LIQUID ASPHALT MGS-94-06F

1.0 DESCRIPTION. This specification covers Medium-Curing Cut-Back Asphalt, Rapid-Curing Cut-Back Asphalt, and Emulsified Asphalt.

2.0 MATERIALS.

2.1 Medium-Curing Cut-Back Asphalt. The material shall conform to the requirements of AASHTO M 82, invoking Note 2 using penetration in lieu of viscosity Medium-curing cut-back asphalt shall show no separation or curdling prior to use and shall not foam when heated to the application temperature.

2.2 Rapid-Curing Cut-Back Asphalt. The material shall conform to the requirements of AASHTO M 81, invoking Note 2 using penetration in lieu of viscosity. Rapid-curing cut-back asphalt shall show no separation or curdling prior to use and shall not foam when heated to the application temperature.

2.3 Diluted Emulsified Asphalt. Diluted emulsified asphalt shall be homogeneous and shall be usable for a minimum of 3 days after delivery.

2.3.1 The base material shall be SS-1, SS-1H, CSS-1 or CS-1H meeting the requirements of Section 2.4 or Section 2.5 of these specifications.

2.3.2 The dilution rate shall be 1 part water to 1 part emulsion.

2.3.3 The residue shall be 28.5 percent minimum.

2.3.4 The supplier will not be held responsible for diluted or base emulsified asphalt that has frozen after delivery.

2.4 Anionic Emulsified Asphalt. Anionic emulsified asphalt shall be homogeneous and shall comply with the requirements of AASHTO M 140 and limits specified in Table 1 of these specifications.

2.4.1 The anionic emulsified asphalt shall remain homogeneous and usable for a minimum of 30 days after delivery. The supplier will not be held responsible for emulsion that has been frozen after delivery.

2.5 Cationic Emulsified Asphalt. Cationic emulsified asphalt shall be homogeneous and shall comply with the requirements of AASHTO M 208 and limits specified in Table 2 of these specifications.

2.5.1 The cationic emulsified asphalt shall remain homogeneous and usable for a minimum of 30 days after delivery. The supplier will not be held responsible for emulsion that has been frozen after delivery.

2.6 Polymer Modified Emulsified Asphalt. Polymer modified emulsified asphalt shall meet the requirements of AASHTO M 316 and limits specified in Table 3 of these specifications.

2.6.1 The polymer modified emulsified asphalt shall remain homogeneous and usable for a minimum of 30 days after delivery. The supplier will not be held responsible for emulsion that has been frozen after delivery.

2.7 Scrub Seal Emulsion. Scrub seal emulsion shall meet the requirements of Table 4 of these specifications.

2.7.1 The scrub seal emulsion shall be smooth and homogeneous, be polymer modified and contain an asphalt rejuvenator. The scrub seal emulsion shall remain usable for a minimum of 30 days after delivery. The supplier will not be held responsible for emulsion that has been frozen after delivery.

3.0 Sampling and Testing.
Unless otherwise stated the AASHTO specifications shall be those in effect at the time of the order of this material. For all material, AASHTO T 111, *Inorganic Matter or Ash in Bituminous Materials*, may be substituted for AASHTO T 44, *Solubility of Bituminous Materials*, at the specification value indicated.

3.1 Medium-Curing and Rapid-Curing Cut-Back Asphalt. Sampling and testing of medium-curing and rapid-curing cut-back asphalts will be made as follows:

Property	AASHTO	MC	RC
Sampling	R 66	X	X
Water	T 55	X	X
Flash Point (Tag Open Cup)	T 79	X	X
Viscosity	T 201	X	X
Distillation	T 78	X	X
Penetration	T 49	X	X
Ductility	T 51	X	X
Solubility in Trichloroethylene	T 44	X	X

3.2 Emulsified Asphalt Sampling. Samples of emulsified asphalt shall be taken in accordance with AASHTO R 66.

3.3 Emulsified Asphalt Testing. Emulsified asphalt, anionic emulsified asphalt, and cationic emulsified asphalt shall be tested in accordance with AASHTO T 59 prior to dilution.

3.3.1 Polymer Modification. Polymer modified emulsified asphalt shall be tested in accordance with the procedures set forth for the applicable properties in Table 3.

3.4 Scrub Seal Emulsion Sampling. Samples of scrub seal emulsion shall be taken in accordance with AASHTO R 66.

3.4.1 Scrub Seal Emulsion Testing. Scrub seal emulsion shall be tested in accordance with the procedures set forth for the applicable properties in Table 4. Complete testing of sample for asphalt emulsion properties and residue according to Section 3.3.

4.0 Rejection.
Emulsified asphalt that does not fully comply with the requirements of these specifications will be rejected. The supplier shall be responsible for the cost and disposal of rejected material, as well as any material in the state-owned tank into which the unsatisfactory material is unloaded.

