M-494.4

AC 150/5370-10

CHANGE 9

DATE 5/12/80

ADVISORY CIRCULAR

CHANGE

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: Change 9 to STANDARDS FOR SPECIFYING CONSTRUCTION OF AIRPORTS--Rewritten in Guide Specification Format

1. PURPOSE. This Change transmits Item P-626, Emulsified Asphalt Slurry Seal Surface Treatment. It has been revised to indicate use as a material to improve the skid resistant characteristics of airport pavements.

The Change number and date of changed material is carried at the top of each page.

PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
427 through 440	10/24/74	427-434	5/12/80
		435 through 440	5/12/80

William V. Vitale

WILLIAM V. VITALE
Director, Office of Airport Standards

Suggest filing this transmittal at the back of the AC. It will provide a reference authority for changes, a method of determining that all Changes have been received, and a check for determining if the AC contains the proper pages.

Initiated by: AAS-200

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT 1.5 1.6

1. DESCRIPTION 3

1.1 This item shall consist of a mixture of emulsified asphalt, mineral aggregate, and water; properly proportioned, mixed, and spread evenly on a prepared underlying course or existing wearing course in accordance with these specifications and shall conform to the dimensions shown on the plans or as directed by the Engineer. 5 10 10 11 12 12

2. MATERIALS 14

2.1 AGGREGATE. The aggregate shall consist of sound and durable natural or manufactured sand, slag, crusher fines, crushed stone, or crushed stone and rock dust, or a combination thereof. Smooth-textured sand of less than 1.25 percent water absorption, as tested by ASTM C128, shall not exceed 50 percent of the total combined aggregate. The aggregate shall be clean and free from vegetable matter, dirt, dust, and other deleterious substances. The aggregate blend shall have a sand equivalent of not less than 45 when tested in accordance with ASTM D2419. The aggregate shall show a loss of not more than [**____] percent when tested in accordance with ASTM C131. The sodium sulfate soundness loss shall not exceed [**____] percent, or the magnesium soundness loss shall not exceed [**____] percent after 5 cycles when tested in accordance with ASTM C88. Aggregate retained on the No. 50 sieve (300 micro m) shall be 100 percent crushed. 17 20 22 23 25 26 29 30 32 34 35 38 40 41 41

********** 45.1

The percent loss when tested under ASTM C131 should not exceed 35. The sodium sulfate loss should not exceed 9 percent; the magnesium sulfate loss should not exceed 12 percent. In certain specific cases, where aggregates complying with those maximums cannot be economically obtained, aggregates with a higher percentage loss or wear may be specified, provided a satisfactory service record under similar conditions of service and exposure has been demonstrated. 46 47 48 50 50 51 52 53 53

********** 54.2

The combined aggregate shall conform to the gradation shown in Table 1 when tested in accordance with ASTM C136. 59 60

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT 1.5 1.6

TABLE 1. GRADATION OF AGGREGATES 62 63

Sieve Size	Percentage by Weight Passing Sieves	65 66
3/8 in. (9.5 mm)	*	68
No. 4 (4.75 mm)	*	69
No. 8 (2.36 mm)	*	70
No. 16 (1.18 mm)	*	71
No. 30 (600 micro m)	*	72
No. 50 (300 micro m)	*	73
No. 100 (150 micro m)	*	74
No. 200 (75 micro m)	*	75 76
Residual asphalt content Percent dry aggregate	*	78 79 80
Pounds of aggregate per square yard	*	82 83
Kilograms of aggregate per square meter	*	84 85 86

The aggregate, as finally selected, shall have a gradation within the limits designated in Table 1, and should not vary from the low limit on one sieve to the high limit on the adjacent sieve and vice versa. 90 91 92 92

********** 96.1

The aggregate gradation band applicable to a project shall be specified by the Engineer from the gradations shown in this note. The appropriate gradation shall be inserted in Table 1. Insert points are denoted by asterisks. 97 98 99 100

The Type I gradation is used for maximum crack penetration and is usually used in low density traffic areas where the primary objective is sealing. 102 103 103

The Type II gradation is used to seal and improve skid resistance. 105 105

The Type III gradation is used to correct surface conditions and provide skid resistance. 107 107

