
USACE / NAVFAC / AFCEA

UFGS-02748A (January 1998)

Preparing Activity: USACE

Replacing without revision
CEGS of same number and date

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

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SECTION 02748A

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01/98

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SECTION 02748A

BITUMINOUS TACK AND PRIME COATS 01/98

NOTE: This guide specification covers the requirements for bituminous tack and prime coats for airfield pavements, roads, parking areas and general paving needs.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

PART 1 GENERAL

1.1 REFERENCES

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 20	(1970; R 2000) Penetration-Graded Asphalt Cement
AASHTO M 226	(1980; R 2000) Viscosity Graded Asphalt Cement
AASHTO M 81	(1992; R 2000) Cut-Back Asphalt (Rapid-Curing Type)
AASHTO M 82	(1975; R 2000) Cut-Back Asphalt (Medium-Curing Type)
AASHTO T 40	(2002) Sampling Bituminous Materials

ASTM INTERNATIONAL (ASTM)

ASTM D 1250	(1980; R 2002) Petroleum Measurement Tables
ASTM D 140	(2001) Sampling Bituminous Materials
ASTM D 2026	(1997) Cutback Asphalt (Slow-Curing Type)
ASTM D 2027	(1997) Cutback Asphalt (Medium-Curing Type)
ASTM D 2028	(1997) Cutback Asphalt (Rapid-Curing Type)
ASTM D 2397	(2002) Cationic Emulsified Asphalt
ASTM D 2995	(1999) Determining Application Rate of Bituminous Distributors
ASTM D 3381	(1992; R 1999) Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 946	(1982; R 1999) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 977	(2003) Emulsified Asphalt

1.2 SUBMITTALS

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" 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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Waybills and Delivery Tickets

Waybills and delivery tickets, during progress of the work.

SD-06 Test Reports

Sampling and Testing

Copies of all test results for bituminous materials, within 24 hours of completion of tests. Certified copies of the manufacturer's test reports indicating compliance with applicable specified requirements, not less than [30] [_____] days before the material is required in the work.

1.3 UNIT PRICES

NOTE: Delete unit price paragraphs when lump sum bidding is used. Edit submittal requirements accordingly.

1.3.1 Measurement

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

The bituminous material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10 percent over the specified application rate. Any amount of bituminous material more than 10 percent over the specified application rate for each application shall be deducted from the measured quantities, except for irregular areas where hand spraying of the bituminous material is necessary. Measured quantities shall be expressed in [metric tons 2000 pound tons] [liters at 15.6 degrees C gallons at 60 degrees F. Volumes measured at temperatures other than 15.6 degrees C 60 degrees F shall be corrected [in accordance with ASTM D 1250] [using a coefficient of expansion of 0.00045 per degree C 0.00025 per degree F for asphalt emulsion]].

1.3.2 Payment

The quantities of bituminous material, determined as specified above, will be paid for at the respective contract unit prices. Payment shall constitute full compensation for all operations necessary to complete the work as specified herein.

1.3.3 Waybills and Delivery Tickets

Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and certified delivery tickets for all bituminous materials used in the construction of the pavement covered by the contract. The Contractor shall not remove bituminous material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

1.4 PLANT, EQUIPMENT, MACHINES AND TOOLS

1.4.1 General Requirements

Plant, equipment, machines and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times.

1.4.2 Bituminous Distributor

The distributor shall have pneumatic tires of such size and number to prevent rutting, shoving or otherwise damaging the base surface or other layers in the pavement structure. The distributor shall be designed and equipped to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. Distributor equipment shall include 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 hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

1.4.3 Power Brooms and Power Blowers

Power brooms and power blowers shall be suitable for cleaning the surfaces

to which the bituminous coat is to be applied.

1.5 WEATHER LIMITATIONS

Bituminous coat shall be applied only when the surface to receive the bituminous coat is dry. Bituminous coat shall be applied only when the atmospheric temperature in the shade is 10 degrees C 50 degrees F or above and when the temperature has not been below 2 degrees C 35 degrees F for the 12 hours prior to application.

