## SECTION 890 ASPHALT MATERIAL

### 890.1 GENERAL REQUIREMENTS

Transporting conveyances for asphalt material shall be free of contaminating material. A record of material hauled the previous load in truck transport tanks shall be furnished as a prerequisite to loading. A determination shall be made if the previously hauled material is compatible with the material to be loaded or if cleaning of the tank is required to prevent contamination.

A sampling valve meeting the requirements of the Department Materials Manual for field sampling of asphalt materials shall be furnished.

If the material is to be used prior to testing by the Department, the company or jobber furnishing asphalt materials shall furnish for each tank car, truck tank, or other individual conveyance, two copies of a certificate of compliance. The certificates shall show all information contained on Form DOT 62 and a properly executed certification statement.

Temperatures to provide kinematic viscosities of 300 centistokes and 150 centistokes for mixing application and 200 centistokes and 50 centistokes for spray application shall be furnished with each load of asphalt cement, performance graded asphalt binder or cut-back asphalt on or along with the certificate of compliance.

Upon presentation of a certificate of compliance the Engineer may permit incorporation into the work the asphalt material covered by the certificate. Permission by the Engineer to use asphalt material shall not be construed as an acceptance of the material. Acceptance of asphalt material will be based on test results from the samples obtained.

Asphalt material tested and accepted for use on a project and transferred by the Contractor to another project, may be accepted for use in the terminating project on the basis of the test results of the originating project. The Contractor must request and receive from the Engineer of the originating project, prior to transfer, a letter of transfer covering the material. (DOT 70)

### 890.2 SPECIFIC REQUIREMENTS

**A.** **Rapid Curing Cut-back Asphalt** shall conform to AASHTO M 81.

**B.** **Medium Curing Cut-back Asphalt** shall conform to AASHTO M 82.

**C.** **Slow Curing Cut-back Asphalt** shall conform to the following requirements:

**1.** The oil shall be uniform in appearance and consistency and shall show no foaming when heated to the application temperature. The residue of specified penetration shall be smooth and homogeneous in appearance.

**2.** The grade of liquid asphaltic material specified shall conform to the requirements shown in Table 1.

## ASPHALT MATERIAL

### TABLE 1

| REQUIREMENT | SC-70 Min | SC-70 Max | SC-250 Min | SC-250 Max | SC-800 Min | SC-800 Max | SC-3000 Min | SC-3000 Max |
|---|---|---|---|---|---|---|---|---|
| Kinematic Viscosity at 140EF (60EC) (see Note 1) Centistokes | 70 | 140 | 250 | 500 | 800 | 1600 | 3000 | 6000 |
| Flash Point (Cleveland open cut), degrees EF (EC) | 150 (66) | --- | 175 (79) | --- | 200 (93) | --- | 225 (107) | --- |
| Asphalt Residue of 100 pen., percent by weight | 50 | --- | 60 | --- | 70 | --- | 80 | --- |
| Ductility of 100 pen., residue @ 77EF (25EC), 5 cm. per min., cm | 100 | --- | 100 | --- | 100 | --- | 100 | --- |
| Solubility in Trichlorethylene, percent | 99.0 | --- | 99.0 | --- | 99.0 | --- | 99.0 | --- |
| Spot Test (See Note 2) with: Standard naphtha | Negative for all grades | | | | | | | |
| Naphtha xylene solvent, percent xylene | Negative for all grades | | | | | | | |
| Heptane xylene solvent percent xylene | Negative for all grades | | | | | | | |

NOTES TO TABLE 1

**NOTE 1:** As an alternative, Saybolt-Furol viscosities may be specified as follows:

| | | |
|---|---|---|
| Grade SC-70 | Furol viscosity at 50EC | 60 to 120 sec. |
| Grade SC-250 | Furol viscosity at 60EC | 125 to 250 sec. |
| Grade SC-800 | Furol viscosity at 82.2EC | 100 to 200 sec. |
| Grade SC-3000 | Furol viscosity at 82.2EC | 300 to 600 sec. |

**NOTE 2:** The use of the spot test is optional. When specified, the Engineer shall indicate whether the standard naphtha solvent, the naphtha xylene solvent or the heptane xylene solvent will be used in determining compliance with the requirement and in the case of xylene solvent, the percentage of xylene to be used.

