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## TRANSMITTAL LETTER

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Pub 37 (Bulletin 25) – Specifications for Bituminous Materials, November 2018 Edition

### INFORMATION AND SPECIAL INSTRUCTIONS:

The November 2018 Edition is a reformatted version of the November 2002 Edition that was published with a transmittal letter dated August 23, 2004. None of the technical information contained in the November 2002 Edition, such as the specification limits or the use of materials, were revised.

See the attachment for the summary of changes.

CANCEL AND DESTROY THE FOLLOWING:

ALL PREVIOUS EDITIONS

ADDITIONAL COPIES ARE AVAILABLE FROM:

- PennDOT website - [www.penndot.gov](http://www.penndot.gov)  
*Click on Forms, Publications & Maps*

APPROVED FOR ISSUANCE BY:

*Christine Reilly*  
Christine Reilly, P.E. Division Chief,  
Construction and Materials Division  
Bureau of Project Delivery

## Transmittal Letter Attachment

### Bulletin 25 – November 2018 Edition Summary of Changes:

1. The table of contents is re-organized. The emulsified asphalt materials are sorted alphabetically.
2. The document is grouped in two parts:
  - a. Part I General
  - b. Part II Specifications
    - i. Performance Graded (PG) Binder Specifications
    - ii. Emulsified Asphalt Specifications
    - iii. Cutback Asphalt Specifications
    - iv. Waterproofing Asphalt Specifications
3. Editorial changes:
  - a) The US postal address of the Materials Testing Lab was updated.
  - b) Table of Content was moved to the beginning.
  - c) The format of the fonts was changed from bold to regular.
  - d) Specification information was organized in tables.
  - e) The nomenclature of the emulsified asphalt materials was edited to match the nomenclature of the AASHTO Specifications as follows:
    - i. The letter “M” was removed from the abbreviation “PM” to indicate Polymer Modified materials e.g., CSS-1hPM changed to CSS-1hP.
    - ii. The references E-2, E-2M, E-3, and E-3M were removed from rapid setting emulsions CRS-2, CRS-2P, RS-2, and RS-2P.
    - iii. The number of decimals of the emulsified asphalt specification values were adjusted to match the AASHTO Specification values.
  - f) A list of acronyms was added.
  - g) Pages were renumbered.
4. The specifications of the following emulsified asphalt materials were added in accordance with SOL 481-17-01:
  - NTT / CNTT
  - TACK
5. The specifications of the following emulsified asphalt materials were added in accordance with SOL 481-18-02:
  - CQS-1hPM (CQS-1hP)
  - CSS-1hPM (CSS-1hP)
  - HFRS-2
  - HFRS-2PM (HFRS-2P)
  - SS-1hPM (SS-1hP)

# BULLETIN 25

## SPECIFICATIONS FOR BITUMINOUS MATERIALS



**pennsylvania**  
DEPARTMENT OF TRANSPORTATION

PUB 37 (11-18)

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# **PART I GENERAL**

## **INSTRUCTIONS GOVERNING TESTING AND SHIPMENT OF BITUMINOUS MATERIAL**

Refer to Pennsylvania Department of Transportation Pub. 408, Section 702 on Bituminous Material for requirements concerning quality control, certification and shipment.

Specifications for Emulsified Asphalts MS-2, CMS-2, HFMS-2s, HFMS-2h, and HFMS-2 require a stone coating test on the proposed (job) aggregate. The vendor shall make arrangements to obtain a sample of the job aggregate in advance and shall run the stone coating test to determine the aggregate-emulsion compatibility. The vendor shall state on each certification accompanying the shipment that the emulsified asphalt is compatible with the job aggregate being used. The vendor shall also insure that Emulsified Asphalts RS-2, CRS-2, RS-2P, CRS-2P, and CRS-1P are compatible with the job aggregate intended for seal coat and surface treatment.

Storage tanks suitable for use as a source of supply for materials listed on the contract will be set aside for each class of material. Suitable tankage shall be defined as an individual tank capable of storing one fourth (1/4) of the total contract order or one hundred ninety thousand (190,000) Liters, (50,000 Gallons), whichever is the lesser amount. Note and follow the Special Instructions and Conditions noted in the Invitation Bid Proposal.

Verification samples, with all test results as per specifications and sample identification Form TR-447, shall be sent to the following shipping address:

PA Department of Transportation  
Materials Testing Laboratory  
DGS Annex Complex  
82 Dogwood Avenue  
Harrisburg, PA 17110

The appropriate sample sizes and containers shall be as follows:

**Performance Graded (PG) Binders and Asphalt Cutbacks:** One liter (one-quart) sample in a metal can (double friction-top cans or square cans with screw tops).

**Emulsions:** Two-liter (two-quart) sample in wide mouth jars or bottles made of plastic.

Tanker trucks shall be equipped with an inspection hatch at least eight inches in diameter, located at the lowest point of the truck bed. The trucks shall also be equipped with The Asphalt Institute submerged sampling device No. 133 (IS-133) or approved equal.



## APPLICATION (SPRAYING) AND MIX TEMPERATURES FOR CUTBACK AND EMULSIFIED ASPHALTS

It is expected that the vendor shall provide the necessary technical assistance to assure the successful field application of the materials supplied.

Minimum and maximum application or mixing temperatures for cutback or emulsified asphalts shall be placed on the bill of lading for each material shipped to the Department or Contractor for use on Pennsylvania Department of Transportation projects. The procedure to establish these temperatures for each batch of material produced is as follows:

**Asphalt Cutbacks:** Use ASTM D2493 Viscosity-Temperature Chart for Asphalt Binders to draw a typical temperature-viscosity curve for the material by plotting viscosities obtained at 60°C (140°F) and two other convenient temperatures. This is to be submitted to the Laboratory Testing Section (LTS). For subsequent batches of material, only the viscosity at 60°C (140°F) needs to be obtained. A point shall be plotted on the typical temperature-viscosity chart, representing the viscosity at 60°C (140°F) of the batch to be shipped. A curve parallel to the submitted curve shall be drawn through the plotted point at 60°C (140°F). Read the temperature at the intersection of the 200 cSt line and the drawn parallel curve. This temperature is the minimum spraying (application) temperature. At the intersection of the 100 cSt line and the parallel curve, read the maximum spraying temperature. For MC-30 and MC-70 cutbacks, a minimum viscosity of 20 cSt would be permitted for spraying applications only.

**Emulsified Asphalts:** The minimum and maximum application or mixing temperatures for the type and class of material used are listed in the emulsified asphalt specifications contained in this bulletin.

The vendor is responsible that all truck shipments to Department Forces be delivered within the specified temperature range. The Department is not permitted to heat any bituminous material in truck transports.

The viscosity of the material at time of use governs the amount of application per square meter (per square yard), or the amount of coating on the aggregates. It is, therefore, important that material be used within the indicated temperatures.

## AVOID OVERHEATING

Whereas, underheating can adversely affect the application and the service ability of the materials, overheating can cause the following conditions:

1. Overheating of cutback asphalts can cause excessive evaporation and accumulation of vapors, which in turn can create a fire or explosion hazard.
2. Overheating of cutback asphalts can cause a loss of volatiles, which will change the grade and defeat the purpose of its proper use.
3. Overheating of emulsified asphalts will result in the loss of water and oils and thereby alter the material which will affect its use.
4. Overheating of PG Binders will destroy the desired properties of the materials and present difficulty in the various operations of constructing bituminous concrete surfaces.

## SAFETY

Read the Material Safety Data Sheet (MSDS) provided by the vendor before handling and disposing of bituminous materials. The MSDS contains general information, fire and explosion hazards, health hazards, protective equipment, control measures, occupational exposure limits, emergency and first aid, and spill and disposal methods.

The following are some additional precautions:

**Cutback Asphalts:** It must be recognized that the temperature ranges indicated generally are above the flash point for MC and RC liquid bituminous materials. In fact, some of these liquid bituminous materials will flash at temperatures below these specified ranges. Accordingly, suitable safety precautions are mandatory at all times when handling these liquid bituminous materials. Open flames or sparks must not be permitted close to these materials. All applicable intra and interstate commerce requirements must be met.

**PG Binders:** Studies have established that hydrogen sulfide gas evolves as a product of a complex reaction between the sulfur and hydrogen in asphalt cements at elevated temperature levels. The presence of hydrogen sulfide is masked by the hot asphalt hydrocarbon smell and is not readily detectable. The primary locations observed where hazardous hydrogen sulfide concentrations are likely to occur are in or immediately adjacent to enclosed vapor spaces above hot asphalt, such as in storage tanks, tank car domes, etc. All personnel, particularly those associated directly with asphalt shipments (loading and unloading), storage, use, and inspection must be made aware of this potential hazard. The following safety precautions must be taken:

1. Keep face at least two feet from the opening.
2. Use long handled hook to open dome cover.
3. Wear air-supplied respirators if vapors cannot be avoided.
4. Do not permit any smoking or open flames near the opening.

## **SPECIFICATIONS FOR COAL TARS AND COAL TAR PRIMERS**

Specifications for Coal Tars and Coal Tar Primers, WP2, CTPC, RT-2C, RT-4C, RT-6C, RT-9C, RT-10C, RT-12C, RT-14, WM-2, and RT-14A have been deleted due to insignificant use, availability, and health hazards. When used in exceptional cases, the specifications as contained in the 1983 Edition shall apply. Copies of these specifications can be obtained from the Laboratory Testing Section (LTS).

### **SPECIFICATIONS FOR BF-1, NRC-250, NRC-800, U-1, WP-2, J-1, SRTC, PC-1**

Specifications for the above referenced materials have been deleted due to insignificant use and availability. When used in exceptional cases, the specifications as contained in the 1986 Edition shall apply. Copies of these specifications can be obtained from the Laboratory Testing Section (LTS).

### **SPECIFICATIONS FOR MC-400-E, ME-250, ME-400, ME-800, RCE-250, RCE-800**

Specifications for the above referenced materials have been deleted due to insignificant use and availability. When used in exceptional cases, the specifications as contained in the 1996 Edition shall apply. Copies of these specifications can be obtained from the Laboratory Testing Section (LTS).

Specifications for MC-400PM have been deleted due to insignificant use and availability. When used in exceptional cases, the specifications as contained in the 1998 Edition shall apply. Copies of these specifications can be obtained from the Laboratory Testing Section (LTS).

Emulsified Petroleum Resins (EPR) and Calcium Lignosulfonate (CLS) have been removed because they are not bituminous materials.