5.0 Platform Scales for Weighing Bituminous Material. Equipment for weighing of bituminous material shall consist of accurate and reliable platform scales approved by the Department.

5.1 Scales shall be accurate to within 0.4 percent of the net load applied, when tested for accuracy, regardless of the location of the load on the platform. The value of the smallest unit of graduation on a scale shall be not greater than 20 pounds. Sensitivity requirements of scales not equipped with balance indicators shall be twice the value of the minimum graduated interval on the weigh beam, or 0.2 percent of the nominal capacity of the scale, whichever is less. For scales equipped with balance indicators, the sensitivity requirement shall be the value of the minimum graduated interval on the weigh beam.

5.2 When equipment to be weighed is of such length that all axles cannot be weighed simultaneously, a level area of Portland cement concrete or asphaltic concrete pavement shall be provided permitting those axles not on the scale platform to be on the pavement during the weighing operation. the approach shall be the same width as the platform and of sufficient length to insure the level positioning of vehicles during weight determinations. the weighing shall be performed with all brakes released. When equipment to be weighed is equipped with an air bag suspension unit on any axle, the equipment including semi-trailers or pup trailers shall be weighed on platform scales of sufficient size to weigh all axles of the combination simultaneously.

5.3 Scales shall have been calibrated within the year immediately prior to any material being delivered or any time the engineer has cause to question the accuracy of the scale. Scale acceptance shall be based on one of the following:

5.3.1 A valid certification or seal of approval by the Division of Weights and Measures of the Missouri Department of Agriculture.

5.3.2 A valid certification or seal of approval by a State of Missouri duly appointed "Sealer of weights and measures" in cities or counties of seventy-five thousand population or more.

5.3.3 Certification of calibration from a commercial scale service company showing that the scale meets the requirements of these specifications. The Supplier shall furnish the certificate of calibration to the engineer.

5.4 Regardless of the form of acceptance, the calibration shall be within the accuracy requirements specified herein and the scales shall meet all requirements of these specifications.

5.5 Verification of a platform scale may be required by the weighing of a hauling unit on another recently calibrated and certified scale.

5.6 All cost incurred in obtaining a certification of calibration or verification shall be borne by the Supplier.

6.0 Ordering Information. The unit bid request will set forth the grade or type, and quantity, of bituminous material being purchased.

TABLE 1 - ANIONIC EMULSIFIED ASPHALT

	RS-2	EA-90	EA-150	EA-300	SS-1	SS-1H
Viscosity, SFS, 25 C, SFS.	-----	-----	-----	-----	20-100	20-100
Viscosity, SFS, 50 C, SFS.	100-400	50-500	50-500	50-500	-----	-----
Sieve Test[a], percent, max.	0.10[b]	0.50	0.50	0.50	0.10[b]	0.10[b]
Cement Mixing Test, percent, max.	-----	-----	-----	-----	2.0	2.0
Demulsibility[c], 35 ml, 0.02 N $CaCl_2$, (1.11g/L) percent, min.	60	-----	-----	-----	-----	-----
Distillation:						
Oil distillate, by volume of emulsion, percent, max.	-----	4	4	7	-----	-----
Residue, percent, min.	63	65	65	67	57	57
Tests on residue from distillation:						
Penetration, 25 C, 100 g, 5 sec., dmm	100-200	90-150	150-300	300 Min.	100-200	40-90
Ductility, 25 C, 5 cm/min., cm.,min.	40	-----	-----	-----	40	40
Solubility in trichloroethylene, percent, min.	97.5	97.5	97.5	97.5	97.5	97.5
Float Test, 60 C, sec., min.	-----	1200	1200	1200	-----	-----

[a] This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

[b] A percentage of 0.30 is acceptable for samples taken at point of use or shipped to the Central Laboratory for testing.

[c] The demulsibility test shall be made within 30 days from date of shipment.

TABLE 2 - CATIONIC EMULSIFIED ASPHALT

	CRS-2	CMS-2M	CSS-1	CSS-1H
Viscosity, Saybolt Furol at 25 C, SFS.	-----	-----	20-100	20-100
Viscosity, Saybolt, Furol at 50 C, SFS.	100-400	50-500	-----	-----
Sieve Test[a], percent, max.	0.10[b]	0.50	0.10[b]	0.10[b]
Cement Mixing Test, percent, max.	-----	-----	2.0	2.0
Demulsibility[c] , 35 ml, 0.8% sodium dioctyl sulfosuccinate, percent, min.	40	-----	-----	-----
Particle Charge Test	Positive	Positive	Positive[d]	Positive[d]
Distillation:				
Oil distillate, by volume of emulsion, percent, max.	3	7	-----	-----
Residue, percent, min.	65	70	57	57
Tests on Residue from Distillation:				
Penetration, 25 C, 100 g, 5 sec., dmm	100-250	300 min.	100-250	40-90
Ductility, 25 C, 5 cm/min., cm.,min.	40	-----	40	40
Solubility in trichloroethylene, percent, min.	97.5	97.5	97.5	97.5

[a] This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

[b] A percentage of 0.30 is acceptable for samples taken at point of use or shipped to the Central Laboratory for testing.