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT 1.5 1.6

GRADATION OF AGGREGATES 109 110

Sieve Size	Percentage by Weight Passing Sieves Type I	Type II	Type III
3/8 in. (9.5 mm)	---	100	100
No. 4 (4.75 mm)	100	90-100	70-90
No. 8 (2.36 mm)	90-100	65-90	45-70
No. 16 (1.18 mm)	65-90	45-70	28-50
No. 30 (600 micro m)	40-60	30-50	19-34
No. 50 (300 micro m)	25-42	18-30	12-25
No. 100 (150 micro m)	15-30	10-21	7-18
No. 200 (75 micro m)	10-20	5-15	5-15
Residual asphalt content Percent dry aggregate	10-16	7.5-13.5	6.5-12
Pounds of aggregate per square yard	6-10	10-15	15-20
Kilograms of aggregate per square meter	3.2-5.4	5.4-8.1	8.1-10.8

****

Precautions shall be taken to prevent segregation of the aggregate in storing and handling. The stockpile shall be kept in areas that drain readily.

2.2 FILLER. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D242 and shall be used in the minimum amounts required. Mineral filler shall only be used if needed to improve the workability of the mix or to improve the gradation of the aggregate. The filler shall be considered as part of the blended aggregate.

2.3 EMULSIFIED ASPHALT. The emulsified asphalt shall conform to the requirements of ASTM D [**_____] for type [**_____] emulsion.

****

The Engineer shall specify the type of emulsion and the controlling specification.

Cationic emulsions conforming to the requirements of ASTM D2397 for type CSS-1 or CSS-1h are preferred for use in moderate or hot climates.

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT

Anionic emulsions conforming to the requirements of ASTM D977 for type SS-1 or SS-1h may be used for colder climatic areas.

****

2.4 WATER. All water used in making the slurry shall be potable and free from harmful soluble salts.

2.5 TACK COAT. The tack coat shall be a diluted asphalt emulsion of the same type specified for the slurry mix. The ratio of asphalt emulsion to water shall be 1 to 3.

3. CONSTRUCTION METHODS

3.1 WEATHER LIMITATIONS. The slurry seal shall not be applied if either the pavement or the air temperature is 55 degrees F (13 degrees C) or below or when rain is imminent.

****

The Engineer should not specify a lower permissible temperature since slurry placed at lower temperatures usually will not cure properly due to poor dehydration and poor asphalt coalescence.

****

3.2 EQUIPMENT AND TOOLS. All equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working order at all times. Descriptive information on the slurry mixing and applying equipment to be used shall be submitted to the Engineer for approval not less than 10 days before work starts.

(a) Pressure Distributors. Pressure distributors used for application of the diluted asphalt emulsion tack coat shall be self-propelled, equipped with pneumatic tires, and capable of uniformly applying 0.05 to 0.15 gallon per square yard (0.23 to 0.68 liter per square meter) of the diluted emulsion over the required width of application. Distributors shall be equipped with tachometers, pressure gages, and volume-measuring devices.

(b) Slurry Mixing Equipment. The slurry mixing machine shall be a continuous flow mixing unit capable of accurately delivering a predetermined proportion of aggregate, water, and asphalt emulsion to the mixing chamber and of discharging the thoroughly mixed product on a continuous basis. The aggregate shall be prewetted immediately prior to mixing with the emulsion. The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients together. No excessive mixing shall be permitted. The mixing machine shall be equipped with an approved fines feeder that provides an accurate metering device or method to introduce a predetermined proportion of

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT 1.5 1.6

mineral filler into the mixer at the same time and location that the aggregate is fed into the mixer. The fines feeder shall be used whenever added mineral filler is part of the aggregate blend.

The mixing machine shall be equipped with a water pressure system and fog-type spray bar adequate for complete fogging of the surface with an application of 0.05 to 0.10 gallon per square yard (0.23 to 0.45 liter per square meter) preceding the spreading equipment.

Sufficient machine storage capacity to mix properly and apply a minimum of 5 tons (4 500 kg) of the slurry shall be provided. Proportioning devices shall be calibrated prior to placing the slurry seal.

(c) Slurry Spreading Equipment. Attached to the mixing machine shall be a mechanical-type squeegee distributor equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. It shall be maintained to prevent loss of slurry on varying grades and crown by adjustments to assure uniform spread. There shall be a lateral control device and a flexible strike-off capable of being adjusted to lay the slurry at the specified rate of application. The spreader box shall have an adjustable width. The box shall be kept clean, and built-up asphalt and aggregate on the box shall not be permitted. The use of burlap drags or other drags shall be approved by the Engineer.