# **SPECIFICATIONS, PRACTICES, AND TEST METHODS USED BY THE BITUMINOUS TESTING LABORATORY**

## **AASHTO STANDARD PRACTICES**

- R 26 Certifying Suppliers of Performance-Graded Asphalt Binders
- R 28 Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)
- R 66 Sampling Asphalt Materials

## **AASHTO STANDARD SPECIFICATIONS**

- M 81 Cut-Back Asphalt (Rapid-Curing Type)
- M 82 Cut-Back Asphalt (Medium-Curing Type)
- M 140 Emulsified Asphalt
- M 208 Cationic Emulsified Asphalt
- M 320 Performance-Graded Asphalt Binder

## **ASTM STANDARD SPECIFICATIONS**

- D5976 Type I Polymer Modified Asphalt Cement for Use in Pavement Construction

## **AASHTO TEST METHODS**

- T 44 Solubility of Bituminous Materials
- T 48 Flash Point of Asphalt Binder by Cleveland Open Cup
- T 49 Penetration of Bituminous Materials
- T 50 Float Test for Bituminous Materials
- T 51 Ductility of Asphalt Materials
- T 53 Softening Point of Bitumen (Ring-and-Ball Apparatus)
- T 55 Water in Petroleum Products and Bituminous Materials by Distillation
- T 59 Emulsified Asphalts
- T 72 Saybolt Viscosity
- T 78 Distillation of Cutback Asphalt Products
- T 79 Flash Point with Tag Open Cup
- T 111 Inorganic Matter or Ash in Bituminous Materials
- T 179 Effect of Heat and Air on Asphalt Materials (Thin-Film Oven Test)
- T 201 Kinematic Viscosity of Asphalts
- T 202 Viscosity of Asphalts by Vacuum Capillary Viscometer
- T 228 Specific Gravity of Semi-Solid Asphalt Materials
- T 240 Rolling Thin Film Oven Test
- T 301 Elastic Recovery Test of Asphalt Materials by Means of a Ductilometer
- T 313 Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)
- T 314 Determining the Fracture Properties of Asphalt Binder in Direct Tension (DT)
- T 315 Test Method for Determining Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)
- T 316 Standard Test Method for Viscosity Determination of Asphalt Binder using Rotational Viscometer

**ASTM TEST METHODS**

D6084 Elastic Recovery of Asphalt Materials by Durometer

**PENNSYLVANIA TEST METHODS**

PTM No. 747 Determination of Distributor Application Rate in the Field

PTM No. 750 Determination of Optimum Emulsion Content for Open Graded Emulsion Mixtures  
(Pennsylvania Runoff Method).

PTM No. 758 Open Distillation of Emulsified Asphalts

## NOMENCLATURE FOR BITUMINOUS MATERIALS

The prefix or suffix **P** listed for any bituminous material means that the material is polymer-modified, and as such, special attention by the user should be given to usage, storing, handling, or temperature requirements.

Whenever possible, equivalent AASHTO designations have been listed for bituminous materials. Although the AASHTO specification requirements vary for some of the materials listed in this Bulletin, for the sake of continuity, the properties of those materials are similar enough to warrant an AASHTO designation.

In all cases however, the specification requirements for the materials listed herein take precedence. AASHTO, ASTM, or PTM refer to the most recent edition.

## PG BINDER SUPPLIER REQUIREMENTS

During the first quarter of each year, submit an updated Quality Control Plan which covers every Refinery and/or Storage Terminal supplying PG Binders to the Department. The PG Binder Certification Document on Pages 17 and 18 must be completed and attached to the Annual Quality Control Plan.

**PG Binders:** On the Bill of Lading, provide the minimum and maximum laboratory mixing and compaction temperatures, as determined from binder viscosities of 280 and 150 centistokes, respectively. These values are derived from rotational viscosities, which are measured in Pascal Seconds (Pa-S). The relationship between centistokes and Pascal-Seconds is a function of the asphalt specific gravity at the test temperature. The rotational viscosities are determined at 135°C (275°F) and a higher temperature, typically 165°C (330°F). These temperatures are for informational purposes and only to be used when making laboratory compacted specimens. **(Note 1)** HMA Production, delivery and placement temperatures for the type and class of PG Binders used are as follows:

Binder Grade	Temperature °C	Temperature °F
PG 46-40 <sup>Note 2</sup>	115 – 145	240 – 295
PG 52-28 <sup>Note 2</sup>	115 – 150	240 – 300
PG 58-28 <sup>Note 2</sup>	125 – 155	260 – 310
PG 64-22 <sup>Note 2</sup>	130 – 160	265 – 320
PG 64-28 <sup>Note 3</sup>	130 – 160	265 – 320
PG 70-22 <sup>Note 3</sup>	138 – 165	280 – 330
PG 70-28 <sup>Note 3</sup>	135 – 163	275 – 325
PG 76-22 <sup>Note 2</sup>	140 – 165	285 – 330
PG 76-28 <sup>Note 3</sup>	138 – 165	280 – 330

**Note 1:** Typically, these temperatures for Polymer-Modified PG Binders can be much higher than what is necessary or recommended at these viscosities. Therefore, it is important to follow the PG Binder Suppliers recommendations for the minimum and maximum laboratory mixing and compaction temperatures, in lieu of this procedure.

**Note 2:** For use as listed in the applicable section of Publication 408.

**Note 3:** These PG Binder Grades are restricted use non-standard grades. The PennDOT Laboratory Testing Section (LTS) must be contacted prior to use.

### Intermediate Test Temperatures for PG Binders

For PG 70-XX and greater high temperature grades (e.g., PG 76-22), the intermediate test temperature on the PAV Residue (Dynamic Shear T 315:  $G^* \sin \delta$ , Test Temp @ 10 rad/s.) will be 25°C (77°F). The material must meet the specification requirement (5000 kPa maximum) at 25°C (77°F).

PG suppliers sending PG 70-XX and greater high temperature grade material for plant verification testing to the LTS are required to send copies of their test results. Those test results must indicate that the intermediate test temperature was 25°C (77°F).

## QUALITY CONTROL PLAN REQUIREMENTS FOR PG BINDER SUPPLIERS

At least annually, submit a formal Quality Control (QC) Plan for PG Binders for each approved source. The QC plan shall address, but is not limited to, all requirements of AASHTO R 26 and as amended herein.

The QC Plan should include detailed manufacturing and testing procedures related to binder production, from receipt of your raw materials through storage and shipping of the final product.

Failure to adhere to the submitted and reviewed QC Plan may result in suspension of a source or sources for a period of time; as deemed appropriate and recommended by the Bulletin 15 Failures Committee.

The enclosed PG Binder Certification Document must be completed and signed.

You must reference the appropriate page number or item number in your QC Plan for each relevant requirement listed on the Certification Document.

Send the QC Plan and the completed PG Binder Certification Document to the Bituminous Testing Laboratory:

U.S. Mailing Address: (Do not send samples to this address)

PA Department of Transportation  
Materials Testing Laboratory  
DGS Annex Complex  
81 Lab Lane  
Harrisburg, PA 17110

Shipping Address: (UPS, FedEx, DHL, etc.):

PA Department of Transportation  
Materials Testing Laboratory  
DGS Annex Complex  
82 Dogwood Avenue  
Harrisburg, PA 17110



## PG BINDER CERTIFICATION DOCUMENT

This document shall be filled out and signed by the PG Binder Supplier and submitted annually together with the QC Plan.

1. Supplier of the PG Binder \_\_\_\_\_
2. Location of the Supplier \_\_\_\_\_
3. Persons performing Quality Control \_\_\_\_\_
4. Person ultimately responsible for QC decisions \_\_\_\_\_
5. Controls that are in place to ensure quality Page \_\_\_\_\_
6. Manufacturing Process:
  - a) A statement indicating that with the exception of PG 76-22, all other PG Binders approved for PennDOT projects, shall not be polymer-modified, nor shall they utilize oxidized or blown asphalt Page \_\_\_\_\_
  - b) A statement indicating that PG 76-22 binders will be modified with Styrene block co-Polymers SB or SBS, and not utilizing oxidized or blown asphalt. Page \_\_\_\_\_
  - c) Method of testing to establish quality. Page \_\_\_\_\_
  - d) How batches are identified or designated [e.g., Alphanumeric (TK2) or Day/Month/Year (3/8/20)]. Page \_\_\_\_\_
7. Frequency of QC testing:
  - a) Applicable test methods. Page \_\_\_\_\_
  - b) Statement indicating the test temperature on the PAV Residue AASHTO T 315 for PG 70-XX and greater high temperature grades will be 25°C. The material must meet the Specification requirement (5000 kPa maximum) at 25°C. Clearly document this when sending plant verification samples to the PennDOT Laboratory Testing Section (LTS). Page \_\_\_\_\_
  - c) Action points (tolerance requirements) for corrective measures. Page \_\_\_\_\_
  - d) Disposition of material which fails to meet Specification requirements shall include the following statements: Page \_\_\_\_\_
    - i. Asphalt Producers will be notified within 24 hours of non-compliant material shipment.
    - ii. Verification sample for the non-compliant batch(es) shall be received by the Department within 24 hours.
    - iii. Resumed shipment of adjusted material batch(es) will not occur until complete AASHTO M 320 certification testing is completed, results and verification sample received by the Department.

**PG BINDER CERTIFICATION DOCUMENT CONTINUED**

8. An acknowledgement that a verification sample and accompanying test results for each batch will be forwarded to the LTS as required by Section 702 in Publication 408 (Department of Transportaion Specifications). A batch is defined as a tank completely filled, partially filled, or refilled with a blend of residual material.

Page\_\_\_\_\_

9. Storage and shipping controls in place to prevent contamination or sample degradation.

Page\_\_\_\_\_

*I certify that the information and references provided to the Bureau of Project Delivery is accurate and meets PA Department of Transportation minimum QC Plan requirements of PG Binders.*

Company Representative Signature: \_\_\_\_\_

Title:\_\_\_\_\_

Phone Number:\_\_\_\_\_

e-mail Address:\_\_\_\_\_

# **PART II**

# **SPECIFICATIONS**



# **PERFORMANCE GRADED (PG) BINDER SPECIFICATIONS**

## SPECIFICATIONS FOR ASPHALT CEMENT, AASHTO PG 46-40

These specifications cover petroleum asphalt cement for use in seal coat, surface treatment, FB-2, hot mix recycling, or as otherwise specified in Publication 408 or Special Provisions.

The material is to be heated, as required, to yield a viscosity between 150 and 280 centistokes for mixing and between 50 and 120 centistokes for spraying. The maximum delivery temperature shall not exceed 177°C (350°F) when the material is used for spraying. The asphalt shall be homogeneous and shall not foam when heated.

Unless otherwise specified, PG Binders shall be tested in accordance with the latest version of AASHTO M 320, and the material shall conform to the following requirements:

<b>PG 46-40</b>			
<b>TESTS ON ORIGINAL BINDER</b>			
<b>TEST</b>	<b>TEST METHOD</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>
Flash Point, °C	AASHTO T 48	230	N/A
Viscosity, Pa•s	AASHTO T 316	N/A	3
Dynamic Shear, $G^*/\sin \delta$ , kPa	AASHTO T 315	1.00	N/A
<b>TESTS ON RTFO RESIDUE (AASHTO T 240)</b>			
Mass Loss, Percent, %	AASHTO T 240	N/A	1.00
Dynamic Shear, $G^*/\sin \delta$ , kPa	AASHTO T 315	2.20	N/A
<b>TESTS ON PAV RESIDUE (AASHTO R 28)</b>			
Dynamic Shear, $G^* \sin \delta$ , kPa	AASHTO T 315	N/A	5000
Creep Stiffness, MPa	AASHTO T 313	N/A	300
m-value		0.300	N/A

## SPECIFICATIONS FOR ASPHALT CEMENT, AASHTO PG 52-28

These specifications cover petroleum asphalt cement for use in hot mix recycling, FB-2, or as otherwise specified in Publication 408 or Special Provisions.

The material shall be heated, as required, to yield a viscosity between 150 and 280 centistokes. The maximum delivery temperature shall not exceed 177°C (350°F). The asphalt cement shall be homogeneous, free from water, and shall not foam when heated.

