greater than 360 days after the application. The results of the two tests between 24 and 96 hours must indicate friction is increasing at a rate to obtain similar friction value of the pavement surface prior to application, and the long term test must

indicate no apparent adverse effect with time relative to friction values and existing pavement surface.

The contractor shall submit a list of airports which meet the above requirements, as well as technical details on application rates, aggregate rates, and point of contact at these airports to confirm use and success of sealer with aggregate. Friction tests shall be submitted from no less than one of the airports on the list and each set of tests described above, must be from one project.

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

Equipment List[; G][; G, [_____]]

List of equipment used in the project along with calibration reports.

Friction Test that includes date, time, weather, speed, wet or dry and operator name for each run of each test[; G][; G, [_____]]

Inspection Reports[; G][; G, [_____]]

Provide reports and all Quality Assurance records daily when application is made.

SD-04 Samples

Emulsified Asphalt
Aggregates

Provide in accordance with Field Quality Control.

SD-06 Test Reports

Tests[; G][; G, [_____]]

Recommendation by contractor/manufacture from results of test section application.

Provide to the Contracting Officer copies of the test results, within 24 hours of the completion of the test. Certified copies of the aggregate test results including gradation, film retention, friable particles, sand equivalent, specific gravity and mohs hardness, not less than [30] [_____] days before the material is required in the work.

Bituminous Materials[; G][; G, [_____]]

Certified copies of the bituminous materials test reports indicating compliance with specified requirements, not less than [30] [_____] days before the material is required in the work. A copy of the calibration test results, before the asphalt distributor and aggregate spreader are used on the job.

1.5 QUALITY ASSURANCE

NOTE: Keep applicable tests and delete the others
depending on whether this section is used for Seal
Coat with or without aggregate and whether on
airfield or other pavements.

Provide copies of [Contractor Qualifications](#) for applicators, personal and equipment, Certified by Manufacturer to apply product and to have made three (3) applications similar to this project in past two (2) years. Include letters from contracting authorities attesting to performance of work, schedule adherence, quality of workmanship, materials and name and work phone of points of contact. Obtain samples at time of delivery to the field as necessary to satisfy the requirements herein. Perform sampling and testing using an approved commercial testing laboratory or facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been approved. If deemed necessary by the Contracting Officer, laboratory inspection shall be accomplished at the contractor's expense by the Contracting Officer. Perform tests in sufficient numbers, and at the location and times directed, to ensure that the materials meet specified requirements.

1.5.1 Samples

Take aggregate samples for laboratory tests in accordance with [ASTM D75/D75M](#).
Take samples of emulsified asphalt in accordance with [ASTM D140/D140M](#).

1.5.2 Aggregates Source

Select sources from which [aggregates](#) are to be obtained and notify the Contracting Officer within [15] days after the award of the Contract. Perform tests for the evaluation of aggregates by using an approved commercial laboratory at no expense to the Government. Tests for determining the suitability of aggregate shall include, but not limited to: gradation in accordance with [ASTM C136](#), sand equivalent of 60 or less in accordance with [ASTM D2419](#), clay lumps and friable particles in accordance with [ASTM C142/C142M](#) and unit weight and voids in accordance with [ASTM C29/C29M](#). The proposed use of an antistripping agent is subject to approval by the Contracting Officer and determined by the contractor.

1.5.3 Emulsified Asphalt Source

Select sources from which [bituminous materials](#) are to be obtained and notify the Contracting Officer within [15] days after the award of the contract.

1.5.4 Equipment Calibration

Equipment calibration may be achieved by either one of the two following procedures:

- a. First Procedure: Contractor to furnish a State Calibration Certification for the emulsified asphalt distributor, from any state providing that service, or other acceptable agency certification at the approval of the Contracting Officer, and the calibration date shall have been within 6 months of the contract award, or up to 12 months if

supporting documents substantiate continuous work using the same distributor.

