

AMENDMENT TO OPSS 1103, NOVEMBER 2016

Special Provision No. 111S12

July 2017

OPSS 1103, November 2016, Material Specification for Emulsified Asphalt, is deleted in its entirety and replaced with the following:

1103.01 SCOPE

This specification covers the requirements for different types and grades of emulsified asphalt suitable for both roadway construction and as a straw mulch adhesive.

1103.02 REFERENCES

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Material

OPSS 1153 Emulsified Asphalt Patching Material

Ontario Ministry of Transportation Publications

MTO Laboratory Testing Manual:

LS-200	Penetration of Bituminous Materials
LS-204	Solubility of Bituminous Materials in Trichloroethylene
LS-205	Ductility of Bituminous Materials
LS-207	Float of Bituminous Materials
LS-208	Elastic Recovery by Ductilometer
LS-216	Determination of Residue by Distillation of Emulsified Asphalts
LS-217	Determination of Oil Portion of Distillate in Emulsified Asphalt Primers
LS-218	Particle Charge of Emulsified Asphalt and Emulsified Asphalt Primers
LS-219	Viscosity of Emulsified Asphalts
LS-220	Demulsibility of Emulsified Asphalts
LS-221	Settlement and Storage Stability of Emulsified Asphalt
LS-222	Cement Mixing of Emulsified Asphalts
LS-223	Sieve Test for Emulsified Asphalts
LS-224	Coating for Emulsified Asphalts
LS-226	Test for High Float Emulsified Asphalt

ASTM International

D 140/D 140M -15	Standard Practice for Sampling Bituminous Materials
D 1310-14	Standard Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
D 2939-03	Test Methods for Emulsified Bitumens Used As Protective Coating
D 6930-10	Standard Test Method for Settlement and Storage Stability of Emulsified Asphalts
D 6997-12	Standard Test Method for Distillation of Emulsified Asphalt
D 6998-11	Standard Practice for Evaluating Aggregate Coating Using Emulsified Asphalts
D 36/D36M-14e1	Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

Others

Environment and Climate Change Canada - Code of Practice for the Reduction of Volatile Organic Compound (VOC) Emissions from the Use of Cutback and Emulsified Asphalt - Feb, 2017
Ozone Annex (2000) of the Canada-United States Air Quality Agreement (1991)
Canadian Environmental Protection Act, 1999 (CEPA 1999)

1103.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Emulsified Asphalt means asphalt cement mixed with water to increase the flow qualities of the asphalt cement.

Ozone season means the period of May 1 through September 30 (warm-season months, when the days are warmer and longer), as defined in the Ozone Annex (2000) of the Canada-United States Air Quality Agreement (1991).

Volatile organic compounds (VOC) means the Item 65 components on the List of Toxic Substances in Schedule 1 of the Canadian Environmental Protection Act, 1999 (CEPA 1999).

1103.05 MATERIALS

1103.05.01 General

Emulsified asphalt shall be of the type and grade specified in the Contract Documents and shall be supplied from a source approved by the Owner. Under no circumstances shall the source of supply or the product be changed, or partial or total supply allocated to another supplier without prior written approval of the Owner.

1103.05.02 Physical Requirements

Emulsified asphalts shall consist of suitable paving asphalts dispersed in water and shall meet the requirements specified in Tables 1, 2, 3, 8, 9 and 10 and Figure 1. The addition of polymers or other additives after the manufacture of an emulsified asphalt shall not be permitted.

Emulsified asphalts and polymer-modified emulsified asphalts shall be homogeneous after mixing and show no signs of separation within 14 Days of delivery.

1103.05.03 Straw Mulch Adhesive

Emulsified asphalt used as a straw mulch adhesive shall be a specially refined petroleum asphalt emulsified in water, of fluid consistency designed for cold spray applications, containing neither petroleum solvents nor other components toxic to plant life, and shall be according to Table 1.

1103.05.04 Shipping

The material shall be shipped in clean containers. Containers that are being reused shall be inspected and cleaned, if required, prior to loading to ensure there is no contamination.