Unless otherwise specified, PG Binders shall be tested in accordance with the latest version of AASHTO M 320, and the material shall conform to the following requirements:

<b>PG 52-28</b>			
<b>TESTS ON ORIGINAL BINDER</b>			
<b>TEST</b>	<b>TEST METHOD</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>
Flash Point, °C	AASHTO T 48	230	N/A
Viscosity, Pa•s	AASHTO T 316	N/A	3
Dynamic Shear, G*/sin δ, kPa	AASHTO T 315	1.00	N/A
<b>TESTS ON RTFO RESIDUE (AASHTO T 240)</b>			
Mass Loss, Percent, %	AASHTO T 240	N/A	1.00
Dynamic Shear, G*/sin δ, kPa	AASHTO T 315	2.20	N/A
<b>TESTS ON PAV RESIDUE (AASHTO R 28)</b>			
Dynamic Shear, G* sin δ, kPa	AASHTO T 315	N/A	5000
Creep Stiffness, MPa	AASHTO T 313	N/A	300
m-value		0.300	N/A

## SPECIFICATIONS FOR ASPHALT CEMENT, AASHTO PG 58-28

These specifications cover petroleum asphalt cement for use in bituminous concrete base course, aggregate-bituminous base course, soil-bituminous base course, bituminous surface course ID-2, FJ-1, ID-3, FB-2, hot mix recycling, or as otherwise specified in Publication 408 or Special Provisions.

The material shall be heated, as required, to yield a viscosity between 150 and 280 centistokes. The maximum delivery temperature shall not exceed 177°C (350°F). The asphalt cement shall be homogeneous, free from water, and shall not foam when heated.

Unless otherwise specified, PG Binders shall be tested in accordance with the latest version of AASHTO M 320 and the material shall conform to the following requirements:

<b>PG 58-28</b>			
<b>TESTS ON ORIGINAL BINDER</b>			
<b>TEST</b>	<b>TEST METHOD</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>
Flash Point, °C	AASHTO T 48	230	N/A
Viscosity, Pa•s	AASHTO T 316	N/A	3
Dynamic Shear, $G^*/\sin \delta$ , kPa	AASHTO T 315	1.00	N/A
<b>TESTS ON RTFO RESIDUE (AASHTO T 240)</b>			
Mass Loss, Percent, %	AASHTO T 240	N/A	1.00
Dynamic Shear, $G^*/\sin \delta$ , kPa	AASHTO T 315	2.20	N/A
<b>TESTS ON PAV RESIDUE (AASHTO R 28)</b>			
Dynamic Shear, $G^* \sin \delta$ , kPa	AASHTO T 315	N/A	5000
Creep Stiffness, MPa	AASHTO T 313	N/A	300
m-value		0.300	N/A



**SPECIFICATIONS FOR ASPHALT CEMENT, AASHTO PG 64-22**

These specifications cover petroleum asphalt cement for use in bituminous concrete base course, aggregate-bituminous base course, soil-bituminous base course, bituminous surface course ID-2, FJ-1, FJ-4, ID-3, FB-2, hot mix recycling, or as otherwise specified in Publication 408 or Special Provisions.

The material shall be heated, as required to yield a viscosity between 150 and 280 centistokes. The maximum delivery temperature of the material shall not exceed 177°C (350°F). The asphalt cement shall be homogeneous, free from water, and shall not foam when heated.

Unless otherwise specified, PG Binders shall be tested in accordance with the latest version of AASHTO M 320 and the material shall conform to the following requirements:

<b>PG 64-22</b>			
<b>TESTS ON ORIGINAL BINDER</b>			
<b>TEST</b>	<b>TEST METHOD</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>
Flash Point, °C	AASHTO T 48	230	N/A
Viscosity, Pa•s	AASHTO T 316	N/A	3
Dynamic Shear, G*/sin δ, kPa	AASHTO T 315	1.00	N/A
<b>TESTS ON RTFO RESIDUE (AASHTO T 240)</b>			
Mass Loss, Percent, %	AASHTO T 240	N/A	1.00
Dynamic Shear, G*/sin δ, kPa	AASHTO T 315	2.20	N/A
<b>TESTS ON PAV RESIDUE (AASHTO R 28)</b>			
Dynamic Shear, G* sin δ, kPa	AASHTO T 315	N/A	5000
Creep Stiffness, MPa	AASHTO T 313	N/A	300
m-value		0.300	N/A

**SPECIFICATIONS FOR ASPHALT CEMENT, AASHTO PG 76-22**

These specifications cover Polymer-Modified Asphalt Cement, for use in “Heavy-Duty” (Anti-Rutting) Bituminous Concrete, or as otherwise specified in Publication 408 or Special Provisions.

The PG 76-22 shall consist of Conventional Asphalt Cement to which styrene block co-polymers SB or SBS have been added. The Polymer-Modified Binder shall be storage stable, preblended, and homogeneous. The supplier shall stipulate in writing specific handling, storage, or usage requirements.

Except as noted below, PG 76-22 shall be tested in accordance with the latest version of AASHTO M 320, and the material shall conform to the following requirements:

<b>PG 76-22</b>			
<b>TESTS ON ORIGINAL BINDER</b>			
<b>TEST</b>	<b>TEST METHOD</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>
Flash Point, °C	AASHTO T 48	230	N/A
Viscosity, Pa•s	AASHTO T 316	N/A	3
Dynamic Shear, G*/sin δ, kPa	AASHTO T 315	1.00	N/A
Separation, R & B Difference, °C	ASTM D5976	N/A	2.2
<b>TESTS ON RTFO RESIDUE (AASHTO T 240)</b>			
Mass Loss, Percent, %	AASHTO T 240	N/A	1.00
Dynamic Shear, G*/sin δ, kPa	AASHTO T 315	2.20	N/A
Elastic Recovery @ 25°C (77°F), %	ASTM D6084	60	N/A
<b>TESTS ON PAV RESIDUE (AASHTO R 28)</b>			
Dynamic Shear, G* sin δ, kPa <u>Note: Test Temperature = 25°C</u>	AASHTO T 315	N/A	5000
Creep Stiffness, MPa	AASHTO T 313	N/A	300
m-value		0.300	N/A

# **EMULSIFIED ASPHALT SPECIFICATIONS**

**SPECIFICATIONS FOR EMULSIFIED ASPHALT (AEP)**

These specifications cover emulsified asphalts for use as a bituminous prime coat or a dust palliative.

This material shall be applied in one (1) application undiluted between 32°C (90°F) and 60°C (140°F), at the specified application rate on a prepared surface. As a dust palliative, apply at a rate of 1.13 to 1.36 liters per square meter (0.25 to 0.30 gallons per square yard) on roads which have been properly prepared by blading, grading and compacting.

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts with low residue content which are held in storage tanks, drums, or distributors for longer than 24 hours are subject to rapid settlement. Therefore, prior to sampling AEP emulsions for test purposes, the material shall be agitated or circulated. Additionally, AEP emulsions shall be agitated or circulated prior to application to ensure uniformity.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

<b>AEP</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Saybolt Furol Viscosity @ 25°C (77°F), SFS	AASHTO T 59	N/A	75
Sieve Test, %		N/A	0.10
Sand Penetration Test and Cure Test	Bulletin 25 Appendix B	<b>PASS</b>	
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	38	N/A
Oil distillate, percent by volume of the total emulsion, %		N/A	4

**SPECIFICATIONS FOR EMULSIFIED ASPHALT TACK COAT (AET)**

These specifications cover slow setting cationic or anionic emulsified asphalts, for conditioning and treating an existing surface with an application of bituminous bonding material (tack coat). This material shall be heated, as required, for proper distributor application between 24°C (75°F) and 60°C (140°F). To avoid "Boil-Off" of the water in AET emulsions, do not exceed 60°C (140°F) application temperature.

The emulsified asphalt shall be homogeneous. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts with low residue content which are held in storage tanks, drums, or distributors for longer than 24 hours are subject to rapid settlement. Therefore, prior to sampling AET emulsions for test purposes, the material shall be agitated or circulated. Additionally, AET emulsions shall be agitated or circulated prior to application to ensure uniformity.

The specific gravity of the emulsified asphalt shall be reported for each shipment.

The emulsified asphalt shall also meet the following requirements:

<b>AET</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	Anionic	Negative	
	Cationic	Positive	
Saybolt Furol Viscosity @ 25°C (77°F), SFS	AASHTO T 59	N/A	100
Storage Stability Test, 24 hour, %		N/A	1.0
Sieve Test, %		N/A	0.10
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	28	38
Oil distillate, percent by volume of the total emulsion, % ( <b>Note 1</b> )		N/A	2
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	50	175
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** The presence of oil distillate as specified is only permissible in field obtained samples.

## SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALT, AASHTO GRADE CMS-2

These specifications cover cationic medium setting emulsified asphalt, for use in bituminous stabilization, bituminous surface courses FB-1 and FB-2, and cold mix recycling.

When the material is applied by distributor, the application temperature of the material shall be between 60°C (140°F) and 71°C (160°F). When used in motor paver work, the temperature of the material shall be between 38°C (100°F) and 71°C (160°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements: **(Note 1)**

<b>CMS-2</b>				
<b>Test</b>		<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test		AASHTO T 59	Positive	
*Stone Coating Test on <u>Proposed Aggregate</u>	Coating, dry aggregate		Good	
	Coating, wet aggregate		Fair	
Saybolt Furol Viscosity @ 50°C (122°F), SFS			50	450
Storage Stability Test, 24 hour, % <b>(Note 2)</b>			N/A	1.0
Sieve Test, % <b>(Note 2)</b>			N/A	0.10
<b>Distillation:</b>				
Asphalt Residue, % by mass (weight), %		AASHTO T 59	65	N/A
Oil distillate, percent by volume of the total emulsion, %			N/A	12
<b>Tests on Residue from Distillation:</b>				
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm		AASHTO T 49	100	250
Ductility @ 25°C (77°F) 5 cm/min, cm		AASHTO T 51	40	N/A
Solubility in trichloroethylene, %		AASHTO T 44	97.5	N/A

\*See Appendix A, Section 2.0 for coating test procedures.

**Note 1:** Identical to AASHTO M 208.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE CQS-1hP

These specifications cover quick setting cationic emulsified asphalt for **Micro-Surfacing**, de-slicking and slurry seal operations. (**Note 1**)

This material shall be heated, as required, for proper distributor application from 32°C (90°F) to 65°C (150°F). When used in mixing operations the material shall be between 21°C (70°F) and 65°C (150°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks, drums, or distributors for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated or circulated, sampled and retested to determine its compliance with these specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements: (**Note 2**)

CQS-1hP			
Test	Test Method	Minimum	Maximum
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 25°C (77°F), SFS		20	100
Storage Stability Test, 24 hour, % ( <b>Note 3</b> )		N/A	1.0
Sieve Test, % ( <b>Note 4</b> )		N/A	0.10
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	62	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	40	90
Elastic Recovery, 10°C (50°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	AASHTO T 301	50	N/A
Ring and Ball Softening Point, °F	AASHTO T 53	135	N/A
Ash content, %	AASHTO T 111	N/A	1

**Note 1:** The asphalt shall be Polymer-Modified **prior** to emulsification. All modifiers shall be incorporated before the milling process at the producer's manufacturing facility.