(d) Roller. The roller shall be a pneumatic-tired roller capable of exerting a contact pressure during rolling of 50 pounds per square inch (350 000 newtons per square meter).

(e) Auxiliary Equipment. Other tools or equipment such as brushes, hand squeegees, hose equipment, tank trucks, water distributors and flushers, power blowers, barricades, etc., shall be provided as required.

3.3 CLEANING EXISTING SURFACE. Prior to placing the tack coat and slurry seal coat, unsatisfactory areas shall be repaired and the surface shall be cleaned of dust, dirt, or other loose foreign matter, grease, oil, or any type of objectionable surface film. Any standard cleaning method will be acceptable except that water flushing will not be permitted in areas where considerable cracks are present in the pavement surface.

Any painted stripes or markers on the surface to be treated shall be removed before applying the tack coat.

When the surface of the existing pavement or base is irregular or broken, it shall be repaired or brought to uniform grade and

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT 1.5 1.6

cross section as directed by the Engineer. Cracks wider than 3/8 inch (10 mm) shall be sealed with compatible joint sealer prior to applying the slurry seal.

3.4 APPLICATION OF BITUMINOUS TACK COAT. Following the preparation for sealing, application of the diluted emulsion tack coat shall be made by means of a pressure distributor in amounts between 0.05 and 0.15 gallon per square yard (0.23 to 0.68 liter per square meter) as directed by the Engineer. The tack coat shall be applied, at least, 2 hours before the slurry seal, but within the same day.

3.5 COMPOSITION OF SLURRY MIX. The amount of asphalt emulsion to be blended with the aggregate, within the limitations of Table 1, shall be as determined by the Engineer. The Contractor shall submit samples of the materials intended for use, at least, 10 days prior to application of the slurry mixture. Enough material will be furnished to produce not less than 30 pounds (14 kg) of slurry mixture for each gradation to be used. Upon request, additional samples of materials shall be furnished the Engineer during construction, and the amount of asphalt emulsion shall be subject to change as directed by the Engineer. The rate of application of each mixture gradation shall be as specified in pounds of dry aggregate per square yard.

****

The main items of design in emulsified asphalt slurry seals are aggregate gradation, emulsified asphalt content, and consistency of the mixture. The aggregates, emulsified asphalt, and water should form a creamy-textured slurry that, when spread, will flow in a wave ahead of the strike-off squeegee. This will allow the slurry to flow down into the cracks in the pavement and fill them before the strike-off passes over. Technical Bulletin No. 111, "Outline Guide Design Procedure for Slurry Seal," published by The International Slurry Seal Association contains information to aid designers of slurry mixes.

****

3.6 TEST SECTIONS. Test sections shall be placed prior to the start of the slurry seal work in the presence of the Engineer. The areas to be tested will be designated by the Engineer and will be located on the existing pavement. A maximum of three test areas each containing approximately 50 square yards (45 square meters) will be used to determine the exact proportions of water and asphalt to be used in the job mix. The test sections shall utilize the same equipment and method of operation as will be used on the remainder of the work. The Engineer shall select the final job mix proportions based on the results of the laboratory tests and the test sections.

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT 1.5
1.6

3.7 APPLICATION OF SLURRY SEAL COAT. The surface shall be prewet by fogging ahead of the slurry spreader box. Water used in prewetting the surface shall be applied at such a rate that the entire surface is damp with no apparent flowing water in front of the slurry spreader box. The slurry mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. Total time of mixing shall not exceed 5 minutes. A sufficient amount of slurry shall be carried in all parts of the spreader box at all times so that complete coverage of all surface voids and cracks is obtained. Care shall be taken not to overload the spreader box which shall be towed at a slow and uniform rate not to exceed 5 miles per hour (8 kilometers per hour). No lumping, balling, or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted. If the coarse aggregate settles to the bottom of the mix, the slurry will be removed from the pavement surface. A sufficient amount of slurry shall be fed in the box to keep a full supply against the full width of the squeegee. The mixture shall not be permitted to overflow the front sides of the spreader box. No excessive breaking of the emulsion will be allowed in the spreader box. No streaks such as caused by oversized aggregate will be left in the finished pavement.