[c] The demulsibility test shall be made within 30 days from date of shipment.

[d] If the particle charge test result is inconclusive, materials having a maximum pH value of 6.7 will be acceptable.

TABLE 3 - POLYMER MODIFIED EMULSIFIED ASPHALT

Tests	CRS-2P Min.	CRS-2P Max.	EA-90P Min.	EA-90P Max.
Viscosity, Saybolt, Furol at 50 C, SFS.	100	400	100	400
Storage Stability Test [b, c]. 24 hour, percent	-----	1	-----	1
Classification Test	Pass	-----	-----	-----
Particle Charge Test	Positive	-----	-----	-----
Sieve Test, 20 mesh, percent [c]	-----	0.3	-----	0.3
Demulsibility, 35 ml, 0.02 N $CaCl_2$, (1.11g/L) percent, min. -----	-----	30	-----	
Distillation:				
Oil Distillate by volume of emulsion, percent	-----	3	-----	3
Residue from Distillation [d], percent	65	-----	65	-----
Tests on Residue from Distillation:				
Penetration, 25 C, 100 g, 5 sec.	100	200	100	200
Ductility, 4 C, 5 cm/min, cm	30	-----	25	-----
Ash [e], percent	-----	1	-----	1
Float Test at 60 C, sec.	-----	-----	1200	-----
Elastic Recovery, percent[f]	58	-----	58	-----

[a] All tests are performed in accordance with latest AASHTO T 59 except as noted.

[b] In addition to AASHTO T 59; upon examination of the test cylinder, after standing undisturbed for 24 hours, the surface shall show no appreciable white, milky colored substance and shall be a homogeneous brown color throughout.

[c] This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

[d] AASHTO T 59 modified to maintain a 205 C $\pm$ 5 C maximum temperature for 15 minutes.

[e] AASHTO T 111, Ash in Bituminous Materials.

[f] Condition the ductilometer and samples to be treated at 10 C. Prepare the brassplate, mold and briquet specimen in accordance with AASHTO T 51. Keep the specimen at the specified test temperature of 10 C for 85-95 minutes. Immediately after conditioning, place the specimen in the ductilometer and proceed to elongate the sample to 20 cm at the rate of pull of 5 cm/min. After the 20 cm elongation has been reached; stop the ductilometer and hold the sample in its elongated position for 5 minutes. After 5 minutes, clip the sample approximately in half by means of scissors or other cutting devices. Let the sample remain in the ductilometer in an undisturbed condition for one hour. At the end of this time period, retract the half sample specimen until the two broken ends touch. At this point note the elongation (x) in cm. Calculate the percent recovery by the following formula:

$$\text{Percent Recovery} = \frac{20 - X}{20} \times 100$$

TABLE 4 - SCRUB SEAL EMULSION

	Min.	Max.	Test Method
Tests on Scrub Seal Emulsion:			
Saybolt Furol Viscosity, @ 25 C,SFS	30	100	AASHTO T 59
Storage Stability Test [a, b], 24 hr., percent	--	1	AASHTO T 59
Demulsibility, 35 ml, 0.02 N $CaCl_2$, (1.11g/L) percent, min.	--	60	AASHTO T 59
Sieve Test [b, c], percent	--	0.1	AASHTO T 59
Residue by Distillation [d], percent	60	--	AASHTO T 59
Oil Distillate by Volume, percent	--	3	
Tests on Residue from Distillation:			
Penetration @ 25 C, 5 sec, 100 g, dmm	100	300	AASHTO T 49
Float Test @ 60 C, sec	1200	--	AASHTO T 50
Ash, percent	--	1	AASHTO T111
Elastic Recovery [e], percent	30	--	AASHTO T 301
Saturates [f], percent	--	20	ASTM D4124

[a] Upon examination of the test cylinder after standing undisturbed for 24 hours, the surface shall show no white, milky colored substance but shall be a homogeneous brown color throughout.

[b] This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

[c] A percentage of 0.30 is acceptable for samples taken at the point of use or shipped to the Central Laboratory for testing.

[d] ASTM D244 with modifications to include a 205 $\pm$ 5 C maximum temperature to be held for 15 minutes.

[e] ASTM D5976 with test temperature of 10C and modification of 200 mm elongation.

[f] ASTM D4124 with modification to use Alumina, CG - 20 Grade, available from Aluminum Company of America, Pittsburgh, PA.