SECTION 113

EMULSIFIED ASPHALTS

113.1 GENERAL: Emulsified asphalts shall be a homogeneous mixture of paving asphalt base, water, and an emulsifying or stabilizing agent complying with the requirements of this specification. Emulsified asphalt shall be classified as quick-setting, rapid-setting, medium-setting, or slow-setting type in either anionic or cationic emulsions.

113.2 REFERENCES:

113.2.1 American Society for Testing and Materials, ASTM:

D5	Standard Test Method for Penetration of Bituminous Materials
D70	Standard Test Method for Specific Gravity and Density of Semi-Solid Bituminous Materials
D88	Standard Test Method for Saybolt Viscosity
D113	Standard Test Method for Ductility of Bituminous Materials
D244	Standard Test Methods for Emulsified Asphalts
D977	Standard Specification for Emulsified Asphalt
D2042	Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene
D2397	Standard Specification for Cationic Emulsified Asphalt
D3628	Standard Practice for Selection and Use of Emulsified Asphalt
E70	Standard Test Method for pH of Aqueous Solutions with the Glass Electrode

113.2.2 American Association of State Highway and Transportation Officials, AASHTO:

0	Solubility of Asphalt Materials in Trichlorethylene
T49	Standard Test Method for Penetration of Bituminous Materials
T51	Standard Test Method for Ductility of Bituminous Materials
T59	Standard Test Methods for Emulsified Asphalts
T200	Standard Test Method for pH of Aqueous Solutions with the Glass Electrode

113.2.3 This Specification:

SECTION 112	PAVING ASPHALT BINDER
SECTION 116	ASPHALT CONCRETE
SECTION 302	AGGREGATE BASE COURSE CONSTRUCTION
SECTION 305	CEMENT TREATED BASE COURSE CONSTRUCTION
SECTION 336	ASPHALT CONCRETE CONSTRUCTION
SECTION 337	PORTLAND CEMENT CONCRETE CONSTRUCTION

113.3 TESTING REQUIREMENTS: The emulsified asphalt shall conform to the requirements set forth in the Tables 113.3.1, 113.3.2,113.3.3, or TABLE 113.5.3.

113.4 TEST REPORT AND CERTIFICATION: Quality assurance sampling and testing of emulsified asphalt shall be performed by the CONTRACTOR to verify compliance with the specification. A sample will be taken at random during paving operations from a load(s) of material shipped to the project, either at least once a week, or as directed by the ENGINEER. Non-complying sample test results shall be reported to the ENGINEER within 24 hours of completion of the test(s). Complying sample test results shall be reported in writing to the ENGINEER no later than ten working days after the date of sampling. Emulsified asphalt sampling and testing shall be incidental to the cost of the material and placement costs.

113.5 TEMPERATURES:

113.5.1 Emulsified asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the emulsified asphalt during heating. The CONTRACTOR shall furnish and keep on the site at all times an accurate thermometer suitable for determining the temperature of the emulsified asphalt.

113.5.2 Unless otherwise specified, the various grades of emulsified asphalt shall be applied at temperatures within the limits specified in Table 113.5.2, the exact temperature to be determined by The ENGINEER. Emulsified asphalt shall be reheated, if necessary, but at no time after loading into a tank car or truck for transportation from the refinery to the purchaser shall the temperature of the emulsion be raised above 185 ^{O}F. During all reheating operations the emulsified asphalt shall be agitated to prevent localized overheating. Emulsified asphalt shall not be permitted to cool to a temperature of less than 40 ^{O}F.

113.6 MEASUREMENT AND PAYMENT: The unit of volumetric measurement shall be the U.S. gallon

at a temperature of 60°F. If this material is to be part of a surface treatment the measurement may be in square yards of area covered. All approved quantities shall be paid at the unit price per defined unit of measurement as specified in the Bid Proposal.

TABLE 113.3.2 SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALT

Type	Test Method		Rapid Setting				Medium Setting						Slow Setting			
Grade	AASHTO	ASTM	CRS-1		CRS-2		CMS-2S		CMS-2		CMS-2h		CCS-1		CSS- lh	
Tests on Emulsions:			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity SSF @ 77°F. (25°C.) sec.		D88	20	100	100	400	50	450	50	450	50	450	20	100	100	100
Viscosity SSF @ 122°F. (50°C.) sec.		D88	-	5	-	5	-	5	-	5	-	5	-	5	-	5
Settlement 5 days, %			-	1	-	1	-	1	-	1	-	1	-	1	-	1
Storage Stability Test 1 day [2] Demulsibility 35 ml 0.8% sodium dioctyl sulfosuccinate, %[3]			40	-	40	-	-	-	-	-	-	-	-	-	-	-
Coating ability s water resistance:																
Coating, dry aggregate			-	-	-	-	Good	-	Good	-	Good	-	-	-	-	-
Coating, after spraying			-	-	-	-	Fair	-	Fair	-	Fair	-	-	-	-	-
Coating, wet aggregate			-	-	-	-	Fair	-	Fair	-	Fair	-	-	-	-	-
Coating, after spraying			-	-	-	-	Fair	-	Fair	-	Fair	-	-	-	-	-
Particle charge test			Positive		Positive		Positive		Positive		Positive		Positive		Positive	
Sieve test, %			-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10
Cement mixing test, %			-	-	-	-	-	-	-	-	-	-	-	2.0	-	2.0
Distillation:																
oil distillate by volune of emulsion %		0	-	3	-	3	-	20	-	12	-	12	-	-	-	-
Residue, %			60	-	65	-	60	-	65	-	65	-	57	-	57	-
Tests on residue from distillation test			-	(4)	-	(4)	-	-	-	-	-	-	-	-	-	-
Penetration, 77°F. (25°C.)	T49	D5	100	250	100	250	100	250	100	250	40	90	100	250	40	90
Ductility, 77°F. (25°C.), 5 cm/min., cm.	T51	D113	40	-	40	-	40	-	40	-	40	-	40	-	40	-
Solubility in Trichloroethylene, %	0	D2042	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-