**Note 2:** Identical to AASHTO M 316.

**Note 3:** This test requirement is for samples taken at the point of use.

**Note 4:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field

## SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALT, AASHTO GRADE CRS-1

These specifications cover cationic rapid setting emulsified asphalt, for use in mulching, Portland cement concrete curing (base course), or as specified in Publication 408.

The material shall be heated, as required, for proper distributor application, between 21°C (70°F) and 66°C (150°F). When the material is obtained from drums, the minimum application temperature of the material shall be 4.4°C (40°F).

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and shall show no separation of asphalt within 30 days after delivery, provided separation has not been caused by freezing.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements: **(Note 1)**

<b>CRS-1</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 50°C (122°F), SFS		20	100
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Demulsibility, 35 ml of 0.8% Sodium Dioctyl Sulfosuccinate, %		40	N/A
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	60	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	100	250
Ductility @ 25°C (77°F) 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** Identical to AASHTO M 208.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.



**CRS-1P**  
**Low Temperature Emulsion**

**SPECIFICATIONS FOR "LOW-TEMPERATURE" POLYMER-MODIFIED CATIONIC EMULSIFIED ASPHALT CRS-1P**

These specifications cover cationic rapid setting Polymer-Modified emulsified asphalt, for use only on low temperature seal coat operations. **(Note 1)**

The ambient temperature range for the use of CRS-1PM is 2°C (35°F) to 13°C (55°F). The supplier of CRS-1P low temperature emulsion shall stipulate in writing any specific handling, storage, usage, or temperature requirements. Unless authorized by the engineer, no deviation from the supplier's recommendations shall be permitted. CRS-1P low temperature emulsions should not be used in rainy weather or on wet or damp surfaces. Calibrated equipment in good repair must be used.

The emulsion shall be homogeneous and miscible with water in all proportions. It shall show no separation of asphalt within 30 days after delivery, provided separation has not been caused by freezing.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The asphalt shall be polymer-modified **prior** to emulsification. All modifiers shall be incorporated before the milling process, at the producer's manufacturing facility.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

<b>CRS-1P</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 25°C (122°F), SFS		20	200
Sieve Test, %		N/A	0.10
Breaking index at 20°C (68°F)		N/A	80
<b>Distillation:</b>			
Residue by Distillation at 204°C (400°F), %	AASHTO T 59	65	N/A
Oil Distillate, by volume of total emulsion, %		N/A	5
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	100	250
Elastic Recovery, 10°C (50°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	AASHTO T 301	60	N/A

**Note 1:** The asphalt shall be Polymer-Modified **prior** to emulsification. All modifiers shall be incorporated, before the milling process, at the producer's manufacturing facility.

**SPECIFICATIONS FOR "LOW-TEMPERATURE" POLYMER-MODIFIED CATIONIC EMULSIFIED  
ASPHALT CRS-1P (Continued)  
BREAKING INDEX (B.I.)**

1. SCOPE

This procedure is used to determine the amount of a specified silica filler necessary to break 100 grams of emulsion. The mass of material that results in the breaking of the emulsion is the breaking index.

2. EQUIPMENT AND MATERIALS

- 2.1 500 ml metal breaker
- 2.2 Glass stirring rod
- 2.3 Balance capable of  $\pm 0.1$  g. accuracy
- 2.4 Oven
- 2.5 Siliceous filler

The siliceous filler shall be a natural sand or natural sand and silica flour having a minimum SiO<sub>2</sub> content of 98%. The specific gravity should be approximately 2.65. The grading shall be as follows:

	U.S. Std. <u>Sieve No.</u>	Percent <u>Passing</u>
150 $\mu\text{m}$	(100)	100
106 $\mu\text{m}$	(140)	90 - 95
75 $\mu\text{m}$	(200)	50 - 60
45 $\mu\text{m}$	(325)	10 - 25

The filler must be dried to constant mass at  $100^{\circ}\text{C} \pm 5.5^{\circ}\text{C}$  ( $212^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ) prior to the test and then stored in a sealed container.

3. PROCEDURE

- 3.1 Weigh 100 g. of emulsion into the metal beaker. Record the mass of the beaker, stirring rod, and emulsion as  $M_1$ .
- 3.2 Place the beaker, stirring rod, and emulsion in an environmental chamber at  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ), and allow the temperature to stabilize.
- 3.3 Slowly add the filler to the emulsion while stirring with the glass rod. Continuously add the filler at a rate of a few grams per second.
- 3.4 When the emulsion plus filler becomes black and cohesive, the emulsion is considered broken and no additional filler should be added. Only a small amount of free water should be present.
- 3.5 Weigh the beaker, stirring rod, and emulsion plus filler. Record the mass as  $M_2$ .

4. CALCULATION

- 4.1 The breaking index is defined as the mass of filler necessary to break 100 grams of emulsion.

$$\text{B.I.} = M_2 - M_1$$

## SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALT, AASHTO GRADE CRS-2

These specifications cover cationic rapid setting emulsified asphalt, for use in surface treatment, seal coat, paved shoulders, or as otherwise specified in Publication 408.

This material shall be heated, as required, for proper application between 60°C (140°F) and 79°C (175°F).

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and shall show no separation of asphalt within 30 days after delivery, provided separation has not been caused by freezing.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

<b>CRS-2</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 50°C (122°F), SFS		150	400
Storage Stability Test, 24 hour, % <b>(Note 1)</b>		N/A	1.0
Sieve Test, % <b>(Note 1)</b>		N/A	0.10
<b>Distillation:</b>			
Oil Distillate, by volume of total emulsion, %	AASHTO T 59	N/A	3
Asphalt Residue, % by mass (weight), %		65	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100 g, 5 sec, 0.1 mm	AASHTO T 49	100	250
Ductility @ 25°C (77°F) 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

## SPECIFICATIONS FOR POLYMER MODIFIED CATIONIC EMULSIFIED ASPHALT CRS-2P

These specifications cover cationic rapid setting Polymer-Modified emulsified asphalt, for use in seal coats. **(Note 1)**

This material shall be heated, as required, for proper application between 60°C (140°F) and 79°C (175°F).

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and shall show no separation of asphalt within 30 days after delivery, provided separation has not been caused by freezing.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

<b>CRS-2P</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 50°C (122°F), SFS		150	400
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Sieve Test, % <b>(Note 2)</b>		N/A	0.30
<b>Distillation: (Note 3)</b>			
Oil Distillate, by volume of total emulsion, %	AASHTO T 59	N/A	3
Asphalt Residue, % by mass (weight), %		65	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100 g, 5 sec, 0.1 mm	AASHTO T 49	100	250
Ductility @ 4°C (39.2°F) 5 cm/min, cm	AASHTO T 51	30	N/A
Ash, %	AASHTO T 111	N/A	1
Softening Point, Ring & Ball, °C	AASHTO T 53	38	N/A
Elastic Recovery, 10°C (50°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	AASHTO T 301	50	N/A

**Note 1:** The asphalt shall be Polymer-Modified **prior** to emulsification. All modifiers shall be incorporated, before the milling process, at the producer's manufacturing facility.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** AASHTO T 59 modified to maintain a 177°C ± 5.5°C (350°F ± 10°F) maximum temperature for 15 minutes.

**SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALT, AASHTO GRADE CSS-1**

These specifications cover cationic slow setting emulsified asphalt, for use in patching, soil bituminous stabilization, mulching, bituminous surface courses FB-1, FB-2, and cold mix recycling.

This material shall be heated, as required, for proper application between 32°C (90°F) and 65°C (150°F). When used in mixing operations the material shall be between 21°C (70°F) and 65°C (150°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements: **(Note 1)**

<b>CSS-1</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 25°C (77°F), SFS		20	100
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
Cement Mixing Test, %		N/A	2.0
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AAHSTO T 59	57	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	100	250
Ductility @ 15.5°C (60°F) 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** Identical to AASHTO M 208

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALT, AASHTO GRADE CSS-1h**

These specifications cover cationic slow setting emulsified asphalt, for de-slicking and slurry seal operation, waterproofing primer, and cold mix recycling.

This material shall be heated, as required, for proper application between 32°C (90°F) and 65°C (150°F). When used in mixing operations the material shall be between 21°C (70°F) and 65°C (150°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment.

The emulsified asphalt shall also meet the following requirements: **(Note 1)**

<b>CSS-1h</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 25°C (77°F), SFS		20	100
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
Cement Mixing Test, %		N/A	2.0
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AAHSTO T 59	57	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25 °C (77°F), 100 g, 5 sec, 0.1 mm	AASHTO T 49	40	90
Ductility @ 25°C (77°F) 5 cm per min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** Identical to AASHTO M 208.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE CSS-1hP

These specifications cover slow setting cationic emulsified asphalt for fog sealing, waterproofing primer, and cold mix recycling. **(Note 1)**

This material shall be heated, as required, for proper distributor application from 32°C (90°F) to 65°C (150°F). When used in mixing operations the material shall be between 21°C (70°F) and 65°C (150°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks, drums, or distributors for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated or circulated, sampled and retested to determine its compliance with these specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements: **(Note 2)**

<b>CSS-1hP</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 25°C (77°F), SFS		20	100
Storage Stability Test, 24 hour, % <b>(Note 3)</b>		N/A	1.0
Sieve Test, % <b>(Note 4)</b>		N/A	0.10
Cement Mixing Test, %		N/A	2.0
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	57	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1 mm	AASHTO T 49	40	90
Elastic Recovery, 10°C (50°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	AASHTO T 301	25	N/A
Ash content, %	AASHTO T 111	N/A	1

**Note 1:** The asphalt shall be Polymer-Modified **prior** to emulsification. All modifiers shall be incorporated before the milling process at the producer's manufacturing facility.

**Note 2:** Identical to AASHTO M 316.

**Note 3:** This test requirement is for samples taken at the point of use.

**Note 4:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT (E-1 PRIME)

These specifications cover emulsified asphalts for use as a bituminous prime coat or dust palliative.

This material shall be applied by Distributor, at an application temperature between 38°C (100°F) and 77°C (170°F). As a dust palliative, apply at a rate of 1.13 to 1.36 liters per square meter (0.25 to 0.30 gallons per square yard) on roads which have been properly prepared by blading, grading and compacting.

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts with low residue content which are held in storage tanks, drums, or distributors for longer than 24 hours are subject to rapid settlement. Therefore, prior to sampling E-1 Prime emulsions for test purposes, the material shall be agitated or circulated. Additionally, E-1 Prime emulsions shall be agitated or circulated prior to application to ensure uniformity.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

<b>E-1 PRIME</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Saybolt Furol Viscosity @ 25°C (77°F), SFS	AASHTO T 59	N/A	30
Storage Stability Test, 24 hr, %		N/A	1.0
Sieve Test, %		N/A	0.10
Cure Test	Bulletin 25 Appendix B	<b>PASS</b>	
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	38	48
Oil distillate, percent by volume of the total emulsion, % <b>(Note 1)</b>		N/A	8%
<b>TESTS ON RESIDUE FROM DISTILLATION @349°C (660°F): (Note 1)</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	200	N/A
Ductility @ 4°C (40°F), 5 cm/min, cm	AASHTO T 51	50	N/A

**Note 1:** AASHTO T 59-16 (Residue and Oil Distillate by Distillation) Section 6 with the following modifications:

Sec. 6.3 Apparatus - Two (2) ring burners with the dimensions described therein.

Sec. 6.3.4 Thermometers - The 279 mm (11 inch) total immersion thermometer that monitors the temperature of the emulsion, shall be an ASTM 8C.