PART 2 PRODUCTS

2.1 TACK COAT

NOTE: The following information should be reviewed before making the selection of bituminous material:

a. If ASTM D 2028 or AASHTO M 81 is used, then Note A of TABLE 1 of ASTM D 2028 or AASHTO M 82 should be reviewed and the material specified by viscosity or penetration. Cutback asphalt grades recommended for tack are RC-70 and RC-250; they may be used generally as a tack in pavement construction. In cold-weather construction, they can be used with less concern than emulsions which contain water.

b. Paving grade asphalts can also be used in tack applications. More heat is required to achieve spraying consistency for these materials. Selection of a grade involves consideration of the various grading systems used. The following materials are recommended:

Penetration Grades (ASTM D 946 or AASHTO M 20)

200-300
120-150
85-100

Viscosity Grades (ASTM D 3381 or AASHTO M 226, TABLE 1 or 2)

AC 2.5
AC 5
AC 10

Aged Residue Viscosity Grades (ASTM D 3381 or AASHTO M 226)

AR 1000
AR 2000
AR 4000

The harder grades, 85-100 penetration, AC 10, and AR 4000 viscosity grades, are recommended for airfields. These grades are harder and would be better able to resist uplift pressures caused by jet engines. The other grades may be considered for more general use. The temperature-viscosity relation for the job asphalt should be checked to

ensure that a spraying consistency can be achieved in the recommended temperature range of paragraph APPLICATION TEMPERATURE.

c. Either anionic or cationic emulsions can be used for tack. A list of recommended emulsions is as follows:

Anionic Emulsion ASTM D 977

RS-1
MS-1
HFMS-1
SS-1
SS-1h

Cationic Emulsions ASTM D 2397

CRS-1
CSS-1
CSS-1h

Grades SS-1h and CSS-1h are made with a harder base asphalt and are recommended for airfields. The other grades can be considered for general use. Grades RS-1, SS-1, and SS-1h are widely used tack materials.

d. An asphalt-based tack or tar tack may be used between an asphalt and tar or tar-rubber concrete course, but a tar tack should be used between tar and tar-rubber concrete courses. This specification must be altered for a tar tack coat.

[Cutback asphalt] [Asphalt] [Emulsified asphalt] shall conform to [ASTM D 2028] [ASTM D 946] [ASTM D 3381] [ASTM D 977] [ASTM D 2397] or [AASHTO M 81] [AASHTO M 20] [AASHTO M 226] Grade [_____].

2.2 PRIME COAT

NOTE: Remove brackets from around the material to be allowed in the contract specifications and delete the other materials and references.

a. If cutback asphalts are used, one of the following types and grades can be recommended:

Slow-Curing Type (ASTM D 2026): SC-70, SC-250.
Medium-Curing Type (ASTM D 2027 or AASHTO M 82): MC-30, MC-70, MC-250.
Rapid-Curing Type (ASTM D 2028 or AASHTO M 81): RC-70, RC-250.

Selection of a particular type and grade should consider the nature of the surface to be treated. An open base course material will be penetrated readily, and all of the above types and grades can

be considered except for the low viscosity MC-30. A tight surface is not going to be penetrated as readily; therefore, the less viscous materials are recommended such as RC-70, MC-30, MC-70 and SC-70. Some caution might be urged in using RC-70 or RC-250 because the solvent may separate or be absorbed by the base course fines and leave the asphalt deposited on the surface. Cutback asphalts can be used in cold-weather construction with less concern than emulsions which contain water. Less viscous grades may be used for cold-weather construction such as RC-70, MC-30 and MC-70.

b. There are two types of emulsions that can be used for prime coats. A list of recommended emulsion grades by type is as follows:

Anionic Emulsions ASTM D 977: SS-1, SS-1h.
Cationic Emulsions ASTM D 2397: CSS-1, CSS-1h.

Penetration and coating will be most efficient at about optimum moisture content. Water dilution of the emulsion is also required to reduce viscosity.

[Cutback asphalt] [Emulsified asphalt] shall conform to [ASTM D 977] [ASTM D 2026] [ASTM D 2027] [ASTM D 2028] [ASTM D 2397] or [AASHTO M 81] [AASHTO M 82], Grade [_____].