**D. Sampling and Testing:**

| | |
|---|---|
| Sampling | SD 301 |
| Flash Point | AASHTO T 48 |
| Kinematic Viscosity | AASHTO T 201 |
| Residue of Specified Penetration | SD 310 |
| Ductility | AASHTO T 51 |
| Solubility in Trichloroethylene | AASHTO T 44 |

**E. Asphalt Cement** penetration graded and viscosity graded asphalt cement, shall conform to AASHTO M 20 and AASHTO M 226, respectively.

When a penetration graded asphalt cement is specified, the Contractor may furnish the comparable viscosity graded asphalt cement as set forth in the following table:

| AASHTO M 226 | | AASHTO M 20 |
|---|---|---|
| AC-2.5 | for | 200-300 |
| AC-5 | for | 120-150 |
| AC-10 | for | 85-100 |
| AC-20 | for | 60-70 |

The certificate of compliance for the asphalt cement furnished shall indicate by grade designation which grading specification (AASHTO M 20 or AASHTO M 226) the material is certified to meet.

In the event asphalt cement is furnished simultaneously from sources to meet different grading specifications, the Engineer may require separate storage and use of the material from a source, if viscosity characteristics of the two materials are not compatible at the same mixing temperature.

**F. Performance Graded Asphalt Binder** shall conform to AASHTO Performance Graded Binder Specifications (MP1). The asphalt binder shall, if necessary, be blended at the terminal with any additives necessary to meet the specifications.

**G. Emulsified Asphalt** shall conform to AASHTO M 140. When SS-lh emulsified asphalt is specified for tack or flush seal coat, the cement mixing test requirement is waived.

**H. Cationic Emulsified Asphalt** shall conform to AASHTO M 208. When CSS-1h is specified for tack or flush seal coat, the cement mixing test requirement is waived.

**I. Petroleum Resin-Oil Base Emulsion** shall conform to the following requirements:

| TEST | LIMITS MIN. | LIMITS MAX. | TEST METHOD |
|---|---|---|---|
| Saybolt-Furol viscosity at 77EF (25EC) (seconds) | 15 | 40 | AASHTO T 59 |
| Residue Percent | 60 | | AASHTO T 59(1) |
| Miscibility | No coagulation | | AASHTO T 59(2) |
| Sieve Test | | .30 | AASHTO T 59(3) |
| Partial Charge | Positive | | |
| Tests on Residue | | | |
| Kinematic Viscosity at 140EF (60EC) (centistokes) | 100 | 200 | AASHTO T 201 |

**FOOTNOTES:**

**1.** T 59 residue by evaporation test for percent residue is made by heating a 50 gram sample to 300EF (149EC) until foaming ceases, them immediately cooled and results calculated.

**2.** Test procedure identical with T 59, except Normal Calcium Chloride solution shall be used in place of distilled water.

**3.** Test procedure identical with T 59, except distilled water shall be used in place of two percent Sodium Oleate solution.

The material shall have the capability of increasing the ductility and penetration of the asphalt binder in an asphalt concrete surface when applied at the specified rate.

**J. Petroleum Resin-Oil Base Emulsion (Diluted)** shall be diluted with potable water in the ratio of approximately two parts emulsion to one part water by volume.

The petroleum resin-oil base emulsion prior to dilution shall conform to the requirements of 890.2 H, above.

The diluted emulsion shall meet the following requirements:

| TEST | LIMITS MIN. | LIMITS MAX. | TEST METHOD |
|---|---|---|---|
| Residue Percent | 40 | | AASHTO T 59(1) |
| Sieve Test | | .30 | AASHTO T 59(3) |
| Particle Charge | Positive | | |
| <u>Tests on Residue</u> | | | |
| Kinematic Viscosity at 140EF (60EC) (centistokes) | 100 | 200 | AASHTO T 201 |

For footnotes, see Paragraph 890.2 H.