- b. Second Procedure: Furnish all equipment, materials and labor necessary to calibrate the emulsified asphalt distributor and the aggregate spreader. Perform all calibrations with the approved job materials and prior to applying the specified coatings to the prepared surface. Perform calibration of the emulsified asphalt distributor in accordance with ASTM D2995. Perform work to calibrate the tank and measuring devices of the distributor. Perform inspection and calibration at the beginning of the work and at least once a day during construction.

1.5.5 Material Performance

Provide proof of Material Performance to address the following requirements.

Friction tests previously performed in accordance with FAA Advisory Circular, FAA AC 150/5320-12, at 40 and 60 mph-wet, must be submitted showing, as a minimum; friction value of pavement surface prior to sealant application; two values, test between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value test at no less than 90 days or greater than 360 days after the application. The results of the two tests between 24 and 96 hours must indicate friction is increasing at a rate to obtain similar friction value of the pavement surface prior to application, and the long term test must indicate no apparent adverse effect with time relative to friction values and existing pavement surface.

The contractor shall submit a list of airports which meet the above requirements, as well as technical details on application rates, aggregate rates, and point of contact at these airports to confirm use and success of sealer with aggregate. Friction tests shall be submitted from no less than one of the airports on the list and each set of tests described above, must be from one project.

Seal coat material submittal without required friction performance will not be approved.

Friction tests performed on this project, if any, cannot be used as a substitute of this requirement.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver emulsified asphalt to the site in a homogenous and undamaged condition. Inspect the materials for contamination and damage. Unload and store the materials with a minimum of handling. Protect stored aggregate from contamination and segregation. Replace defective or damaged materials.

1.7 ENVIRONMENTAL REQUIREMENTS

Apply the coating when the existing surface is dry, and when the weather is not foggy, rainy, or when the wind velocity will prevent the uniform application of the material. For emulsified asphalt seal coat with aggregate apply only when both the atmospheric temperature and the pavement surface temperature is above 15.5 degrees C 60 degrees F, unless otherwise directed. For emulsified asphalt seal coat without aggregate, apply only when atmospheric temperature is above 10 degrees C 50 degrees F and rising or when pavement temperature is above 15.5 degrees C 60 degrees F, unless otherwise directed.

PART 2 PRODUCTS

2.1 EMULSIFIED ASPHALT FOR CONVENTIONAL SEAL COAT

NOTE: Retain one or more types of emulsified asphalt. Delete all other materials and references.

Emulsified asphalt grades RS-1, RS-2, CRS-1, SS-1, SS-1H, QS-1H, CRS-2, CSS-1, CSS-1H and CQS-1H are suitable for seal coat applications. Emulsions are better suited to coat aggregate when the aggregate moisture content is over 1 percent but less than 3 percent. The following considerations should be included in the evaluation of alternate grades to be specified for the project:

- a. Local practice and experience, as well as availability and cost of various grades within the project area.
- b. The rapid-setting emulsions (RS and CRS), particularly the cationic types, are effective when damp aggregates must be used.
- c. Where cooler temperatures are anticipated during application, consider the use of CRS-1 and CRS-2 grades.
- d. Anionic emulsions, RS, SS and QS, provide better adhesion to basic aggregates such as limestone, while cationic emulsions, CRS, CSS and CQS are better with acidic aggregates such as silicates.
- e. Select either ASTM D977 or ASTM D2397.

Emulsified Asphalt shall conform to [ASTM D977] Grade [[RS-1] [RS-2] [SS-1] [SS-1H] [QS-1H]] [ASTM D2397] Grade [[CRS-1] [CRS-2] [CSS-1] [CSS-1H] [CQS-1H]]].

NOTE: GSB-88 is a cationic emulsion of gilsonite asphalt manufactured by Asphalt Systems Inc., Salt Lake City, Utah that can be used on pavements with low to moderate weathering in order to economically extend pavement life. Specify GSB-88 and other asphalt emulsions with or without aggregate; however, GSB-88 will always be specified with aggregate for pavements trafficked by aircraft. Other asphalt emulsions with or without aggregates may be used only on airfield shoulders and overruns and other road pavements with approval as noted hereinbefore.

