

<b>State:</b> Michigan	<b>Materials:</b> Section 904.03
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Michigan		Table 1: Requirements for Anionic Emulsified Asphalts						
Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting		Medium-Setting			Slow-Setting	
		RS-1m	RS-2a	MS-0p	MS-2h	MS-2s	SS-1h	
<b>EMULSIONS:</b>								
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	D244	20-100	-	-	-	-	20-100
	50 °C (122 °F)		-	50-300	15-150	50-300	50-300	-
Settlement, 5 days, %			-	-	-	-	-	-
Storage Stability Test, 24 hours, %			2 max.	2 max.	3 max.	3 max.	3 max.	2 max.
Sieve Test, %			0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.
Demulsibility, % (1)			20-60	60 min.	-	-	-	2 max.
Cement Mixing Test, %			-	-	-	-	-	-
Miscibility with water			-	-	-	-	-	Yes (2)
Coating Ability and Water Resistance	Dry Aggregate		-	-	-	-	-	-
	After Spraying		-	-	-	-	-	-
	Wet Aggregate		-	-	-	-	-	-
	After Spraying		-	-	-	-	-	-
Residue, % (3)			65 min.	65 min.	65 min.	65 min.	65 min.	60 min.
Oil Distillate, volume of emulsion, %			2 max.	2 max.	25 max.	7 max.	7 max.	2 max.
<b>Table 1 Continues on Page 2</b>								

Table 1: Requirements for Anionic Emulsified Asphalts (cont)

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting		Medium-Setting			Slow-Setting
		RS-1m	RS-2a	MS-0p	MS-2h	MS-2s	SS-1h
<b>DISTILLATION RESIDUE:</b>							
Penetration, 25 °C (77 °F), tenths of mm	D5	100-200	100-200	85-115 (4)	150-300	300 min.	40-90
Ductility, 25 °C (77 °F), cm	D113	60 min.	60 min.	40 min. (4)	-	-	40 min.
Solubility in trichloroethylene, %	D2042	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.
Ash Content, %	D128	2 max.	2 max.	2 max.	2 max.	2 max.	2 max.
Specific Gravity, 25 °C (77 °F)	D70	0.996 min.	0.996 min.	-	-	-	-
Float Test, seconds	50 °C (122 °F)	-	-	200 max.	-	-	-
	60 °C (140 °F)	-	-	-	1200 min.	1200 min.	-
<b>TABLE 1 NOTES:</b>	<ol style="list-style-type: none"> <li>For RS-1m and RS2a, use 35 ml of 0.02 N CaCl<sub>2</sub>. For SS-1h, use 50 ml of 0.1 N CaCl<sub>2</sub>.</li> <li>No appreciable coagulation or visible separation in 2 hours.</li> <li>The test for residue by distillation shall be modified in accordance with MTM 302.</li> <li>The distillation residue shall cook (ASTM D243) to 100 ± 15 penetration within 2 hours and have a ductility of 40 cm, minimum.</li> </ol>						

Michigan		Table 2: Requirements for Cationic Emulsified Asphalts								
Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting			Medium- Setting	Slow-Setting				
		CRS-1	CRS-2	CRS-2M	CMS-2	CSS-1mM	CSS-1hM	CSS-1h	CSEA	
<b>EMULSIONS:</b>										
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	D244	-	-	-	-	-	-	-	-
	50 °C (122 °F)		20-100	100-400	75-300	50-450	-	-	-	75-400
Settlement, 5 days, %			-	-	-	-	-	-	-	-
Storage Stability Test, 24 hours, %			1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.
Sieve Test, %			0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.
Particle Charge (1)			Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Demulsibility, % (2)			40 min.	40 min.	50 min.	-	-	-	-	50 min.
Cement Mixing Test, %			-	-	-	-	-	-	2.0	-
Coating Ability and Water Resistance	Dry Aggregate		-	-	-	Good	-	-	-	-
	After Spraying		-	-	-	Good	-	-	-	-
	Wet Aggregate		-	-	-	Fair	-	-	-	-
	After Spraying		-	-	-	Fair	-	-	-	-
Residue, % (3,4)			60 min.	65 min.	65 min.	65 min.	62 min.	62 min.	60 min.	68 min.
Oil Distillate, volume of emulsion, %			3 max.	3 max.	3 max.	12 max.	-	-	-	3 max.
pH		-	-	-	-	-	-	-	-	

Table 2 Continues on Page 4.

Table 2: Requirements for Cationic Emulsified Asphalts (cont.)