Adjacent lanes shall be lapped at the edges a minimum of 4 inches (100 mm) to provide complete sealing at the overlap. All edges shall be feathered with hand squeegees.

[After application of the slurry seal, the surface shall be rolled with a pneumatic-tired roller a minimum of 4 coverages. The roller should be operated at a tire pressure of 50 pounds per square inch (350 000 newtons per square meter).]

****

Generally, where normal traffic will iron out the slurry and close any hairline cracks of dehydration, it is not necessary to roll a normal thickness (1/4 inch (6.3 mm) or less) of slurry seal.

However, in some instances the somewhat lattice-like structure of the slurry should probably be densified by pneumatic-tire rolling to improve durability, such as areas subjected to severe braking or acceleration. Rolling of the slurry seal is at the option of the Engineer.

****

The fresh slurry seal application shall be protected by barricades and markers and permitted to dry for 4 to 24 hours, depending on weather conditions. Any damage to uncured slurry will be repaired at the Contractor's expense.

In areas where the spreader box cannot be used, the slurry shall be applied by means of a hand squeegee. Any joints or cracks

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT 1.5 1.6

that are not filled by the slurry mixture shall be filled by using hand squeegees. No excessive buildup or unsightly appearance shall be permitted on longitudinal or transverse joints. Upon completion of the work, the seal coat shall have no holes, bare spots, or cracks through which liquids or foreign matter could penetrate to the underlying pavement. The finished surface shall present a uniform and skid resistant texture satisfactory to the Engineer. All wasted and unused material and all debris shall be removed from the site prior to final acceptance.

****

The cured slurry shall have a homogenous appearance, fill all cracks, adhere firmly to the surface, and have skid resistant texture.

****

3.8 EMULSION MATERIAL (CONTRACTOR'S RESPONSIBILITY). Samples of the emulsion that the Contractor proposes to use, together with a statement as to its source, must be submitted, and approval must be obtained before using such material. The Contractor shall furnish the Engineer a manufacturer's certified report for each consignment of the emulsion. The manufacturer's certified report shall not be interpreted as a basis for final acceptance. All such reports shall be subject to verification by testing samples of the emulsion as received for use on the project.

4. METHOD OF MEASUREMENT

4.1 The bituminous material for emulsified asphalt shall be measured by the [gallon (liter).] [ton (kg).] [Volume shall be corrected to the value at 60 degrees F (16 degrees C) in accordance with Table IV-3 of The Asphalt Institute Manual MS-6. Only the actual quantity of undiluted emulsified asphalt will be measured for payment.]

4.2 Aggregate shall be measured by the ton (kg).

5. BASIS OF PAYMENT

5.1 Payment shall be made at the contract unit price per [gallon (liter)] [ton (kg)] for the emulsified asphalt and at the contract price per ton (kg) for aggregate. These prices shall be full compensation for furnishing all materials, for preparing, mixing, and applying these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT 1.5 1.6

(a) Item P-626-5.1, Emulsified Asphalt for Tack Coat--per [gallon (liter)] [ton (kg)] 480 482

(b) Item P-626-5.1, Emulsified Asphalt for Slurry Coat--per [gallon (liter)] [ton (kg)] 485 487

(c) Item P-626-5.1, Aggregate--per ton (kg) 490

6. TESTING REQUIREMENTS 492

ASTM C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	494 495
ASTM C128	Specific Gravity and Absorption of Fine Aggregate	497 498
ASTM C131	Resistance to Abrasion of Small Size Course Aggregate by Use of the Los Angeles Machine	500 501
ASTM C136	Sieve or Screen Analysis of Fine and Coarse Aggregates	503 504
ASTM D2419	Sand Equivalent Value of Soils and Fine Aggregate	506 507

7. MATERIAL REQUIREMENTS 510

The Asphalt Institute Manual MS-6	Table IV-3 Temperature-Volume Corrections for Emulsified Asphalts	512 513 514
ASTM D242	Mineral Filler for Bituminous Paving Mixtures	516
ASTM D977	Emulsified Asphalt	518
ASTM D2397	Cationic Emulsified Asphalt	520

+ + END OF ITEM P-626 + + 522.3

* U. S. GOVERNMENT PRINTING OFFICE : 1980 311-586/141

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Washington, D.C. 20591

Official Business

PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
FEDERAL AVIATION
ADMINISTRATION
DOT 515