When shipping is by tank truck or railway tank car, the material shall arrive at the destination at a temperature at least 5 °C higher than the minimum spraying temperature specified in Table 4 and not more than the maximum spraying temperature specified in Table 4.

When no spraying temperatures are specified in Table 4, the material shall arrive at a temperature meeting the manufacturer's requirements.

1103.08 QUALITY ASSURANCE

1103.08.01 Compliance

Emulsified asphalts shall be according to Tables 1, 2, 3, 8, 9 and 10 and Figure 1 for the particular type and grade when tested according to the test methods designated in the tables.

1103.08.02 Inspection

The Owner may inspect shipping containers for cleanliness at any time.

1103.08.03 Sampling

Representative samples of material being supplied may be taken, if specified in the Contract Documents, according to ASTM D 140 from either the supplier's plant or, any shipment in the presence of the Contract Administrator. Sample material taken prior to delivery shall be at no additional cost to the Owner.

1103.08.04 Testing

Samples may be tested by the Owner according to the tests listed in Tables 1, 2, 3, 8, 9, and 10.

1103.08.05 Rejection

Failure of any sample to conform to any of the material requirements shall be cause for rejection of the material, unless price adjustments are specified elsewhere in the Contract Documents. Rejected materials shall be replaced at no additional cost to the Owner.

TABLE 1
Anionic Emulsified Asphalts

Requirements	Type	Rapid Setting						Medium Setting				Slow Setting						Test Method		
	Grade	RS-1		RS-2		RS-1HH		MS-1		MS-2		SS-1		SS-1H		SS-1HH			Straw Mulch Adhesive	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		Min.	Max.
Tests on Emulsion																				
Viscosity, Saybolt Furol Seconds : at 25 °C at 50 °C	20	100	--	--	20	60	20	60	--	--	20	60	20	60	20	60	17	40	LS-219	
Residue by Distillation, % by Mass	55	--	60	--	55	--	55	--	65	--	55	--	55	--	55	--	55	--	LS-216	
Settlement, %, 5 Days	--	3	--	3	--	5	--	3	--	3	--	5	--	5	--	5	--	--	LS-221	
7 Days	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5		
Demulsibility, % 35 ml, 0.02 N CaCl ₂ 50 ml, 0.1 N CaCl ₂	60	--	60	--	60	--	--	--	--	--	--	--	--	--	--	--	--	--	LS-220	
Oil Portion of Distillate, % by Volume/Mass	--	--	--	--	--	1	--	--	--	10	--	--	--	--	--	--	1	--	LS-217 ASTM D(6997)	
VOC Content as determined by Oil Portion of Distillate, % by volume at 260 °C During the ozone season, (Note 1)	-	3	-	3	-	3	-	3	-	3	-	3	-	3	-	3	-	3	LS-217 (ASTM D6997)	
Sieve Text, % by Mass	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	LS-223	
Cement Mixing Test, % by Mass	--	--	--	--	--	--	--	--	--	--	--	2.0	--	2.0	--	--	--	--	LS-222	
Particle Charge	NEGATIVE OR NEUTRAL																		LS-218	
Coating Ability and Water Resistance, %, (Note 2)	--	--	--	--	--	--	80	--	80	--	80	--	80	--	--	--	--	--	LS-224	
Fire Resistance	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	PASS	(Note 3)	
Tests on Residue																				
Penetration (at 25 °C, 100 g, 5 s), 0.1 mm	100	200	100	200	20	55	100	200	100	250	100	200	40	100	20	55	100	200	LS-200	
Ductility (at 25 °C, 5 cm/min), cm	60	--	60	--	40	--	40	--	40	--	40	--	40	--	40	--	40	--	LS-205	
Solubility in Trichloroethylene, % by Mass	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	LS-204	
Notes for Table 1:																				
1. Time frames apply to emulsified asphalt used in paving material or in paving, construction and maintenance operations.																				
2. This requirement does not apply for tack coat or joint painting emulsified asphalts.																				
3. There shall be no flash or flare-up when the flame of a bunsen burner is held in contact with the surface of the material, as received, for a period of 10 seconds.																				