Sec. 6.4.4 Procedure - Place one of the ring burners around the still, about 76 mm (3 inches) from the bottom of the still. Place the second ring burner around the still, about 25 mm (1 inch) from the top of the still.



**SPECIFICATIONS FOR EMULSIFIED ASPHALT (E-1 PRIME) (Continued)**

Apply heat by lighting both ring burners and adjusting to a low flame. Also, apply just enough heat from a bunsen burner to the connecting tube to prevent condensation in this tube.

Sec. 6.4.5 Procedure - Move the bottom ring burner approximately level with the bottom of the still when the temperature on the lower thermometer reaches 327°C (620°F), while leaving the top burner in its original position. Increase the temperature to 349°C ± 5°C (660 ± 9°F) maintaining this temperature for fifteen minutes. The total distillation should be completed in 60 ± 15 minutes from the first application of heat.

Sec. 6.4.6 Procedure - When completed with the distillation, leave the still sit for about 10 minutes, or until vapors are no longer present. Weigh the still and accessories as described in Section 14.1. Calculate and report the percentage residue by distillation. Record the volume of oil distillate to the nearest 1/2 ml. Calculate and report the oil distillate as a volume percentage of the total emulsion. Save this oil distillate, if identification is required.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT, E-10

These specifications cover medium setting High-Float emulsified asphalt, for use in hot plant mix stock pile patching material.

This material is to be heated, as required, for proper mixing between 60°C (140°F) and 79°C (175°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

<b>E-10</b>				
<b>Test</b>		<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
*Stone Coating Test on <u>Proposed</u> Aggregate	Coating, dry aggregate	AASHTO T 59	Good	
	Coating, wet aggregate		Fair	
Saybolt Furol Viscosity @ 50°C (122°F), SFS			50	1500
Storage Stability Test, 24 hour, % <b>(Note 1)</b>			N/A	1.0
<b>Distillation:</b>				
Asphalt Residue, % by mass (weight), %		AASHTO T 59	65	N/A
Oil distillate, percent by volume of the total emulsion, %			2	7
<b>Tests on Residue from Distillation:</b>				
Float Test @ 60°C (140°F), sec		AASHTO T 50	1200	N/A
Solubility in trichloroethylene, %		AASHTO T 44	97.5	N/A

\*See Appendix A, Section 2.0 for coating test procedures.

**Note 1:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT (EDP)

These specifications cover emulsified asphalts for use as a bituminous prime coat or a dust palliative.

This material shall be applied in one (1) application undiluted between 32°C (90°F) and 60°C (140°F), at the specified application rate on a prepared surface. As a dust palliative, apply at a rate of 2.3 to 3.4 liters per square meter (0.50 to 0.75 gallons per square yard) on roads which have been properly prepared by blading, grading and compacting. As a prime coat apply at a rate of 1.35 to 3.20 liters per square meter (0.30 to 0.70 gallons per square yard).

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts with low residue content which are held in storage tanks, drums, or distributors for longer than 24 hours are subject to rapid settlement. Therefore, prior to sampling EDP emulsions for test purposes, the material shall be agitated or circulated. Additionally, EDP emulsions shall be agitated or circulated prior to application to ensure uniformity.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

<b>EDP</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Saybolt Furol Viscosity @ 25°C (77°F), SFS	AASHTO T 59	N/A	40
Sieve Test, %		N/A	0.10
Cure Test	Bulletin 25 Appendix B	<b>PASS</b>	
<b>Distillation:</b>			
Residue % by mass for use as a dust palliative, %	AASHTO T 59	20	40
Residue % by mass for use as a prime coat, %		40	50
Oil distillate, percent by volume of total emulsion, %		N/A	3

**SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE HFMS-2**

These specifications cover High-Float medium setting emulsified asphalt, for use in bituminous wearing and binder courses FB-1, FB-2, and cold mix recycling.

This material is to be heated, as required, for proper mixing between 60°C (140°F) and 79°C (175°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements (**Note 1**)

<b>HFMS-2</b>				
<b>Test</b>		<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
*Stone Coating Test on <u>Proposed</u> Aggregate	Coating, dry aggregate	AASHTO T 59	Good	
	Coating, wet aggregate		Fair	
Saybolt Furol Viscosity @ 25°C (77°F), SFS			100	N/A
Storage Stability Test, 24 hour, % ( <b>Note 2</b> )			N/A	1.0
Sieve test, % ( <b>Note 2</b> )			N/A	0.10
Sieve test, % ( <b>Note 3</b> )			N/A	0.30
<b>Distillation:</b>				
Asphalt Residue, % by mass (weight), %		AASHTO T 59	65	N/A
<b>Tests on Residue from Distillation:</b>				
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm		AASHTO T 49	100	200
Float Test @ 60°C (140°F), sec		AASHTO T 50	1200	N/A
Ductility @ 25°C (77°F), 5 cm/min, cm		AASHTO T 51	40	N/A
Solubility in trichloroethylene, %		AASHTO T 44	97.5	N/A

\*See Appendix A, Section 2.0 for coating test procedures.

**Note 1:** Identical to AASHTO M 140.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** For samples taken at the point of use.

**SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE HFMS-2h**

These specifications cover High-Float medium setting emulsified asphalt, for use in bituminous wearing and binder courses FB-1, FB-2, and cold mix recycling.

This material is to be heated, as required, for proper mixing between 60°C (140°F) and 79°C (175°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements: **(Note 1)**

HFMS-2h				
Test		Test Method	Minimum	Maximum
*Stone Coating Test on <u>Proposed</u> Aggregate	Coating, dry aggregate	AASHTO T 59	Good	
	Coating, wet aggregate		Fair	
Saybolt Furol Viscosity @ 25°C (77°F), SFS			100	N/A
Storage Stability Test, 24 hour, % <b>(Note 2)</b> , %			N/A	1.0
Sieve test, % <b>(Note 2)</b>			N/A	0.10
Sieve test, % <b>(Note 3)</b>			N/A	0.30
<b>Distillation:</b>				
Asphalt Residue, % by mass (weight), %		AASHTO T 59	65	N/A
<b>Tests on Residue from Distillation:</b>				
Penetration @ 25°C (77°F), 100g, 5s, 0.1 mm		AASHTO T 49	40	90
Float Test @ 60°C (140°F), sec		AASHTO T 50	1200	N/A
Ductility @ 25°C (77°F) 5 cm/min, cm		AASHTO T 51	40	N/A
Solubility in trichloroethylene, %		AASHTO T 44	97.5	N/A

\*See Appendix A, Section 2.0 for coating test procedures.

**Note 1:** Identical to AASHTO M 140.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** For samples taken at the point of use.

**SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE HFMS-2s**

These specifications cover High-Float medium setting emulsified asphalt, for use in bituminous wearing and binder courses FB-1, FB-2, and cold mix recycling.

This material is to be heated, as required, for proper mixing between 60°C (140°F) and 79°C (175°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements: **(Note 1)**

HFMS-2s				
Test		Test Method	Minimum	Maximum
*Stone Coating Test on Proposed Aggregate	Coating, dry aggregate	AASHTO T 59	Good	
	Coating, wet aggregate		Fair	
Saybolt Furol Viscosity @ 25 °C (77°F), SFS			50	N/A
Storage Stability Test, 24 hour, % <b>(Note 2)</b>			N/A	1.0
Sieve test, % <b>(Note 2)</b>			N/A	0.10
Sieve test, % <b>(Note 3)</b>			N/A	0.30
<b>Distillation:</b>				
Asphalt Residue, % by mass (weight), %		AASHTO T 59	65	N/A
Oil distillate, percent by volume of total emulsion, %			1	7
<b>Tests on Residue from Distillation:</b>				
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm		AASHTO T 49	200	N/A
Float Test @ 60°C (140°F), sec		AASHTO T 50	1200	N/A
Ductility @ 25°C (77°F) 5 cm/min, cm		AASHTO T 51	40	N/A
Solubility in trichloroethylene, %		AASHTO T 44	97.5	N/A

\*See Appendix A, Section 2.0 for coating test procedures.

**Note 1:** Identical to AASHTO M 140.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** For samples taken at the point of use.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE HFRS-2

These specifications cover High-Float rapid setting emulsified asphalt for use in seal coats.

This material shall be heated, as required, for proper application from 60°C (140°F) to 79°C (175°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks, drums, or distributors for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated or circulated, sampled and retested to determine its compliance with these specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements: **(Note 1)**

<b>HFRS-2</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Saybolt Furol Viscosity @ 50°C (122F), SFS	AASHTO T 59	75	400
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Sieve Test, % <b>(Note 3)</b>		N/A	0.10
<b>Demulsibility:</b>			
35 mL, 0.02 N CaCl <sub>2</sub> , %	AASHTO T 59	50	N/A
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	65	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77F), 100g, 5s, 0.1mm	AASHTO T 49	100	250
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	40	N/A
Float test @ 60°C (140°F), sec	AASHTO T 50	1200	N/A
Ash content, %	AASHTO T 111	N/A	1

**Note 1:** Identical to AASHTO M 140.

**Note 2:** This test requirement is for samples taken at the point of use.

**Note 3:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE HFRS-2P

These specifications cover High-Float rapid setting emulsified asphalt for use in seal coats. **(Note 1)**

This material shall be heated, as required, for proper application from 60°C (140°F) to 79°C (175°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks, drums, or distributors for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated or circulated, sampled and retested to determine its compliance with these specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements: **(Note 2)**

HFRS-2P			
Test	Test Method	Minimum	Maximum
Saybolt Furol Viscosity @ 50°C (122°F), SFS	AASHTO T 59	75	400
Storage Stability Test, 24 hour, % <b>(Note 3)</b>		N/A	1.0
Sieve Test, % <b>(Note 4)</b>		N/A	0.10
<b>Demulsibility:</b>			
35 mL, 0.02 N CaCl <sub>2</sub> , %	AASHTO T 59	50	N/A
<b>Distillation:</b>			
Oil Distillate by Volume of emulsified asphalt, %	AASHTO T 59	N/A	3
Asphalt Residue, % by mass (weight), %		65	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	100	200
Elastic Recovery, 25°C (77°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	AASHTO T 301	60	N/A
Float test @ 60°C (140°F), sec.	AASHTO T 50	1200	N/A
Ash content, %	AASHTO T 111	N/A	1

**Note 1:** The asphalt shall be Polymer-Modified **prior** to emulsification. All modifiers shall be incorporated before the milling process at the producer's manufacturing facility.

**Note 2:** Identical to AASHTO M 316.

**Note 3:** This test requirement is for samples taken at the point of use.

**Note 4:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.



## SPECIFICATIONS FOR ANIONIC EMULSIFIED ASPHALT, AASHTO GRADE MS-2

These specifications cover medium setting anionic emulsified asphalt, for use in soil bituminous stabilization, bituminous surface courses FB-1 and FB-2, and cold mix recycling.

When the material is applied by distributor, the application temperature of the material shall be between 60°C (140°F) and 71°C (160°F). When used in motor paver work, the temperature of the material shall be between 38°C (100°F) and 71°C (160°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment.