2.2 (GSB-88) CATIONIC EMULSION OF GILSONITE ORE

The product shall be a chemically engineered asphalt pavement sealer of a cationic emulsion of Gilsonite ore similar to GSB-88 Emulsified Sealer Binder as manufactured by Asphalt Systems, Inc. Salt Lake City, Utah, www.asphaltsystems.biz. Specific application specifications shall be as determined by the results of the test section by the manufacturer and approved by the Contracting Officer. Tests on Residue from Distillation, or Evaporation shall be performed at time of manufacturer to verify conformance to following properties:

Viscosity at 275 degrees F ASTM D4402, 1750 cts maximum; Penetration ASTM D5, 50 dmm maximum; Asphaltenes ASTM D2027, 15 percent minimum; Saturates ASTM D2027, 15 percent maximum; Polar Compounds ASTM D2027, 25 percent minimum; Aromatics ASTM D2027, 15 percent minimum.

- a. pH may be used in lieu of the particle charge test which is sometimes inconclusive in slow setting bituminous emulsions.
- b. Pumping stability is tested by pumping 1 pint, of sealer material diluted 1 part concentrate to 1 part water, at 77 degrees F, through a 1/4-inch gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

The Contractor shall submit to the Contracting Officer, manufacturer's certification to the above test results that the material is the type, grade, and quality specified for each load of bituminous material delivered. The certification shall show the shipment number, refinery, consignee, destination, contract number, and date of shipment.

2.3 AGGREGATE FOR SEAL COAT

NOTE: Use only one gradation in Table I. Use conventional gradation for conventional emulsified asphalts and the GSB-88 gradation when GSB-88 emulsion is specified.

Provide aggregate consisting of crushed stone, crushed gravel, sand, mineral filler or screenings. The moisture content of the aggregate shall be between 1% and 3%. The aggregate shall conform to the gradation shown in TABLE I.

NOTE: If gradations other than indicated in Table I are preferred for GSB-88, modify the values indicated in Table I.

TABLE I. AGGREGATE GRADATIONS		
(Percent by Weight Passing Square-Mesh Sieves)		
<u>Sieve Size</u>	<u>Conventional Gradation</u>	<u>GSB-88 Gradation</u>
4.75 mm	100	--
2.36 mm	10-40	--
1.18 mm	0-10	100
0.60 mm	--	40-75
0.30 mm	0-5	4-12
0.15 mm	0-1	0-5

TABLE I. AGGREGATE GRADATIONS		
(Percent by Weight Passing Square-Mesh Sieves)		
<u>Sieve Size</u>	<u>Conventional Gradation</u>	<u>GSB-88 Gradation</u>
No. 4	100	--
No. 8	10-40	--
No. 16	0-10	100
No. 30	--	40-75
No. 50	0-5	4-12
No. 100	0-1	0-5

2.3.1 Film Retention

The aggregate shall exhibit not less than 95 percent retention of bituminous film in accordance with [ASTM D3625](#).

2.3.2 Friable Particles

The amount of friable particles shall not exceed 0.1 percent of the total weight of aggregate sample when tested in accordance with [ASTM C142/C142M](#).

2.3.3 MOHS Hardness

MOHS hardness shall be within 6-8 in accordance with [ASTM D1474](#).

2.3.4 Sand Equivalent

Sand equivalent shall be equal to or greater than 60 in accordance with

ASTM D2419.

2.4 ANTISTRIPPING AGENT

The use of antistripping agent is subject to prior approval by the Contracting Officer.

2.5 WATER

Provide fresh, clean, and potable water.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

NOTE: If the surface to be treated requires repairs, the method of repairs and extent of work involved should be shown or described. For substantial amounts of repair work use applicable UFGS sections.

Removal of paint and rubber deposits are generally accomplished by high pressure water blasting. Few approved chemicals are effective and sandblasting is not permitted by air pollution regulations at some locations. Mechanical abrasion generally causes damage to the pavement.

Provide Inspection Reports of; climatic temperature during application of seal coat, emulsion temperature and rate of application, adequacy of surface cleaning and preparation, protection of site facilities and aggregate rate of application as applicable, each day of application.