TABLE 2
Cationic Emulsified Asphalts

Requirements	Type	Rapid Setting						Medium Setting				Slow Setting						Slurry Seal		Test Method
	Grade	CRS-1		CRS-2		CRS-1HH		CMS-2		CMS-2H		CSS-1		CSS-1H		CSS-1HH		CSS-H		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Tests on Emulsion																				
Viscosity, Saybolt Furol Seconds : at 25 °C at 50 °C	-- 50	-- 150	-- 100	-- 400	20 --	60 --	-- 50	-- 400	-- 50	-- 400	20 --	100 --	20 --	100 --	20 --	60 --	20 --	100 --	LS-219	
Residue by Distillation, % by Mass	62	--	67	--	55	--	65	--	65	--	57	--	57	--	55	--	57	--	LS-216	
Settlement, %, 5 Days	--	5	--	5	--	5	--	5	--	5	--	5	--	5	--	5	--	5	LS-221	
Demulsibility, % 35 ml 0.8% Diocetyl Sodium Sulfosuccinate Solution	40	--	40	--	40	--	--	--	--	--	--	--	--	--	--	--	--	--	LS-220	
Oil Portion of Distillate, % by Volume/Mass	--	3	--	3	--	1	--	10	--	10	--	5	--	5	--	1	--	--	LS-217 (ASTM D6997)	
VOC Content as determined by Oil Portion of Distillate, % by volume at 260°C During the ozone season (Note 1)	-	3	-	3	-	3	-	3	-	3	-	3	-	3	-	3	-	3	LS-217 (ASTM D6997)	
Sieve Text, % by Mass	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	LS-223	
Cement Mixing Test, % by Mass	--	--	--	--	--	--	--	--	--	--	--	2.0	--	2.0	--	--	--	--	LS-222	
Particle Charge	POSITIVE																		LS-218	
Coating Ability and Water Resistance, % (Note 2)	--	--	--	--	--	--	80	--	80	--	80	--	80	--	--	--	--	--	LS-224	
Tests on Residue																				
Penetration (at 25 °C, 100 g, 5 s), 0.1 mm	100	250	100	250	20	55	100	250	40	125	100	250	40	125	20	55	40	125	LS-200	
Ductility (at 25 °C, 5 cm/min), cm	60	--	60	--	40	--	60	--	40	--	60	--	40	--	40	--	40	--	LS-205	
Solubility in Trichloroethylene, % by Mass	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	LS-204	
Notes for Table 2:																				
1. Time frames apply to emulsified asphalt used in paving material or in paving, construction and maintenance operations.																				
2. This requirement does not apply for tack coat or joint painting emulsified asphalts.																				