The emulsified asphalt shall also meet the following requirements: **(Note 1)**

<b>MS-2</b>				
<b>Test</b>		<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test		AASHTO T 59	Negative	
*Stone Coating Test on <u>Proposed</u> Aggregate	Coating, dry aggregate		Good	
	Coating, wet aggregate		Fair	
Saybolt Furol Viscosity @ 25°C (77°F), SFS			100	N/A
Storage Stability Test, 24 hour, % <b>(Note 2)</b>			N/A	1.0
Sieve Test, % <b>(Note 2)</b>			N/A	0.10
Sieve Test, % <b>(Note 3)</b>			N/A	0.30
<b>Distillation:</b>				
Asphalt Residue, % by mass (weight), %		AASHTO T 59	65	N/A
<b>Tests on Residue from Distillation:</b>				
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm		AASHTO T 49	100	200
Ductility @ 25°C (77°F) 5 cm/min, cm		AASHTO T 51	40	N/A
Solubility in trichloroethylene, %		AASHTO T 44	97.5	N/A

\*See Appendix A, Section 2.0 for coating test procedures.

**Note 1:** Identical to AASHTO M 140.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** For samples taken at the point of use.

**SPECIFICATIONS FOR NON-TRACKING TACK COATS (NTT / CNTT)**

These specifications cover cationic or anionic emulsified asphalts used as a non-tracking tack coat for conditioning and treating an existing surface or between pavement layers with an application of bituminous bonding material.

This material shall be heated, as required, for proper distributor application between 60°C (140F) and 82°C (180F). The consistency of the emulsified asphalt shall be appropriate for pumping, sampling, and applying uniform spray coverage.

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery.

Emulsified asphalts held in storage tanks, drums, or distributors for periods longer than 30 days shall be inspected visually to determine if separation has occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated or circulated, sampled and retested to determine its compliance with these specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements:

NTT / CNTT			
Test	Test Method	Minimum	Maximum
Particle Charge	Anionic	Negative	
	Cationic	Positive	
Saybolt Furol Viscosity @ 25°C (77°F), SFS	AASHTO T 59	N/A	100
Storage Stability Test, 24 hour, % <b>(Note 1)</b>		N/A	1.0
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
Sieve Test, % <b>(Note 1 and 2)</b>		N/A	0.30
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	50	N/A
Oil Distillate, % by volume of total emulsion, % <b>(Note 3)</b>		N/A	2.0
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	10	60
Softening Point, Ring & Ball, °C	AASHTO T 53	45	N/A

**Note 1:** This test requirement is for samples taken at the point of use.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** The presence of oil distillate as specified is only permissible in field obtained samples.

## SPECIFICATIONS FOR ANIONIC EMULSIFIED ASPHALT, AASHTO GRADE RS-1

These specifications cover rapid setting anionic emulsified asphalt, for use in mulching, Portland cement concrete curing (base course), or as specified in Publication 408.

The material shall be heated, as required, for proper distributor application, between 21°C (70°F) and 66°C (150°F). When the material is obtained from the drums, the minimum application temperature of the material shall be 4.4°C (40°F).

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and shall show no separation of asphalt within 30 days after delivery, provided separation has not been caused by freezing.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements: **(Note 1)**

RS-1			
Test	Test Method	Minimum	Maximum
Saybolt Furol Viscosity @ 25°C (77°F), SFS	AASHTO T 59	20	100
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Demulsibility, 35 ml of CaCl <sub>2</sub> solution (0.02 N), %		60	N/A
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
Sieve Test, % <b>(Note 3)</b>		N/A	0.30
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	55	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	100	200
Ductility @ 25°C (77°F) 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** Identical to AASHTO M 140.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** For samples taken at the point of use.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE RS-2

These specifications cover rapid setting emulsified asphalt, for use in surface treatment, seal coat, paved shoulders, or as otherwise specified in Publication 408.

This material shall be heated, as required, for proper application between 60°C (140°F) and 79°C (175°F).

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and shall show no separation of asphalt within 30 days after delivery, provided separation has not been caused by freezing. Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

RS-2			
Test	Test Method	Minimum	Maximum
Saybolt Furol Viscosity @ 50°C (122°F), SFS	AASHTO T 59	150	400
Storage Stability Test, 24 hour, % <b>(Note 1)</b>		N/A	1.0
Demulsibility, 35 ml of CaCl <sub>2</sub> solution (0.02 N), %		60	N/A
Sieve Test, % <b>(Note 1)</b>		N/A	0.10
Sieve Test, % <b>(Note 2)</b>		N/A	0.30
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	63	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	100	200
Ductility @ 25°C (77°F) 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 2:** For samples taken at the point of use.

## SPECIFICATIONS FOR POLYMER MODIFIED ANIONIC EMULSIFIED ASPHALT RS-2P

These specifications cover anionic rapid setting Polymer-Modified emulsified asphalt, for use in seal coats. **(Note 1)**

This material shall be heated, as required, for proper application between 60°C (140°F) and 79°C (175°F).

The emulsified asphalt shall be homogeneous, shall be miscible with water in all proportions and shall show no separation of asphalt within 30 days after delivery, provided separation has not been caused by freezing.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements:

<b>RS-2P</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Negative	
Saybolt Furol Viscosity @ 50°C (122°F), SFS		150	400
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Sieve Test, % <b>(Note 2)</b>		N/A	0.30
<b>Distillation: (Note 3)</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	63	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	100	200
Ductility @ 4°C (39.2°F) 5 cm/min, cm	AASHTO T 51	30	N/A
Ash, %	AASHTO T 111	N/A	1
Softening Point, Ring & Ball, °C	AASHTO T 53	38	N/A
Elastic Recovery @ 10°C (50°F), %	AASHTO T 301	50	N/A

**Note 1:** The asphalt shall be Polymer-Modified **prior** to emulsification. All modifiers shall be incorporated, before the milling process, at the producer's manufacturing facility.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** AASHTO T 59 modified to maintain a 177°C ± 5.5°C (350°F ± 10°F) maximum temperature for 15 minutes.

## SPECIFICATIONS FOR ANIONIC EMULSIFIED ASPHALT, AASHTO GRADE SS-1

These specifications cover slow setting anionic emulsified asphalt, for use in patching, soil bituminous stabilization, mulching, bituminous surface courses FB-1, FB-2, and cold mix recycling.

This material shall be heated, as required, for proper application between 32°C (90°F) and 65°C (150°F). When used in mixing operations the material shall be heated between 21°C (70°F) and 65°C (150°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment and shall also meet the following requirements: **(Note 1)**

<b>SS-1</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Negative	
Saybolt Furol Viscosity @ 25°C (77°F), SFS		20	100
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
Sieve Test, % <b>(Note 3)</b>		N/A	0.30
Cement Mixing Test, %		N/A	2.0
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AAHSTO T 59	57	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	100	200
Ductility @ 25°C (77°F) 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** Identical to AASHTO M 140.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** For samples taken at the point of use.

## SPECIFICATIONS FOR ANIONIC EMULSIFIED ASPHALT, AASHTO GRADE SS-1h

These specifications cover slow setting anionic emulsified asphalt, for de-slicking and slurry seal operation, waterproofing primer, and cold mix recycling.

This material shall be heated, as required, for proper application between 32°C (90°F) and 65°C (150°F). When used in mixing operations the material shall be between 21°C (70°F) and 65°C (150°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine its compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment.

The emulsified asphalt shall also meet the following requirements: **(Note 1)**

<b>SS-1h</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge Test	AASHTO T 59	Negative	
Saybolt Furol Viscosity @ 25°C (77°F), SFS		20	100
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1.0
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
Sieve Test, % <b>(Note 3)</b>		N/A	0.30
Cement Mixing Test, %		N/A	2.0
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	57%	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	40	90
Ductility @ 25°C (77°F) 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** Identical to AASHTO M 140

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** For samples taken at the point of use.

## SPECIFICATIONS FOR EMULSIFIED ASPHALT, AASHTO GRADE SS-1hP

These specifications cover slow setting anionic emulsified asphalt for fog sealing, waterproofing primer, and cold mix recycling. **(Note 1)**

This material shall be heated, as required, for proper distributor application from 32°C (90°F) to 65°C (150°F). When used in mixing operations the material shall be between 21°C (70°F) and 65°C (150°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks, drums, or distributors for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated or circulated, sampled and retested to determine its compliance with these specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements: **(Note 2)**

<b>SS-1hP</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Saybolt Furol Viscosity @ 25°C (77°F), SFS	AASHTO T 59	20	100
Storage Stability Test, 24 hour, % <b>(Note 3)</b>		N/A	1.0
Sieve Test, % <b>(Note 4)</b>		N/A	0.10
Cement mixing test, %		N/A	2.0
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	57	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	40	90
Elastic Recovery, 10°C (50 °F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	AASHTO T 301	25	N/A
Ash content, %	AASHTO T 111	N/A	1

**Note 1:** The asphalt shall be Polymer-Modified **prior** to emulsification. All modifiers shall be incorporated before the milling process at the producer's manufacturing facility.

**Note 2:** Identical to AASHTO M 316.

**Note 3:** This test requirement is for samples taken at the point of use.

**Note 4:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.



## SPECIFICATIONS FOR TACK COAT (TACK)

These specifications cover cationic or anionic emulsified asphalts used as a tack coat for conditioning and treating an existing surface or between pavement layers with an application of bituminous bonding material.

This material shall be heated, as required, for proper distributor application from 32°C (90°F) to 65°C (150°F). The consistency of the emulsified asphalt shall be appropriate for pumping, sampling, and applying uniform spray coverage.

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery.

Emulsified asphalts held in storage tanks, drums, or distributors for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated or circulated, sampled and retested to determine its compliance with these specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment. The emulsified asphalt shall also meet the following requirements:

<b>TACK</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Particle Charge	Anionic	Negative	
	Cationic	Positive	
Saybolt Furol Viscosity @ 25°C (77°F), SFS	AASHTO T 59	20	100
Storage Stability Test, 24 hour, % <b>(Note 1)</b>		N/A	1.0
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
Sieve Test, % <b>(Note 1 and 2)</b>		N/A	0.30
<b>Distillation:</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	57	N/A
Oil Distillate, % by volume of total emulsion, % <b>(Note 3)</b>		N/A	2.0
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	40	90
Ductility @ 25°C (77°F) 5 cm/min, cm	AASHTO T 51	40	N/A
Solubility in Trichloroethylene, %	AASHTO T 44	97.5	N/A

**Note 1:** This test requirement is for samples taken at the point of use.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** The presence of oil distillate as specified is only permissible in field obtained samples.

**SPECIFICATIONS FOR POLYMER-MODIFIED ULTRA-THIN FRICTION COURSE EMULSIFIED ASPHALT (UTFCEM)**

These specifications cover Polymer-Modified emulsified asphalt, for use on Ultra-Thin Friction Course. **(Note 1)**

This material shall be heated, as required, for proper application between 50°C (120°F) and 80°C (180°F).

The emulsified asphalt shall be homogeneous and miscible with water in all proportions. It shall show no separation after thorough mixing within 30 days after delivery, provided separation has not been caused by freezing or contamination.

Emulsified asphalts held in storage tanks or drums for periods longer than 30 days shall be inspected visually to determine if separation occurred during storage. If no separation is noted, the emulsified asphalt shall be agitated, sampled and retested to determine compliance with specification requirements.

The specific gravity of the emulsified asphalt shall be reported for each shipment.