**K. High Float** emulsified asphalt shall conform to the following requirements:

**TABLE 1** Requirements for Emulsified Asphalt

| TYPE | Rapid-Setting | | | | | | Medium-Setting | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RS-1 | | RS-2 | | HFRS-2 | | MS-1 | | MS-2 | | MS-2h | |
| GRADE | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| *TESTS ON EMULSIONS:* | | | | | | | | | | | | |
| Viscosity, Saybolt Furol at 77EF (25EC), s | 20 | 100 | | | | | 20 | 100 | 100 | | 100 | |
| Viscosity,Saybolt Furol at 122EF (50EC), s | | | 75 | 400 | 75 | 400 | | | | | | |
| Storage stability test, 24-h, % | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 |
| Demulsibility, 35 ml, 0.02 N, CaCl2, % | 60 | | 60 | | 60 | | | | | | | |
| Coating ability and water resistance | | | | | | | | | | | | |
| Coating, dry aggregate | | | | | | | good | | good | | good | |
| Coating, after spraying | | | | | | | fair | | fair | | fair | |
| Coating, wet aggregate | | | | | | | fair | | fair | | fair | |
| Coating, after spraying | | | | | | | fair | | fair | | fair | |
| Cement mixing test, % | | | | | | | | | | | | |
| Sieve test, % | | 0.30 | | 0.30 | | 0.30 | | 0.30 | | 0.30 | | 0.30 |
| Residue by distillation, % | 55 | | 63 | | 63 | | 55 | | 65 | | 65 | |
| Oil Distillate by volume of emulsion, % | | | | | | | | | | | | |
| *TESTS ON RESIDUE FROM DISTILLATION TESTS* | | | | | | | | | | | | |
| Penetration, 77EF (25EC), 100 g, 5s | 100 | 200 | 100 | 200 | 100 | 200 | 100 | 200 | 100 | 200 | 40 | 90 |
| Ductility, 77EF (25EC), 5 cm/min, cm | 40 | | 40 | | 40 | | 40 | | 40 | | 40 | |
| Solubility in trichloroethylene, % | 97.5 | | 97.5 | | 97.5 | | 97.5 | | 97.5 | | 97.5 | |
| Float test, 140EF (60EC), s | | | | | 1200 | | | | | | | |

## **TABLE 2** Requirements for Emulsified Asphalt

| TYPE | Medium-Setting | | | | | | Slow-Setting | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HFMS-1 | | HFMS-2 | | HFMS-2h | | HFMS-2s | | SS-2 | | SS-1h | |
| GRADE | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| ***TESTS ON EMULSIONS:*** | | | | | | | | | | | | |
| Viscosity, Saybolt Furol at 77EF (25EC), s | 20 | 100 | 100 | | 100 | | 50 | | 20 | 100 | 20 | 100 |
| Viscosity,Saybolt Furol at 122EF (50EC), s | | | | | | | | | | | | |
| Storage stability test, 24-h, % | | 1[3] | | 1[3] | | 1[3] | | 1[3] | | 1[3] | | 1[3] |
| Demulsibility[1], 35 ml, 0.02 N, CaCl2, % | | | | | | | | | | | | |
| Coating ability and water resistance | | | | | | | | | | | | |
| Coating, dry aggregate | good | | good | | good | | good | | | | | |
| Coating, after spraying | fair | | fair | | fair | | fair | | | | | |
| Coating, wet aggregate | fair | | fair | | fair | | fair | | | | | |
| Coating, after spraying | fair | | fair | | fair | | fair | | | | | |
| Cement mixing test, % | | | | | | | | | | 2.0 | | 2.0 |
| Sieve test, %[2] | | 0.30[3] | | 0.30[3] | | 0.30[3] | | 0.30[3] | | 0.30[3] | | 0.30[3] |
| Residue by distillation, % | 55 | | 65 | | 65 | | 65 | | 57 | | 57 | |
| ***TESTS ON RESIDUE FROM DISTILLATION TESTS*** | | | | | | | | | | | | |
| Oil Distillate by volume of emulsion, % | | | | | | | 1 | 7 | | | | |
| Penetration, 77EF (25EC), 100 g, 5s | 100 | 200 | 100 | 200 | 40 | 90 | 200 | | 100 | 200 | 40 | 115 |
| Ductility, 77EF (25EC), 5 cm/min, cm | 40 | | 40 | | 40 | | 40 | | 40 | | 40 | |
| Solubility in trichloroethylene, % | 97.5 | | 97.5 | | 97.5 | | 97.5 | | 97.5 | | 97.5 | |
| Float test, 140EF (60EC), s | 1200 | | 1200 | | 1200 | | 1200 | | | | | |

[1] The demulsibility test shall be made within 30 days from date of shipment
[2] A percentage of 0.30 is acceptable for samples taken at point of use
[3] This test requirement on representative samples may be waived, if successful application of the material has been achieved in the field.