TABLE 3
High Float Emulsified Asphalts

Requirements	Type	High Float														Test Method
	Grade	HFRS-2		HFMS-2(ON)		HF-100S		HF-150S		HF-250S		HF-150M		HF-1000M		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Tests on Emulsion																
Viscosity, Saybolt Furol Seconds at 50 °C	75	400	50	300	35	150	35	150	35	150	50	--	50	--	LS-219	
Residue by Distillation, % by Mass	63	--	62	--	62	--	62	--	62	--	62	--	65	--	LS-226 LS-216	
Demulsibility, % 35 ml 0.02 N CaCl2 50 ml 0.10 N CaCl2 50 ml 0.02 N CaCl2	60	--	--	--	--	--	75	--	75	--	--	--	--	--	LS-220	
Oil Portion of Distillate, % by Volume/Mass	--	--	0.5	3	0.5	4	0.5	4	1	6	1	6	1	7	LS-217 (ASTM D6997)	
VOC Content as determined by Oil Portion of Distillate at 260°C During the ozone season (Note 1)	-	3	-	3	-	3	-	3	-	3	-	3	-	3	LS-217 (ASTM D6997)	
Sieve Text, % by Mass	--	0.10	--	0.10	--	0.10	--	0.10	--	0.10	--	0.10	--	0.10	LS-223	
Particle Charge	--		Negative		--		--		--		--		--		LS-218	
Coating Test	--		(Note 2)		(Note 2)		(Note 2)		(Note 2)		(Note 3)		(Note 3)		ASTM D6998	
Storage Stability 24 h, % by Mass	--	1.0	--	1.5	--	1.5	--	1.5	--	1.5	--	1.5	--	1.5	ASTM D 6930	
Tests on Residue																
Penetration (at 25 °C, 100 g, 5 s), 0.1 mm	100	200	90	200	100	175	150	250	250	500	150	--	--	--	LS-226 LS-200	
Ductility (at 25 °C, 5 cm/min), cm	40	--	--	--	--	--	--	--	--	--	--	--	--	--	LS-205	
Solubility in Trichloroethylene, % by Mass	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	LS-204	
Float Test at 60 °C, s	1200	--	1200	--	1200	--	1200	--	1200	--	1200	--	1200	--	LS-226 LS-207	
Apparent Viscosity (at 60 °C), Pa·s	--	--	--	--	Requirements outlined on Figure 1						10	80 (Note 4)	2	8 (Note 4)	LS-226	
Notes for Table 3:																
1. Time frames apply to emulsified asphalt used in paving material or in paving, construction and maintenance operations.																
2. Follow ASTM D6998, except that the mixture of aggregate and emulsified asphalt shall be mixed vigorously for 5 min. at the end of which period the aggregates shall be thoroughly and uniformly coated. The mixture shall then be completely immersed in tap water and the water poured off. The aggregate shall then be at least 90% coated.																
3. Follow ASTM D6998, except that the mixture of aggregate and emulsified asphalt shall be mixed vigorously for 5 min. then allowed to stand for 3 hours after which the mixture shall be capable of being mixed an additional 1 min. The mixture shall then be rinsed twice with approximately its own volume of tap water, without showing appreciable loss of bituminous film. After the second washing the aggregate shall be at least 90% coated.																
4. Viscosity limits (at 60 °C at 1.0 s-1) shown for mixing grades are tentative. Supplier to advise purchaser before delivery, if limits cannot be met.																

TABLE 4
Temperature for Spraying and Mixing Emulsified Asphalts, °C

Grade	Spraying		Mixing	
	Minimum	Maximum	Minimum	Maximum
RS-1, RS-1P, RS-1HH	30 (Note 1)	70	--	--
	20 (Note 2)	70	--	--
RS-2, RS-2P	60 (Note 1)	80	--	--
MS-1	--	--	30	70
MS-2	--	--	30	70
SS-1	20	70	20	70
SS-1H, SS-1HH	20	70	20	70
HFRS-2	60	80	--	--
HFMS-2(ON), HFMS-2P(ON)	60	80	--	--
HF-100S, HF-100SP	60	80	--	--
HF-150S, HF-150SP	60	80	--	--
HF-250S	60	80	--	--
HF-150M, HF-150MP	--	--	40	80
HF-1000M	--	--	40	75
CRS-1, CRS-1P, CRS-1HH	60	80	--	--
CRS-2, CRS-2P	60	80	--	--
CMS-2	--	--	30	70
CMS-2H	--	--	30	70
CSS-1	--	--	30	70
CSS-1H	--	--	30	70
CSS-1HH	20	70	--	--
CSS-H (Slurry)	--	--	20	35
CQS-1HP	--	--	Manufacturer's Requirements	
Emulsified Asphalt Primer (EAP)	Manufacturer's Requirements		--	--
Solvent-Free Emulsified Asphalt	Manufacturer's Requirements		--	--
Notes for Table 4: 1. For surface treatment. 2. For other uses.				