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.

Immediately before applying the bituminous coat, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated. The surface shall be dry and clean at the time of treatment.

3.2 APPLICATION RATE

NOTE: The range of application rates for the bituminous materials is for the bituminous residue content and does not include water or solvents that are contained in emulsified or liquid bituminous materials. The use of liquid or emulsified material requires that the application rates be corrected. Any prescribed application should be corrected and divided into two applications 24 hours apart when necessary to avoid flowing off the surface because of grade or slope.

The exact quantities within the range specified, which may be varied to

suit field conditions, will be determined by the Contracting Officer.

3.2.1 Tack Coat

Bituminous material for the tack coat shall be applied in quantities of not less than 0.20 liter 0.05 gallon nor more than 0.70 liter per square meter 0.15 gallon per square yard of pavement surface.

3.2.2 Prime Coat

Bituminous material for the prime coat shall be applied in quantities of not less than 0.70 liter 0.15 gallon nor more than 1.80 liters per square meter 0.40 gallon per square yard of pavement surface.

3.3 APPLICATION TEMPERATURE

3.3.1 Viscosity Relationship

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. The temperature viscosity relation shall be furnished to the Contracting Officer.

3.3.2 Temperature Ranges

NOTE: Normal spray application temperatures are as follows. Edit and coordinate materials with Part 2 PRODUCTS. Remove brackets from the material to be allowed in the specification and delete the other materials in brackets.

The viscosity requirements shall determine the application temperature to be used. The following is a normal range of application temperatures:

Liquid Asphalts

[SC-250	75-132 degrees C]
[MC-30	29-87 degrees C]
[MC-70	50-107 degrees C]
[MC-250	75-132 degrees C]
[RC-70	50-90 degrees C*]
[RC-250	75-12 degrees C*]

Paving Grade Asphalts

Penetration Grades

[200-300	plus 130 degrees C]
[120-150	plus 132 degrees C]
[85-100	plus 137 degrees C]

Viscosity Grades

[AC 2.5	plus 132 degrees C]
[AC 5	plus 137 degrees C]
[AC 10	plus 137 degrees C]

[AR 1000	plus 135 degrees C]
[AR 2000	plus 140 degrees C]
[AR 4000	plus 143 degrees C]

Emulsions

[RS-1	20-60 degrees C]
[MS-1	20-70 degrees C]
[HFMS-1	20-70 degrees C]
[SS-1	20-70 degrees C]
[SS-1h	20-70 degrees C]
[CRS-1	52-85 degrees C]
[CSS-1	20-70 degrees C]
[CSS-1h	20-70 degrees C]

Liquid Asphalts

[SC-70	120-225 degrees F]
[SC-250	165-270 degrees F]
[MC-30	85-190 degrees F]
[MC-70	120-225 degrees F]
[MC-250	165-270 degrees F]
[RC-70	120-200 degrees F*]
[RC-250	165-250 degrees F*]

Paving Grade Asphalts

Penetration Grades

[200-300	plus 265 degrees F]
[120-150	plus 270 degrees F]
[85-100	plus 280 degrees F]

Viscosity Grades

[AC 2.5	plus 270 degrees F]
[AC 5	plus 280 degrees F]
[AC 10	plus 280 degrees F]

[AR 1000	plus 275 degrees F]
[AR 2000	plus 285 degrees F]
[AR 4000	plus 290 degrees F]

Emulsions

[RS-1	70-140 degrees F]
[MS-1	70-160 degrees F]
[HFMS-1	70-160 degrees F]
[SS-1	70-160 degrees F]
[SS-1h	70-160 degrees F]

[CRS-1	125-185 degrees F]
[CSS-1	70-160 degrees F]
[CSS-1h	70-160 degrees F]

*These temperature ranges exceed the flash point of the material and care should be taken in their heating.

3.4 APPLICATION

NOTE: If the designer chooses not to specify a prime coat at the time of design, delete all references to a prime coat within this section. If the drainage layer is used beneath the surfacing material (Asphalt cement hot mix concrete), the underlying material (base course) shall not be primed and the appropriate paragraphs dealing with the prime coat shall be deleted. Add prime coat details on drawings and reference contractors option in specifications if this option is retained.