**TABLE 3** Requirements and Typical Applications for Cationic Emulsified Asphalt[1]

| TYPE | Rapid-Setting | | | | | | Slow-Setting | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CRS-1 | | CRS-2 | | CRS-2P | | CMS-2 | | CMS-2h | | CSS-1 | | CSS-1h | |
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| ***TESTS ON EMULSIONS:*** | | | | | | | | | | | | | | |
| Viscosity, Saybolt Furol at 77EF (25EC), s | | | | | | | | | | | 20 | 100 | 20 | 100 |
| Viscosity,Saybolt Furol at 122EF (50EC), s | 20 | 100 | 100 | 400 | 50 | 450 | 50 | 450 | 20 | 100 | | | | |
| Storage stability test, 24-h, % | | 1[1] | | 1[1] | | 1[3] | | 1[1] | | 1[1] | | 1[1] | | 1[1] |
| Demulsibility[1], 35 ml, 0.02 N, CaCl2, % | | | | | | | | | | | | | | |
| Sodium dioctyl sulfosucinate, % | 40 | | 40 | | 40 | | | | | | | | | |
| Cure test | | | | | passes[22] | | | | | | | | | |
| Classification test | passes | | passes | | passes | | | | | | | | | |
| Coating ability and water resistance | | | | | | | | | | | | | | |
| Coating, dry aggregate | | | | | | | good | | good | | | | | |
| Coating, after spraying | | | | | | | fair | | fair | | | | | |
| Coating, wet aggregate | | | | | | | fair | | fair | | | | | |
| Coating, after spraying | | | | | | | fair | | fair | | | | | |
| Particle charge test | positive | | positive | | positive | | positive | | positive | | positive[2] | | positive[2] | |
| Cement mixing test, % | | | | | | | | | | | | 2.0 | | 2.0 |
| Sieve test, %[2] | | 0.30[1] | | 0.30[1] | | 0.30[1] | | 0.30[1] | | 0.30[1] | | 0.30[1] | | 0.30[1] |
| Residue by distillation, % | 60 | | 65 | | 65 | | 65 | | 65 | | 57 | | 57 | |
| ***TESTS ON RESIDUE FROM DISTILLATION TESTS*** | | | | | | | | | | | | | | |
| Oil Distillate by volume of emulsion, % | | 3 | | 3 | | 1[33] | | 12 | | 12 | | | | |
| Penetration, 77EF (25EC), 100 g, 5s | 100 | 250 | 100 | 250 | 100 | 150 | 100 | 250 | 40 | 90 | 100 | 250 | 40 | 115 |
| Ductility, 77EF (25EC), 5 cm/min, cm | 40 | | 40 | | | | 40 | | 40 | | 40 | | 40 | |
| Ductility, 49EF (9EC), 5 cm/min, cm | | | | | 30 | | | | | | | | | |
| Solubility in trichloroethylene, % | 97.5 | | 97.5 | | 97.5 | | 97.5 | | 97.5 | | 97.5 | | 97.5 | |
| Softening Point, EF (EC) | | | | | 100 (38) | | | | | | | | | |
| Elastic Recovery, | | | | | 55 | | | | | | | | | |

1. This test requirement on representative samples may be waived, if successful application of the material has been achieved in the field.
2. If the particle charge test result is inconclusive, material having a maximum pH value of 6.7 will be

acceptable if agreed to by the Department.

3. Examine the CRS-2P storage stability test sample after it has been allowed to stand undisturbed for 24 hours. The surface of the test sample shall show no white, milky colored substance, but shall be homogeneous brown color throughout.