TABLE 5
Minimum Apparent Viscosity, HF-100S

Penetration at 25 °C 0.1 mm	Minimum Apparent Viscosity at 60 °C, Pa·s at 0.5 s⁻¹	Penetration at 25 °C 0.1 mm	Minimum Apparent Viscosity at 60 °C, Pa·s at 0.5 s⁻¹	Penetration at 25 °C 0.1 mm	Minimum Apparent Viscosity at 60 °C, Pa·s at 0.5 s⁻¹
75	1428	117	823	159	563
76	1405	118	815	160	559
77	1382	119	806	161	554
78	1360	120	798	162	550
79	1339	121	790	163	546
80	1318	122	782	164	542
81	1298	123	774	165	538
82	1279	124	766	166	534
83	1260	125	759	167	530
84	1241	126	751	168	526
85	1223	127	744	169	522
86	1205	128	737	170	518
87	1188	129	729	171	515
88	1172	130	723	172	511
89	1155	131	716	173	507
90	1139	132	709	174	504
91	1124	133	702	175	500
92	1109	134	696	176	496
93	1094	135	690	177	493
94	1080	136	683	178	490
95	1066	137	677	179	486
96	1052	138	671	180	483
97	1038	139	665	181	480
98	1025	140	659	182	476
99	1013	141	653	183	473
100	1000	142	648	184	470
101	988	143	642	185	467
102	976	144	637	186	464
103	964	145	631	187	461
104	953	146	626	188	458
105	941	147	621	189	455
106	930	148	615	190	452
107	920	149	610	191	449
108	909	150	605	192	446
109	899	151	600	193	443
110	889	152	595	194	440
111	879	153	591	195	437
112	869	154	586	196	435
113	860	155	581	197	432
114	850	156	576	198	429
115	841	157	572	199	426
116	832	158	567	200	424

Notes for Table 5:

1. This table is based on the apparent viscosity of 1000 Pa·s at 0.5 s⁻¹ at 100 penetration, and 500 Pa·s at 0.5 s⁻¹ at 175 penetration.

TABLE 6
Minimum Apparent Viscosity, HF-150S

Penetration at 25 °C 0.1 mm	Minimum Apparent Viscosity at 60 °C, Pa·s at 0.5 s⁻¹	Penetration at 25 °C 0.1 mm	Minimum Apparent Viscosity at 60 °C, Pa·s at 0.5 s⁻¹	Penetration at 25 °C 0.1 mm	Minimum Apparent Viscosity at 60 °C, Pa·s at 0.5 s⁻¹
125	164	155	136	200 - 201	109
126	163	156 - 157	135	202 - 203	108
127	162	158	134	204 - 205	107
128	161	159	133	206 - 208	106
129	160	160 - 161	132	209 - 210	105
130	158	162	131	211 - 212	104
131	157	163 - 164	130	213 - 215	103
132	156	165	129	216 - 217	102
133	155	166 - 167	128	218 - 220	101
134	154	168	127	221 - 222	100
135	153	169 - 170	126	223 - 225	99
136	152	171	125	226 - 227	98
137	151	172 - 173	124	228 - 230	97
138 - 139	150	174 - 175	123	231 - 233	96
140	149	176	122	234 - 236	95
141	148	177 - 178	121	237 - 239	94
142	147	179 - 180	120	240 - 242	93
143	146	181	119	243 - 245	92
144	145	182 - 183	118	246 - 248	91
145	144	184 - 185	117	249 - 251	90
146	143	186 - 187	116	252 - 254	89
147 - 148	142	188 - 189	115	255 - 258	88
149	141	190 - 191	114	259 - 261	87
150	140	192 - 193	113	262 - 265	86
151	139	194 - 195	112	266 - 268	85
152 - 153	138	196 - 197	111	269 - 272	84
154	137	198 - 199	110	273 - 275	83

Notes for Table 6:

1. This table is based on the apparent viscosity of 140 Pa·s at 0.5 s⁻¹ at 150 penetration, and 90 Pa·s at 0.5 s⁻¹ at 250 penetration.

TABLE 7
Minimum Apparent Viscosity, HF-250S

Penetration at 25 °C 0.1 mm	Minimum Apparent Viscosity at 60 °C, Pa•s at 1.0 s⁻¹	Penetration at 25 °C 0.1 mm	Minimum Apparent Viscosity at 60 °C, Pa•s at 1.0 s⁻¹
225 - 227	57	311 - 317	37
228 - 231	56	318 - 323	36
232 - 234	55	324 - 331	35
235 - 237	54	332 - 338	34
238 - 240	53	339 - 346	33
241 - 244	52	347 - 354	32
245 - 248	51	355 - 363	31
249 - 251	50	364 - 372	30
252 - 255	49	373 - 382	29
256 - 259	48	383 - 392	28
260 - 264	47	393 - 404	27
265 - 268	46	405 - 416	26
269 - 273	45	417 - 428	25
274 - 277	44	429 - 442	24
278 - 282	43	443 - 457	23
283 - 287	42	458 - 473	22
288 - 293	41	474 - 490	21
294 - 298	40	491 - 509	20
299 - 304	39	510 - 525	19
305 - 310	38		