The emulsified asphalt shall also meet the following requirements:

UTFCEM			
Test	Test Method	Minimum	Maximum
Particle Charge Test	AASHTO T 59	Positive	
Saybolt Furol Viscosity @ 25°C (77°F), SFS		20	100
Storage Stability Test, 24 hour, % <b>(Note 2)</b>		N/A	1
Sieve Test, % <b>(Note 2)</b>		N/A	0.10
Demulsibility, %		55	N/A
<b>Distillation: (Note 3) and (Note 4)</b>			
Asphalt Residue, % by mass (weight), %	AASHTO T 59	63	N/A
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100g, 5s, 0.1mm	AASHTO T 49	60	150
Elastic Recovery, 10°C (50°F), Straight Sided, 5 cm/min, 20 cm elongation, 5 min hold, %	AASHTO T 301	58	N/A
Ash content, %	AASHTO T 111	N/A	1
Solubility in trichloroethylene (AASHTO T 111 may be substituted for the Solubility Test)	AASHTO T 44	97.5	N/A

**Note 1:** The asphalt shall be Polymer-Modified prior to emulsification. All modifiers shall be incorporated, before the milling process, at the producer's manufacturing facility.

**Note 2:** This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

**Note 3:** AASHTO T 59 modified to maintain a 176.5°C ± 5.5°C (350°F ± 10°F) maximum temperature for 15 minutes. Use an ASTM 16C thermometer to monitor the temperature of the emulsion.

**Note 4:** Distillation on field samples shall show no more than trace amounts of oil.

# **CUTBACK ASPHALT SPECIFICATIONS**

## SPECIFICATIONS FOR CUT-BACK ASPHALT (Medium Curing Type) AASHTO MC-30

These specifications cover liquid petroleum products produced by fluxing an asphalt cement with suitable distillates, to be used for priming, dust palliative, and pre-coating aggregates.

This material is to be heated, as required, between 30°C (85°F) and 88°C (190°F) for spraying applications. The maximum temperature shall not yield a kinematic viscosity less than 20 centistokes and shall not cause fogging. For mixing in the pugmill (such as, pre-coating aggregates) this material shall be heated between 21°C (70°F) and 49°C (120°F).

The cut-back asphalt shall show no separation or curdling prior to use and shall not foam when heated to application or mixing temperatures.

The cut-back asphalt shall conform to the following requirements: **(Note 1)**

<b>MC-30</b>				
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>	
Water, % by mass (weight), %	AASHTO T 55	N/A	0.2	
Flash Point (Tag Open Cup), °C	AASHTO T 79	38	N/A	
Viscosity, Kinematic @ 60°C (140°F), cSt	AASHTO T 201	30	60	
<b>Distillation:</b>				
Distillate, % by volume of total distillate to 360°C (680°F), %	0-225°C (32 - 437°F)	AASHTO T 78	N/A	25
	0-260°C (32 - 500°F)		40	70
	0-315°C (32 - 600°F)		75	93
Asphalt Residue from distillation to 360°C (680°F) volume by difference, %	50		N/A	
<b>Tests on Residue from Distillation:</b>				
Viscosity @ 60°C (140°F), 5 cm Hg, poises	AASHTO T 202	300	1200	
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	100	N/A	
Solubility in Trichloroethylene, % by mass (weight), %	AASHTO T 44	99.0	N/A	

This material shall not be used between May 1 and October 31 unless it is to be used solely as a penetrating prime coat, as a dust palliative, or for pre-coating aggregates.

**Note 1:** Identical to AASHTO M 82.

## SPECIFICATIONS FOR CUT-BACK ASPHALT (Medium Curing Type) AASHTO MC-70

These specifications cover liquid petroleum products produced by fluxing an asphalt cement with suitable distillates, to be used for priming, dust palliative, and pre-coating aggregates.

This material is to be heated, as required, between 49°C (120°F) and 107°C (225°F) for spraying applications. The maximum temperature shall not yield a kinematic viscosity less than 20 centistokes and shall not cause fogging. For mixing in the pugmill (such as, pre-coating aggregates) this material shall be heated between 38°C (100°F) and 65°C (150°F).

The cut-back asphalt shall show no separation or curdling prior to use and shall not foam when heated to application or mixing temperatures.

The cut-back asphalt shall conform to the following requirements: **(Note 1)**

<b>MC-70</b>				
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>	
Water, % by mass (weight), %	AASHTO T 55	N/A	0.2	
Flash Point (Tag Open Cup), °C	AASHTO T 79	38	N/A	
Viscosity, Kinematic @ 60°C (140°F), cSt	AASHTO T 201	70	140	
<b>Distillation:</b>				
Distillate, % by volume of total distillate to 360°C (680°F), %	0-225°C (32 - 437°F)	AASHTO T 78	N/A	20
	0-260°C (32 - 500°F)		20	60
	0-315°C (32 - 600°F)		65	90
Asphalt Residue from distillation to 360°C (680°F) volume by difference, %	55		N/A	
<b>Tests on Residue from Distillation:</b>				
Viscosity @ 60°C (140°F), 5 cm Hg, poises	AASHTO T 202	300	1200	
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	100	N/A	
Solubility in Trichloroethylene, % by mass (weight), %	AASHTO T 44	99.0	N/A	

This material shall not be used between May 1 and October 31 unless it is to be used solely as a penetrating prime coat, as a dust palliative, or for pre-coating aggregates.

**Note 1:** Identical to AASHTO M 82.

## SPECIFICATIONS FOR CUT-BACK ASPHALT (Medium Curing Type) AASHTO MC-400

These specifications cover liquid petroleum products produced by fluxing an asphalt cement with suitable distillates, to be used for bituminous stockpile patching material.

This material is to be heated, as required, for proper mixing between 65°C (150°F) and 88°C (190°F) depending on the viscosity of the material.

The cut-back asphalt shall show no separation or curdling prior to use and shall not foam when heated to application or mixing temperatures.

The cut-back asphalt shall conform to the following requirements:

<b>MC-400</b>				
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>	
Water, % by mass (weight), %	AASHTO T 55	N/A	0.2	
Flash Point (Tag Open Cup), °C	AASHTO T 79	65	N/A	
Viscosity, Kinematic @ 60°C (140°F), cSt	AASHTO T 201	400	800	
<b>Distillation:</b>				
Distillate, % by volume of total distillate to 360°C (680°F), %	0-225°C (32 - 437°F)	AASHTO T 78	N/A	7
	0-260°C (32 - 500°F)		10	45
	0-315°C (32 - 600°F)		55	85
Asphalt Residue from distillation to 360°C (680°F) volume by difference, %	70		N/A	
<b>Tests on Residue from Distillation:</b>				
Viscosity @ 60°C (140°F), 5 cm Hg, poises	AASHTO T 202	300	1200	
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	100	N/A	
Solubility in Trichloroethylene, % by mass (weight), %	AASHTO T 44	99.0	N/A	

Class MC-400 shall be Treated Bituminous Material meeting the requirements listed in Appendix A, Section 2.0.

For stockpile mixes these requirements serve as a guide only. When used in stockpile mixes, the job aggregate shall be substituted for the reference aggregate.

This material is to be used solely for bituminous stockpile patching material. MC-400 grade shall be used when the patching material is intended for use between November 1 and March 1.

## SPECIFICATIONS FOR CUT-BACK ASPHALT (Medium Curing Type) AASHTO MC-800

These specifications cover liquid petroleum products produced by fluxing an asphalt cement with suitable distillates, to be used for bituminous stockpile patching material.

This material is to be heated, as required, for proper mixing between 74°C (165°F) and 96°C (205°F) depending on the viscosity of the material.

The cut-back asphalt shall show no separation or curdling prior to use and shall not foam when heated to application or mixing temperatures.

The cut-back asphalt shall conform to the following requirements: **(Note 1)**

<b>MC-800</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Water, % by mass (weight), %	AASHTO T 55	N/A	0.2
Flash Point (Tag Open Cup), °C	AASHTO T 79	66	N/A
Viscosity, Kinematic @ 60°C (140°F), cSt	AASHTO T 201	800	1600
<b>Distillation:</b>			
Distillate, % by volume of total distillate to 360°C (680°F), %	0-225°C (32 - 437°F)	AASHTO T 78	N/A
	0-260°C (32 - 500°F)		N/A
	0-315°C (32 - 600°F)		45
Asphalt Residue from distillation to 360°C (680°F) volume by difference, %		75	N/A
<b>Tests on Residue from Distillation:</b>			
Viscosity @ 60°C (140°F), 5 cm Hg, poises	AASHTO T 202	300	1200
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	100	N/A
Solubility in Trichloroethylene, % by mass (weight), %	AASHTO T 44	99.0	N/A

Class MC-800 shall be Treated Bituminous Material meeting the requirements listed in Appendix A, Section 2.0.

For stockpile mixes these requirements serve as a guide only. When used in stockpile mixes, the job aggregate shall be substituted for the reference aggregate.

This material is to be used solely for bituminous stockpile patching material. MC-800 grade shall be used when the patching material is intended for use between March 1 and October 31.

Note 1: Identical to AASHTO M 82.

## SPECIFICATIONS FOR CUT-BACK ASPHALT (Rapid Curing Type) AASHTO RC-70

These specifications cover asphalt cement cut-back with petroleum naphtha for use as a liquid membrane-forming curing compound.

The cut-back asphalt shall show no separation or curdling prior to use.

The material shall meet the following requirements: **(Note 1)**

<b>RC-70</b>				
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>	
Water, % by mass (weight), %	AASHTO T 55	N/A	0.2	
Viscosity, Kinematic @ 60°C (140°F), cSt	AASHTO T 201	70	140	
<b>Distillation:</b>				
Distillate, % by volume of total distillate to 360°C (680°F), %	0-190°C (32 - 374°F)	AASHTO T 78	10	N/A
	0-225°C (32 - 437°F)		50	N/A
	0-260°C (32 - 500°F)		70	N/A
	0-315°C (32 - 600°F)		85	N/A
Asphalt Residue from distillation to 360°C (680°F) volume by difference, %			55	N/A
<b>Tests on Residue from Distillation:</b>				
Viscosity @ 60°C (140°F), 5 cm Hg, poises	AASHTO T 202	600	2400	
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	100	N/A	
Solubility in Trichloroethylene, % by mass (weight), %	AASHTO T 44	99.0	N/A	

This material shall not be used between May 1 and October 31 unless it is to be used solely as a protective coating for cement concrete.

**Note 1:** Identical to AASHTO M 81.



## SPECIFICATIONS FOR CUT-BACK ASPHALT (Rapid Curing Type) AASHTO RC-250

These specifications cover asphalt cement cut-back with petroleum naphtha, to be used in treatment of road surfaces.

The material is to be heated, as required, for proper mixing and application to the road, between 65°C (150°F) and 88°C (190°F) depending on the viscosity of the material. When heated in kettles, the material shall be heated between 54°C (130°F) and 65°C (150°F) depending on the viscosity of the material.

This material shall be cut-back asphalt prepared by compounding a suitable volatile naphtha with a petroleum asphalt cement. The naphtha when distilled in accordance with AASHTO Method T-115 shall yield a residue not exceeding three percent by volume.

The cut-back asphalt shall show no separation or curdling prior to use and shall not foam when heated to application or mixing temperatures.