Treat cracks in the surface, not due to structural deficiencies, as outlined below: Cracks less than or equal to 6 mm 1/4 inch but less than 19mm 3/4 inch width shall be cleaned with compressed air and filled with a crack sealer compatible with the seal coat material and recommended by the seal coat manufacturer. Cracks larger than 19mm 3/4 in wide shall be cleaned with compressed air and filled by squeegeeing in a mixture of aggregate and sealer. The final surface of the filled cracks shall be flush or up to 3mm 1/8 inch below the pavement surface. Remove any excess materials from the pavement surface. Base bids on [_____] m ft of cracks between 6 mm 1/4 inch and 19 mm 3/4 inch and [_____] m ft of cracks exceeding 19 mm 3/4 inch with; all cracks depth to be equal to width.

3.1.1 Cleaning Operations

Provide a clean surface for the seal coat. Flushing with water will be permitted. Water will be made available for the contractor's use from a hydrant location within [_____] km(s) mile(s) of the project site [at prevailing Government rates]. The contractor shall provide tools, hoses and hauling equipment for providing and dispensing of the water.

Immediately before applying the sealcoat, loose material, dirt, clay or other objectionable material shall be removed from the surface to be treated by power brooms and sweepers followed by vacuum sweepers. After the cleaning operation and prior to application of the sealcoat, the

Contracting Officer will inspect the area to be treated to determine fitness of the area to receive the the sealcoat.

3.1.2 Protection of Site Facilities

During application, account for wind drift and provide measures to protect adjacent buildings, structures, vehicles, manhole covers, signs, inlet grates, lights, Portland cement concrete and other surface features to prevent them from being spattered or marred.

3.2 EMULSIFIED ASPHALT SEAL COAT APPLICATION

3.2.1 Rate

Base bids on applying material within the ranges shown in Table II. The actual application rates vary within the range specified to suit field conditions and will be recommended by the sealcoat manufacturer's representative and approved by the Contracting Officer prior to use in production by the construction of a test section.

TABLE II. APPLICATION OF MATERIAL		
(Quantities Per Square Meter)		
<u>Seal Type</u> <u>Coat</u>	<u>Emulsified</u> <u>Asphalt,</u> <u>liters</u>	<u>Aggregate,</u> <u>kilograms</u>
Conventional Seal Coat		
with aggregate		
undiluted	0.10-0.15	10-15
without aggregate		
diluted*	0.10-0.15	0
GSB-88	0.45-0.68	0.11-0.34

*For application without aggregate, dilute conventional seal coat emulsion at 1:1 with potable water. Although the residual asphalt content will be different between diluted and undiluted, the application rate is the same. GSB-88 is not to be diluted unless manufacturer's representative directs the dilution.

TABLE II. APPLICATION OF MATERIAL	
(Quantities Per Square Yard)	
<u>Seal Type Coat</u>	<u>Emulsified Asphalt, gallons</u>
Conventional Seal Coat	
without aggregate	
diluted*	0.10-0.15
GSB-88	0.12-0.18

*For application without aggregate, dilute conventional seal coat emulsion at 1:1 with potable water. Although the residual asphalt content will be different between diluted and undiluted, the application rate is the same. GSB-88 is not to be diluted unless manufacturer's representative directs the dilution.

TABLE II. APPLICATION OF MATERIAL		
(Quantities Per Square Yard)		
<u>Seal Type Coat</u>	<u>Emulsified Asphalt, gallons</u>	<u>Aggregate pounds</u>
Conventional Seal Coat		
with aggregate		
undiluted	0.10-0.15	10-15
GSB-88	0.12-0.18	0.27-0.7

3.2.2 Temperature

Asphalt application temperature shall provide an application viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 square mm/sec 20 and 120 centistokes, kinematic. Furnish the temperature viscosity relation to the Contracting Officer.