Notes for Table 7:

1. This table is based on the apparent viscosity of 50 Pa•s at 1.0 s⁻¹ at 250 penetration, and 20 Pa•s at 1.0 s⁻¹ at 500 penetration.

**TABLE 8
Polymer-Modified Emulsified Asphalts**

Requirements	Type	Anionic				Cationic						High Float								Test Method
	Grade	RS-1P		RS-2P		CRS-1P		CRS-2P		CQS-1HP		HFMS-2P(ON)		HF-100SP		HF-150SP		HF-150MP		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Tests on Emulsion																				
Viscosity, Saybolt Furol Seconds: at 25 °C at 50 °C	20	100	--	--	--	--	--	--	--	20	100	--	--	--	--	--	--	--	--	LS-219
Residue by Distillation to 204.4 °C, % by Mass	55	--	60	--	62	--	65	--	62	--	62	--	62	--	62	--	62	--	62	LS-216 LS-226
Settlement, 24 h, % by Mass	--	1	--	1	--	1	--	1	--	1	--	--	--	--	--	--	--	--	--	LS-221
Demulsibility, % 35 ml, 0.02 N CaCl2 35 ml, 0.8% Dioctyl Sodium Sulfo-Succinate Solution 50 ml 0.10 N CaCl2 50 ml 0.02 N CaCl2	60	--	60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	LS-220
Oil Portion of Distillate, % by Volume/Mass	--	--	--	--	--	--	--	--	--	--	0.5	3	0.5	4	0.5	4	1	6	LS-217	
VOC Content as determined by Oil Portion of Distillate, % by volume at 260°C During the ozone season (Note 1)	-	3	-	3	-	3	-	3	-	3	-	3	-	3	-	3	-	3	LS-217 (ASTM D6997)	
Sieve Text, % by Mass	--	0.20	--	0.20	--	0.20	--	0.20	--	0.10	--	0.10	--	0.10	--	0.10	--	0.10	LS-223	
Particle Charge	Negative or Neutral				Positive						Negative		--	--	--	--	LS-218			
Coating Test	--	--	--	--	--	--	--	--	--	--	(Note 2)	(Note 2)	(Note 2)	(Note 2)	(Note 2)	(Note 2)	(Note 2)	(Note 2)	ASTM D 6998	
Storage Stability, 24 h, % by Mass	--	--	--	--	--	--	--	--	--	--	--	--	1.5	--	1.5	--	1.5	--	1.5	ASTM D 6930
Tests on Residue																				
Penetration (at 25 °C, 100 g, 5 s), 0.1 mm	100	200	100	200	100	250	100	250	40	90	90	200	90	150	150	250	150	250	LS-200 LS-226	
Solubility in Trichloroethylene, % by Mass (Note 2)	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	--	97.5	LS-204
Float Test at 60 °C, s	--	--	--	--	--	--	--	--	--	--	1200	--	1200	--	1200	--	1200	--	1200	LS-226 LS-207
Ash Content, % by Mass of Residue (Note 4)	--	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--	1.0	ASTM D 2939	
Elastic Recovery (at 10 °C), %	55	--	55	--	55	--	55	--	50	--	55	--	55	--	50	--	50	--	50	LS-208
Force Ductility at 800% Elongation, 5 cm/min. Pull Rate at 4 °C, kg	0.5	--	0.5	--	0.5	--	0.5	--	--	--	0.5	--	0.5	--	--	--	--	--	--	LS-205
Softening Point, R&B, °C									57											ASTM D36

Notes for Table 8:

1. Time frames apply to emulsified asphalt used in paving material or in paving, construction and maintenance operations. .
2. Follow ASTM D6998, except that the mixture of aggregate and emulsified asphalt shall be mixed vigorously for 5 min. at the end of which period the aggregates shall be thoroughly and uniformly coated. The mixture shall then be completely immersed in tap water and the water poured off. The aggregate shall then be at least 90% coated.
3. Follow ASTM D6998, except that the mixture of aggregate and emulsified asphalt shall be mixed vigorously for 5 min. then allowed to stand for 3 hours after which the mixture shall be capable of being mixed an additional 1 min. The mixture shall then be rinsed twice with approximately its own volume of tap water, without showing appreciable loss of bituminous film. After the second washing the aggregate shall be at least 90% coated.
4. The ash content shall be determined when the manufacturer indicates that the polymer additive is not soluble in trichloroethylene.

**TABLE 9
Emulsified Asphalt Primer (EAP)**

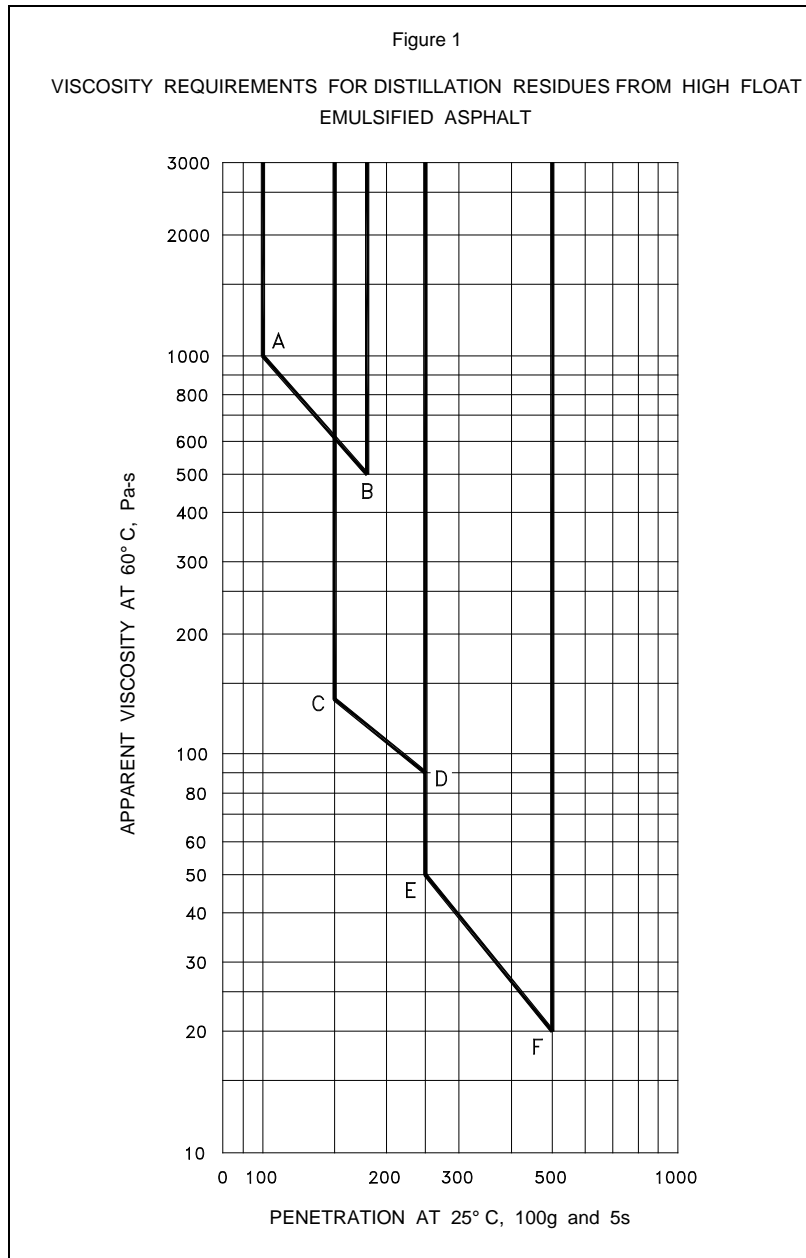
Requirements	Min.	Max.	Test Method
Viscosity, Saybolt Furol Seconds at 50 °C	35	150	LS-219
Residue by Distillation to 260 °C, % by Mass	40	--	LS-216
Oil Portion of Distillate, % by Volume/Mass	10	30	LS-217 (Note 1)
VOC Content as determined by Oil Portion of Distillate, % by volume at 260°C During the ozone season (Note 2)	-	3	LS-217 (ASTM D6997)
Particle Charge	Neutral		LS-218 (Note 3)
Flash Point, Tag Open Cup, °C	45	--	ASTM D 1310
Storage Stability, 24 h	No visible separation		ASTM D 6930 (Note 4)
Tests on Residue			
Penetration (at 25 °C, 100 g, 5 s), 0.1 mm	100	300	LS-200
Ductility (at 25 °C, 5 cm/min), cm (Note 5)	100	--	LS-205
Solubility in Trichloroethylene, % by Mass	97.5	--	LS-204