The material shall meet the following requirements: **(Note 1)**

<b>RC-250</b>				
<b>Test</b>		<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Water, % by mass (weight), %		AASHTO T 55	N/A	0.2
Flash Point (Tag Open Cup), °C		AASHTO T 79	27	N/A
Viscosity, Kinematic @ 60°C (140°F), cSt		AASHTO T 201	250	500
<b>Distillation:</b>				
Distillate, % by volume of total distillate to 360°C (680°F), %	0-225°C (32 - 437°F)	AASHTO T 78	35	N/A
	0-260°C (32 - 500°F)		60	N/A
	0-315°C (32 - 600°F)		80	N/A
Asphalt Residue from distillation to 360°C (680°F) volume by difference, %	65		N/A	
<b>Tests on Residue from Distillation:</b>				
Viscosity @ 60°C (140°F), 5 cm Hg, poises		AASHTO T 202	600	2400
Ductility @ 25°C (77°F), 5 cm/min, cm		AASHTO T 51	100	N/A
Solubility in Trichloroethylene, % by mass (weight), %		AASHTO T 44	99.0	N/A

On contracts or purchase orders specifying Class RC-250 Treated Bituminous Material, the material shall meet the requirements listed in Appendix A, Section 2.0.

This material shall not be used between May 1 and October 31.

**Note 1:** Identical to AASHTO M 81.

## SPECIFICATIONS FOR CUT-BACK ASPHALT (Rapid Curing Type) AASHTO RC-800

These specifications cover asphalt cement cut-back with petroleum naphtha, to be used in treatment of road surfaces.

The material is to be heated, as required, for proper mixing and application to the road, between 79°C (175°F) and 99°C (210°F) depending on the viscosity of the material.

This material shall be cut-back asphalt prepared by compounding a suitable volatile naphtha with a petroleum asphalt cement. The naphtha when distilled in accordance with AASHTO Method T-115 shall yield a residue not exceeding three percent by volume.

The cut-back asphalt shall show no separation or curdling prior to use and shall not foam when heated to application or mixing temperatures.

The material shall meet the following requirements: **(Note 1)**

<b>RC-800</b>				
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>	
Water, % by mass (weight), %	AASHTO T 55	N/A	0.2	
Flash Point (Tag Open Cup), °C	AASHTO T 79	27	N/A	
Viscosity, Kinematic @ 60°C (140°F), cSt	AASHTO T 201	800	1600	
<b>Distillation:</b>				
Distillate, % by volume of total distillate to 360°C (680°F), %	0-225°C (32 - 437°F)	AASHTO T 78	15	N/A
	0-260°C (32 - 500°F)		45	N/A
	0-315°C (32 - 600°F)		75	N/A
Asphalt Residue from distillation to 360°C (680°F) volume by difference, %	75		N/A	
<b>Tests on Residue from Distillation:</b>				
Viscosity @ 60°C (140°F), 5 cm Hg, poises	AASHTO T 202	600	2400	
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	100	N/A	
Solubility in Trichloroethylene, % by mass (weight), %	AASHTO T 44	99.0	N/A	

On contracts or purchase orders specifying Class RC-800 Treated Bituminous Material, the material shall meet the requirements listed in Appendix A, Section 2.0.

This material shall not be used between May 1 and October 31.

**Note 1:** Identical to AASHTO M 81.

# **WATER PROOFING ASPHALT SPECIFICATIONS**

## SPECIFICATIONS FOR WATERPROOFING ASPHALT, WA-1

These specifications cover asphalt cement for use in paint coat waterproofing.

The asphalt cement shall not be heated more than 177°C (350°F) and shall be agitated to prevent localized overheating.

The asphalt cement shall be homogeneous, and shall meet the following requirements:

<b>WA-1</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Water, % by mass (weight), %	AASHTO T 55	N/A	0
Flash Point (Cleveland Open Cup), °C	AASHTO T 79	177	N/A
Softening Point (Ring & Ball Method), °C	AASHTO T 53	46	63
Penetration, 25°C (77°F), 5 cm/min, 0.1 mm	AASHTO T 49	50	100
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	50	N/A
Solubility in trichloroethylene, % by mass (weight), %	AASHTO T 40	99.0	N/A
Mass Change, % by mass (weight), %	AASHTO T 179	N/A	2.0
Retained Penetration, % of original, %	AASHTO T 49	60	N/A

## SPECIFICATIONS FOR WATERPROOFING ASPHALT, WM-1

These specifications cover asphalt cement for use as a mopping coat in the construction of a membrane system of waterproofing.

The asphalt cement shall not be heated more than 204°C (400°F) and shall be agitated to prevent localized overheating.

The asphalt cement shall be homogeneous, and shall meet the following requirements:

<b>WM-1</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Water, % by mass (weight), %	AASHTO T 55	N/A	0
Flash Point (Cleveland Open Cup), °C	AASHTO T 79	204	N/A
Softening Point (Ring & Ball Method), °C	AASHTO T 53	63	77
Penetration, 4°C (39.2°F), 200 g, 60 s, 0.1 mm	AASHTO T 49	12	N/A
Penetration, 25°C (77°F), 100 g, 5 s, 0.1 mm		25	50
Penetration, 46°C (115°F), 50 g, 5 s, 0.1 mm		N/A	115
Ductility @ 25°C (77°F), 5 cm/min, cm	AASHTO T 51	15	N/A
Solubility in trichloroethylene, % by mass (weight), %	AASHTO T 44	99.0	N/A
Mass Change, % by mass (weight), %	AASHTO T 179	N/A	1.0
Retained Penetration, % of original, %	AASHTO T 49	60	N/A

## SPECIFICATIONS FOR WATERPROOFING ASPHALT, WP-1

These specifications cover asphalt cement for use as a primer in membrane and paint coat waterproofing.

The material shall be a cut-back asphalt prepared by compounding a suitable volatile naphtha with petroleum asphalt. The naphtha, when distilled in accordance with AASHTO Method T 155, shall yield residue not exceeding 3% by volume.

The asphalt cement shall be homogeneous, and shall meet the following requirements:

<b>WP-1</b>			
<b>Test</b>	<b>Test Method</b>	<b>Minimum</b>	<b>Maximum</b>
Water, % by mass (weight), %	AASHTO T 55	N/A	0
Viscosity, Saybolt Furol @ 25°C (77°F), SFS	AASHTO T 72	25	150
<b>Distillation, Volume % of the Primer:</b>			
0-225°C (32 - 437°F)	AASHTO T 78	35	N/A
0-360°C (32 - 680°F)		N/A	65
<b>Tests on Residue from Distillation:</b>			
Penetration @ 25°C (77°F), 100 g, 5 s, 0.1 mm	AASHTO T 49	20	50
Solubility in Trichloroethylene, % by mass (weight), %	AASHTO T 44	99.0	N/A

This material shall not be used between May 1 and October 31 unless it is used solely as a protective coating (primer and paint coat) for cement concrete.

# APPENDICES

# APPENDIX "A"

## SPECIFICATIONS FOR TREATED BITUMINOUS MATERIALS

Bituminous material treated with a prepared additive to meet the requirements hereinafter described shall be classified as treated bituminous material.

### 1.0 GENERAL REQUIREMENTS

- 1.1 When required in the contract, all asphaltic material shall be treated bituminous materials.
- 1.2 A sufficient quantity of an additive shall be homogeneously incorporated in the bituminous material at the point of manufacture to meet the requirements hereinafter specified.
- 1.3 The Pennsylvania Department of Transportation reserves the right to sample and test the asphalt cement, naphtha, and cutback asphalt prior to, and after, the addition of the additive.
- 1.4 The additive shall not be injurious to road equipment and accessories and shall not alter the normal mixing and setting qualities of the bituminous material.
- 1.5 The additive shall not detrimentally affect the bituminous material, which when treated shall conform to the specification requirements of the untreated bituminous material as specified in Bulletin 25.
- 1.6 The treated bituminous material shall be homogeneous and shall withstand storage at manufacturing or maximum application temperatures.

### 2.0 TEST REQUIREMENTS

The treated bituminous material for emulsified asphalt shall be tested in accordance with the hereinafter prescribed procedures and shall meet the specified requirements.

**Emulsified Asphalt:** AASHTO T 59 (Coating ability and water resistance section)



## APPENDIX "B"

### SAND PENETRATION TEST FOR DUST PALLIATIVES

The sand penetration test is intended to evaluate how well a dust palliative solution will penetrate a specified material.

#### Apparatus

1. Small container of known cross-sectional area, approximately 76.2 mm in diameter, 50.8 mm in height (3 inches in diameter, 2 inches in height). A 227 gm (8-oz.) ointment tin is suitable.
2. Reference sand. Special screened silica sand #20326. (This graded sand is available from Unimin Sand Inc., 258 Elm Street, New Canaan, Connecticut 06840.
3. MC-30 Cutback Asphalt conforming to AASHTO M 82.
4. Graduated Cylinder.
5. Stop watch, spatula, and ruler.
6. Thermometer, ASTM 83C or equivalent.

#### Procedure

1. Thoroughly mix the reference sand with 1.5 percent water.
2. Place moistened sand into container (minimum material thickness 38 mm (1-1/2 inches) and compact at 7 kg/sq. cm (100 psi) using a round metal disc or plunger slightly smaller in diameter than the container.
3. Using the specified field applied dilution ratio if required, weigh 5 grams of the dust palliative solution into the container of compacted sand and start the stop watch. For comparison purposes, pour the material into the center of the container allowing it to flow from this point of pouring by itself. Pour from a height of about 10 cm. (4 inches).
4. Stop the stop watch when the material has penetrated the compacted sand and record the time in seconds.
5. If additional applications are specified for field use, reapply as required.
6. Remove a cross-section of the penetrated sand with a spatula. Measure to determine the average depth of penetration in mm (inches).
7. Run the above test using MC-30 Cutback Asphalt as a reference material.

## **CURE TEST FOR DUST PALLIATIVES**

- 1.** After the sand penetration test is completed, the container containing the treated sand is placed in an oven at 60 °C (140 °F) for 24 hours.
- 2.** After 24 hours, the sand which was treated with the dust palliative material shall exhibit cohesiveness and not be friable.

## ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AEP	Asphalt Emulsion Prime
AET	Asphalt Emulsified Tack Coat
ASTM	ASTM International (American Society for the Testing of Materials)
BBR	Bending Beam Rheometer
BOL	Bill of Lading
BOPD	Bureau of Project Delivery
COA	Certificate of Analysis
COC	Cleveland Open Cup
CMS	Cationic Medium Set
CQS	Cationic Quick Set
CRS	Cationic Rapid Set
CSS	Cationic Slow Set
DSR	Dynamic Shear Rheometer
EDP	Emulsified Dust Palliative
HMA	Hot Mix Asphalt
LTS	Laboratory Testing Section
MC	Medium Curing
MS	Medium Set
MSCR	Multiple Stress Creep Recovery
P	Polymer Modified
PAV	Pressure Aging Vessel
PennDOT	Pennsylvania Department of Transportation
PG	Performance Grade
PTM	Pennsylvania Test Method
PV	Plant Verification
RC	Rapid Curing
RS	Rapid Set
RTFO	Rolling Thin-Film Oven
SFS	Saybolt Furol Seconds
SRTC	Synthetic Resin Tack Coat
SS	Slow Set
SMA	Stone Matrix Asphalt
QA	Quality Assurance
QC	Quality Control
WMA	Warm Mix Asphalt
cm	Centimeter
cSt	Centistokes
h	High Float
min	Minute
s	Seconds
kPa	Kilo Pascal
MPa	Mega Pascal