3.2.3 Application of Emulsified Asphalt

Following the preparation and inspection of the pavement surface, apply the emulsified asphalt material at the rates determined by the test section. Uniformly apply the bituminous material in a single pass of the distributor

and with either a double or triple lap spray over the surface to be sealed. Spread building paper on the surface for a sufficient distance back from the ends of each application so that flow through the spray bar may be started and stopped on the paper and so that all sprays will be operating at the proper pressure on the surface to be sealed. Immediately after the application, remove the building paper. Properly treat with bituminous material spots missed by the distributor. No smoking, fires, or flames, other than the heaters that are a part of the equipment and hand propane torches used to keep nozzles operational, will be permitted within 8 meters 25 feet of heating, distributing, and transferring operations of bituminous material other than bituminous emulsions.

3.2.4 Excess Sealcoat Material

Approved mineral aggregate shall be provided by the Contractor and shall be spread in sufficient quantity to effectively blot up any excess sealcoat material remaining on the treated pavement surface after 24 hours.

3.2.5 Ponding and Puddling of Sealcoat Material

If low spots and depressions greater than 6 mm 1/2 inch in depth in the pavement surface cause ponding or puddling of the applied materials, the pavement surface shall be broomed with a broom drag. Brooming shall continue until the pavement surface is free of any pools of excess material.

3.2.6 Excess Runoff of Sealcoat

Pavement surfaces which have excessive runoff of sealcoat due to excessive amount of material being applied or excessive surface grade shall be treated in two or more applications at no additional cost to the Government. Each additional application shall be performed after the prior application of material has penetrated into the pavement.

3.2.7 Insufficient Sealcoat Material

When it is determined by the Contracting Officer that the actual application rate of the sealcoat is more than 20 percent below the approved application rate, subsequent applications of sealcoat shall be made to bring the actual application rate up to the approved rate; additional sealcoat material shall penetrate into the pavement surface within 24 hours after application.

3.2.8 Aggregate Application Rate

Apply aggregate at the rates determined by the test section. The aggregate weights shown in Table II are those of aggregate having a specific gravity of 2.65. If the specific gravity of the aggregate to be used is less than 2.55 or greater than 2.75, make adjustments in the number of pounds of aggregate required per square yard to insure a constant volume of aggregate per square yard of treatment.

3.2.9 Application of Aggregate

NOTE: For high volume roads and pavements trafficked by aircraft, aggregate application shall only be allowed from a spreading device attached to the asphalt distributor. For other seal coat

applications, aggregate is spread with a spreader or dump trucks backing over freshly applied asphalt with aggregate applied to areas ahead of truck wheels. Select the appropriate brackets.

Spread the specified quantity of cover aggregate uniformly over the bituminous material. Before the bituminous material is applied, sufficient aggregate to cover the distributor load of bituminous material shall be on trucks at the site of the work. No bituminous material shall be down more than 3 minutes before it is covered with aggregate. [Spreading shall be done uniformly with aggregate-spreading equipment mounted on the distributor]. [Trucks spreading aggregate shall be operated backwards, covering the bituminous material ahead of the truck wheels.] Areas having insufficient cover shall be lightly recovered with additional aggregate by hand during the operations whenever necessary.

3.3 TEST SECTION APPLICATION - SEAL COAT

NOTE: Note to designer: There may be more than one test section needed. Specify the number based upon the pavement surface conditions, slope, and texture.

Prior to production seal coating applying the seal coat, place a test section at a location determined by the Contracting Officer at least 90 meters 300 feet long by 6 meters 20 feet wide a minimum of two adjacent passes of equipment using the approved job materials in accordance with the specification requirements. Perform tests to determine the application rates of the emulsified asphalt, in accordance with ASTM D2995, Test Method A, [and aggregate]. Test sections shall be performed on pavement areas that are not considered critical to operations. Vary the application rates along the longitudinally along the test section in order to effectively evaluate the pavement absorption rates. If the tests indicate that the seal coat test section does not conform to the specification requirements, make necessary adjustments to the application equipment and to the spreading procedures, and construct additional test sections for conformance to the specifications. Where test sections do not conform to specification requirements, repair or remove seal coat at no expense to the Government; no separate payment will be made for seal coat materials and labor, either in placement or removal of any test section. Perform quality control sampling and testing during construction as specified in paragraph FIELD QUALITY CONTROL. Test sections shall be performed in the presence of the Contracting Officer and the Seal Coat Manufacturer's Representative (SCMR). Notify the Contracting Officer seven days prior to the planned test section date. The SCMR shall recommend to the Contracting Officer application rates of materials used in production seal coating. The Contracting Officer shall approve the application rates prior to production seal coating.