22. The cure test is performed as follows: Pour approximately 1 gram of CRS-2P emulsion onto a metal surface. Allow the test sample to cure at temperatures of at least 80EF (27EC) under a heat light or sunlight for 4 hours. After the 4 hour period, the CRS-2P shall show no tackiness or tendency to stick to the fingers when pressed.

33. The distillation test for CRS-2P emulsion shall be in accordance with AASHTO T 59, 8-12 except the second sentence in 11.5 shall be deleted and replaced with the following: "The distillation temperature shall be what the emulsion manufacturer recommends".

| | AE150S | | AE150L | | AE200S | | AE300 | |
|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | Min | Max | Min | Max |
| ***TESTS ON EMULSIONS:*** | | | | | | | | |
| Viscosity,Saybolt Furol at 122EF (50EC), s | 35 | 150 | 35 | 150 | 35 | 150 | 35 | 150 |
| Sieve test, % | | 0.30 | | 0.30 | | 0.30 | | 0.30 |
| Oil Portion, % | 0.5 | 3 | | | 1 | 6 | | 8 |
| Residue by distillation, % | 62 | | 65[1] | | 62 | | 65 | |
| ***TESTS ON RESIDUE FROM DISTILLATION TESTS*** | | | | | | | | |
| Penetration, 77EF (25EC), 100 g, 5s | 140 | 225 | 140 | 225 | 250 | | 300 | |
| Ductility, 77EF (25EC), 5 cm/min, cm | 40 | | 30 | | 40 | | 40 | |
| Solubility in trichloroethylene, % | 97.5 | | 97.5 | | 97.5 | | 97.5 | |
| Float test, 140EF (60EC), s | 1200 | | 1200 | | 1200 | | 1200 | |

NOTE: (1) Distillation as described in T 59 with the following modifications: Material shall be brought to a temperature of 350EF ±10EF (175EC ±5EC) for a period of 20 minutes. Total time to distill, including the 20 minute hold period, shall not exceed 60 minutes.

## 890.3 TEST REPRODUCIBILITY TOLERANCE

Test results which fall outside the specification limits, for a particular test, but within the test reproducibility tolerance as set forth below, will be acceptable.

## ASPHALT MATERIAL

| TEST | TOLERANCE* |
|---|---|
| Flash Point | |
| Tag Open Cup (Ave. of three tests) | 4EF (2.2EC) |
| Cleveland Open Cup | 15EF (8.4EC) |
| Viscosity | |
| Kinematic, 140EF (60EC) (To 3000 CS) | 1.5% |
| Kinematic, 140EF (60EC) (Above 3000 CS) | 4.5% |
| Saybolt-Furol | 4.5% |
| Distillation | |
| Distillate % by vol. (Up to 347EF (175EC)) | 1.8% pts. |
| Distillate % by vol. (Above 347EF (175EC)) | 1.0% pt. |
| Residue % by vol. | 1.0% pt. |
| Test on Residue | |
| Penetration | 8% |
| Solubility in $CH_3$ $CCl_3$ | 0.13% pt. |

## EMULSIFIED ASPHALT

| | |
|---|---|
| Distillation | |
| Residue % by vol. | 1.0% pt. |
| Test on Residue | |
| Penetration (100 or more) | 15 pen. pts. |
| Penetration (Less than 100) | 8 pen. pts. |

## ASPHALT CEMENT

| | |
|---|---|
| Penetration, 77EF (25EC) (Less than 50) | 2 pen. pts. |
| Penetration, 77EF (25EC) (50 or above) | 4% |
| Flash Point | |
| Cleveland Open Cup | 15EF (8.3EC) |
| Pensky-Marten's Closed Cup (Below 220EF (104.4EC)) | 3EF (1.7EC) |
| Pensky-Marten's Closed Cup (Above 220EF (104.4EC)) | 13EF (7.2EC) |
| Viscosity | |
| Kinematic, 275EF (135EC) | 4.4% |
| Absolute, 140EF (60EC) | 5.0% |
| Solubility in $CH_3$ $CCl_3$ | 0.13% pts. |
| Thin-film Test | |
| Loss on heating | 20% |
| % of Original | 4% pts. |

*When tolerances are expressed in terms of percent, the allowable deviation is calculated as the indicated percentage of the upper or lower specification limit, whichever is applicable.