3.4.1 General

Following preparation and subsequent inspection of the surface, the bituminous coat shall be applied at the specified rate with uniform distribution over the surface to be treated. All areas and spots missed by the distributor shall be properly treated with the hand spray. Until the succeeding layer of pavement is placed, the surface shall be maintained by protecting the surface against damage and by repairing deficient areas at no additional cost to the Government. If required, clean dry sand shall be spread to effectively blot up any excess bituminous material. No smoking, fires, or flames other than those from the heaters that are a part of the equipment shall be permitted within 8 meters 25 feet of heating, distributing, and transferring operations of bituminous material other than bituminous emulsions. All traffic, except for paving equipment used in constructing the surfacing, shall be prevented from using the underlying material, whether primed or not, until the surfacing is completed. The bituminous coat shall conform to all requirements as described herein.

3.4.2 Prime Coat

The prime coat will be required if it will be at least seven days before a the surfacing (Asphalt cement hot mix concrete) layer is constructed on the underlying (base course, etc) compacted material. The type of liquid asphalt and application rate will be as specified herein. The Contractor shall protect the underlying from any damage (water, traffic, etc.) until the surfacing is placed. If the Contractor places the surfacing within seven days, the choice of protection measures or actions to be taken is at the Contractor's option. Damage to the underlying material caused by lack of, or inadequate, protection shall be repaired (recompacted or replaced) by approved methods at no additional cost to the Government. If the Contractor options to use the prime coat, it shall be applied as soon as possible after consolidation of the underlying material. To obtain uniform application of the prime coat on the surface treated at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application to start and stop the prime coat on the paper. Immediately after application, the building paper shall be removed and destroyed.

3.4.3 Tack Coat

Tack coat shall be applied at the locations shown on the drawings.

3.5 CURING PERIOD

NOTE: Retain bracketed sentence if prime coat is specified.

Following application of the bituminous material and prior to application of the succeeding layer of pavement, the bituminous coat shall be allowed to cure and to obtain evaporation of any volatiles or moisture. [Prime coat shall be allowed to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course.]

3.6 FIELD QUALITY CONTROL

NOTE: Select the appropriate paragraph based on the amount of bituminous material required.

Samples of the bituminous material [shall be tested for compliance with the applicable specified requirements. A sample shall be obtained and tested by the Contractor for every [[_____] metric tons tons] [[_____] liters gallons] of bituminous material used] [used shall be obtained by the Contractor as directed, under the supervision of the Contracting Officer. The sample may be retained and tested by the Government at no cost to the Contractor].

3.7 SAMPLING AND TESTING

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved.

3.7.1 Sampling

The samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140 or AASHTO T 40. Sources from which bituminous materials are to be obtained shall be selected and notification furnished the Contracting Officer within 15 days after the award of the contract.

3.7.2 Calibration Test

The Contractor shall furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. Calibration shall be made with the approved job material and prior to applying the bituminous coat material to the prepared surface. Calibration of the bituminous distributor shall be in accordance with ASTM D 2995.

3.7.3 Trial Applications

Before providing the complete bituminous coat, three lengths of at least 30 meters 100 feet for the full width of the distributor bar shall be applied to evaluate the amount of bituminous material that can be satisfactorily applied.

3.7.3.1 Tack Coat Trial Application Rate

Unless otherwise authorized, the trial application rate of bituminous tack coat materials shall be applied in the amount of 0.20 liters per square meter 0.05 gallons per square yard. Other trial applications shall be made using various amounts of material as may be deemed necessary.

3.7.3.2 Prime Coat Trial Application Rate

Unless otherwise authorized, the trial application rate of bituminous materials shall be applied in the amount of 1.10 liters per square meter 0.25 gallon per square yard. Other trial applications shall be made using various amounts of material as may be deemed necessary.

3.7.4 Sampling and Testing During Construction

Quality control sampling and testing shall be performed as required in paragraph FIELD QUALITY CONTROL.

-- End of Section --