3.4 FIELD QUALITY CONTROL - SEAL COAT

3.4.1 Tests

Perform field tests in sufficient numbers to assure that the specifications are being met. Testing is the responsibility of the Contractor and shall be performed by an approved commercial laboratory. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type of operation.

3.4.2 Aggregate Gradation

Perform gradation tests in accordance with ASTM C136. Perform a minimum of one test per day. When the source of materials is changed or deficiencies are found, the gradation shall be repeated and the material already placed shall be retested to determine the extent of the unacceptable material. Replace all in-place unacceptable material or re-apply seal coat material conforming to the specification as directed by Contracting Officer at no additional expense to the Government.

3.4.3 Stripping

Perform stripping test on aggregate from each source, in accordance with ASTM D3625, prior to incorporation into the work and when the source is changed.

3.4.4 Emulsified Asphalt Sample

Obtain a sample of the emulsified asphalt used under the supervision of the Contracting Officer. The sample will be retained by the Government.

3.4.5 Water Compatibility Test

In some localities an incompatibility may exist between the asphaltic emulsion and the water to be used for dilution due to their characteristics. Clear, potable water should be used. No less than thirty days prior to commencing work, 0.24 liter one half pint of the proposed asphalt emulsion and 0.24 liter one half pint of the proposed water shall be combined, agitated, and allowed to sit for a period of 24 hours to test their compatibility. If they prove to be incompatible, indicated by separation of the emulsion, clotting, particles settling or other adverse properties from mixing with water, an approved chemical treatment shall be provided for all water used for dilution or a different and compatible source of water shall be selected. Report results to the Contracting Officer.

3.4.6 Application Inspection

Inspect application of seal coat for uniformity. [During application, take 3 [] samples for each [4000] [] square meters [5000] [] square yards of surface area to receive emulsified asphalt. Sample at random locations recommended by the Contractor and approved by Contracting Officer in accordance with ASTM D2495. Weigh samples to determine conformance with application rate.] Furnish a written report within 24 hours of testing citing climatic temperature during application, emulsion temperature during application, and rate of emulsion application determined from testing compared to the approved production rates.

3.4.7 Friction Tests

NOTE: Accomplish friction testing whenever a
sealcoat is applied to runway pavement.

Accomplish Friction Test in accordance with FAA Advisory Circular
FAA AC 150/5320-12 Measurement, Construction, and Maintenance of
Skid-Resistant Airport Pavement Surfaces.

- a. Runway: Contractor is responsible to coordinating testing with Air Operations and the Contracting Officer. Each test includes performing friction tests at 40 mph and 60 mph both wet and dry, 4 m 15 ft to each side of runway centerline. The Contracting Officer shall be present for testing. Provide written report of results.
- b. Test Schedule:
 - 1. Within 30 days of prior to application of seal coat to runway.
 - 2. Within 48 hours after application of seal coat.
 - 3. Between 45 and 60 days after application of seal coat

3.5 TRAFFIC CONTROL

Protect freshly placed coatings from damage by traffic. Provide sufficient warning signs and barricades to prevent traffic over freshly treated surfaces. Protect treated areas from traffic for at least [2] [_____] hours after final application of seal coat material, or for such time as necessary to prevent picking up. Immediately prior to opening for subsequent construction operations (markings) or traffic, broom and vacuum to remove loose material and roll the entire treated area with a self-propelled pneumatic-tired roller. Provide warning signs and barricades for proper traffic control in accordance with MUTCD.

-- End of Section --