Notes for Table 9:

1. Since the total distillate exceeds 100 ml, follow LS-217 with the following modification:
Prior to reaching 100 ml of distillate, carefully replace the first 100 ml graduated cylinder with a second one. After the distillation is complete, determine the volume of oil distillate in both cylinders and record the sum. Calculate the oil portion of the distillate as a percentage of the original weight of primer:
% Oil = (Total Volume of oil distillate, ml X 100) / (200 g primer)
2. Time frames apply to emulsified asphalt used in paving material or in paving, construction and maintenance operations.
3. Follow LS-218 with the modification that the asphalt does not deposit due to an electrical charge on either the anode (positive electrode) or the cathode (negative electrode). Equal adherence to both electrodes due to the viscous nature of the material is not considered deposition.
4. Follow ASTM D 6930 except storage stability shall be based on visual separation of 500 ml representative sample in the glass cylinder after 24 hours.
5. If the ductility at 25 °C is less than 100 cm, the material shall be acceptable if its ductility at 15 °C is more than 100 cm.

TABLE 10
Solvent-Free Emulsified Asphalt

Requirements	Min.	Max.	Test Method
Viscosity, Saybolt Furol Seconds at 25 °C	5	50	LS-219
Residue by Distillation to 260 °C, % by Mass	40	-	LS-216
Sieve Test, % by Mass	-	0.1	LS-223
Oil Portion of Distillate, % by Volume/Mass	-	0.5	LS-217 (Note 1)
Storage Stability, 24 h, %	No visible separation		ASTM D 6930 (Note 2)
Particle Charge	Negative or Neutral		LS-218
Tests on Residue			
Penetration (at 25 °C, 100 g, 5 s), 0.1 mm	40	150	LS-200
Ductility (at 25 °C, 5 cm/min), cm	40	--	LS-205
Solubility in Trichloroethylene, % by Mass	97.5	--	LS-204
<p>Notes for Table 10:</p> <p>1. Since the total distillate will exceed 100 ml, follow LS-217 with the following modification: Prior to reaching 100 ml of distillate, carefully replace the first 100 ml graduated cylinder with a second one. After the distillation is complete, determine the volume of oil distillate in both cylinders and record the sum. Calculate the oil portion of the distillate as a percentage of the original weight of solvent-free emulsified asphalt: % Oil = (Total Volume of oil distillate, ml X 100) / (200 g solvent-free emulsified asphalt)</p> <p>2. Follow ASTM D 6930 except storage stability shall be based on visual separation of 500 ml representative sample in the glass cylinder after 24 hours.</p>			



Notes for Figure 1:

A. Grade of high float emulsified asphalt: HF-100S - A, B
 HF-150S - C, D
 HF-250S - E, F

B. Viscosity shall be above the extrapolated line* designated by specified letters and between penetration limits contained in vertical lines extending upwards from these points.

* See Tables 5, 6, and 7 for acceptable values.

C. Viscosity value shall be reported at the shear rate: 0.5 s^{-1} for grades HF-100S and HF-150S
 1.0 s^{-1} for grade HF-250S