Notes:

1. The test requirement for settlement may be waived when the emulsified asphalt is used in less than 5 days time; or the purchaser may require that the settlement test be
run from the time the sample is received until it is used, if the elapsed time is less than 5 days.
2. The 24 hour (1 day) storage stability test may be used instead of the 5 day settlement test.
3. The Demulsibility test shall be made within 30 days from date of shipment.
4. Must meet a pH requirement of 6.7 maximum (ASTM E-70) if the Particle Charge Test result is inconclusive.

TABLE 113.3.3 EMULSIFIED ASPHALT SLURRY SEAL MIXING GRADES

BITUMULS CLASS			ANIONIC				CATIONIC			
Bitumuls Type			Dense Aggregate Mixing		Quick-Set Slurry Seal		Dense Aggregate Mixing		Quick-Set Slurry Seal	
Bitumuls Grade Designation			DM-h		QS-h		DM-Kh		QS-Kh	
ASTM Grade Designation (Closest)	Test Method		(SS-lh)		(None)		(CSS-lh)		(None)	
Test on Emulsion (a)	AASHTO	ASTM	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol at 77*F (25"c) sec.	T-59	D244	-	100	-	100	-	100	-	100
Storage Stability Test, 1 day, per cent		D244	-	1.0	-	1.0	-	1.0	-	1.0
Cement Mixing Test, per cent	T-59	D244	-	2.0	-	-	-	2.0	-	-
Sieve Test, per cent	T-59	D244	-	0.10	-	0.10	-	0.10	-	0.10
Particle charge Test (b)	T-59	D244	Negative		Negative		Positive		Positive	
pH (b)	T-200	E70	7.3	-	-	-	-	6.7	-	-
Dehydration, ratio			0.5	-	-	-	0.7	-	-	-
Adhesion			Pass	-	-	-	Pass	-	-	-
Slurry Seal Tests (Standard Reference Aggregate ©										
Mixing, seconds			-	-	60	-	-	-	120	-
Setting, minutes			-	-	-	60	-	-	-	60
Water Resistance, after 30 minutes cure			-	-	-	Pass	-	-	-	Pass
Residue by Distillation, per cent	T-59	D244	57	-	57	-	57	-	57	-
Tests on Residue from Distillation Test										
Penetration at 77oF (25"C), 1130 gm, 5 sec.	T-49		40	100	40	100	60	110	40	110
Ductility at 77oF (25"c), cm,	T-51	D113	40	-	40	-	40	-	40	-
Solubility in Trichloroethylene, per cent	T-44	D2042	97	-	97	-	97	-	97	-

Notes:
a) All tests shall be performed within 30 days from the date of emulsified asphalt shipment.
b) Must meet pH Test if inconclusive Particle Charge Test.
c) ASTM C778, Specification for Standard Sand

TABLE 113.5.2 - APPLICATION TEMPERATURE OF EMULSIFIED ASPHALT

Grade	Mixing	Spraying
RS-1	Not Used	70-140 ^{O}F
CRS-1, RS-2, CRS-2	Not Used	125-185 ^{O}F
SS-1, CSS-1	50-160 ^{O}F	70-140 ^{O}F
SS-1h , CSS-lh	50-160 ^{O}F	70-140 ^{O}F
CMS-2S, CMS-2, CMS-2h	50-160 ^{O}F	125-185 ^{O}F
QS-KH, QS-H	50-120 ^{O}F	70-120 ^{O}F

TABLE 113.5.3 - PRIME COAT SPECIFICATION

I.	Material Type		AE-P [1]		PE-P [2]	
II.	Test		Min	Max	Min	Max
	A.	Viscosity, Saybolt Furol, @ 122 degF, sec	15	150	-	75
	B.	Storage Stability @ 24 hr , %	-	1.0	-	-
	C.	Sieve Test No. 20, %	-	-	-	0.10
III.	Distillation Test					
	A.	Residue from Distillation Test To 500 degF, %	65	-	35	-
	B.	Oil by Distillate, % by Volume	-	25	-	4.0
	C.	Solubility in Trichloroethylene, %	97.5	-	-	-

Notes:

[1] AE-P, asphalt emulsified prime

[2] PE-P, penetrating emulsified prime