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting			Medium- Setting	Slow-Setting			
		CRS-1	CRS-2	CRS-2M	CMS-2	CSS-1mM	CSS-1hM	CSS-1h	CSEA
<b>DISTILLATION RESIDUE:</b>									
Penetration, 25 °C (77 °F), tenths of mm	D5	100-250	100-250	80-150	100-250	70-90	40-90	40-90	70-100
Ductility, 4 °C (39.2 °F), cm	D113	-	-	-	-	35 min.	-	-	-
Ductility, 25 °C (77 °F), cm		40 min.	40 min.	-	40 min.	40 min.	40 min.	40 min.	40 min.
Elastic Recovery, 4 °C (39.2 °F), %	D6084	-	-	-	-	65 min.	-	-	-
Elastic Recovery, 10 °C (50 °F), %		-	-	60 min.	-	-	-	-	75 min.
Solubility in trichloroethylene, %	D2042	97.5 min.	97.5 min.	-	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.
Toughness and Tenacity, 25 °C (77 °F) 50 cm/min	D5801	Toughness, nM		4.5 min.	-	-	-	-	9.0 min.
		Tenacity, nM		3.5 min.	-	-	-	-	7.0 min.
Ash Content, %	D128	2 max.	2 max.	2 max.	2 max.	2 max.	2 max.	2 max.	2 max.
Specific Gravity, 25 °C	D70	0.996 min.	0.996 min.	-	-	-	-	-	-
<b>EVAPORATION RESIDUE (5) :</b>									
Softening Point (Ring and Ball), °C, min.	D36	-	-	-	-	60 min.	57.2 min.	-	-
Viscosity, 60 °C (140 °F), Pa·S	D2171	-	-	-	-	800 (6)	800 (6)	-	-
<b>NOTES:</b>	<ol style="list-style-type: none"> <li>1. If Particle Charge test is inconclusive, material having a maximum pH of 6.7 is acceptable.</li> <li>2. The demulsibility test shall be made within 30 days from date of shipment. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.</li> <li>3. The Test for Residue by Distillation shall be modified by MTM 302.</li> <li>4. For CRS-2M, CSS-1mM, CSS-1hM, and CSEA: ASTM D244, with modifications to include a 204 °C (± 6 °C) maximum temperature to be held for 15 minutes.</li> <li>5. Residue by evaporation: Oven evaporate an emulsion sample on a glass plate at a maximum temperature of 60 °C for 24 hours (forced draft over recommended) or air dry the sample at ambient temperatures for 3 days. Once dry, the sample is scraped from the plate using a razor blade tool.</li> <li>6. The minimum viscosity will be obtained using a Cannon-Manning Vacuum Capillary Viscometer Tube No. 14 per ASTM D2171.</li> </ol>								

Michigan		Table 3: Requirements for High Float Emulsified Asphalt		
Property		Test Method AASHTO (T), ASTM (D), or Other	Anionic	
			HFRS-2	HFRS-2M
<b>EMULSIONS:</b>				
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	D244	-	-
	50 °C (122 °F)		50-300	75-300
Storage Stability Test, 24 hours, %			2 max.	1 max.
Sieve Test, %			0.10 max.	0.10 max.
Demulsibility, % (1)			40 min.	50 min.
Residue, % (2,3)			65 min.	65 min.
Oil Distillate, volume of emulsion, %			2 max.	2 max.
<b>DISTILLATION RESIDUE:</b>				
Penetration, 25 °C (77 °F), tenths of mm		D5	100-200	80-150
Ductility, 25 °C (77 °F), cm		D113	60 min.	-
Elastic Recovery, 10 °C (50 °F), %		D6804	-	60 min.
Solubility in trichloroethylene, %		D2042	97.5 min.	-
Toughness and Tenacity, 25 °C (77 °F), 50 cm/min	Toughness, nM	D5801	-	4.5 min.
	Tenacity, nM		-	3.5 min.
Ash Content, %		D128	2 max.	2 max.
Specific Gravity, 25 °C (77 °F)		D70	0.996 min.	-
Float Test, seconds	50 °C (122 °F)	D139	-	-
	60 °C (140 °F)		1200 min	1200 min.
<b>NOTES:</b>		1. For HFRS-2, use 35 ml of 0.02 N CaCl <sub>2</sub> . For HFRS-2M, use 50 ml of 0.02 N CaCl <sub>2</sub> . 2. The Test for Residue by Distillation shall be modified by MTM 302. 3. For HFRS-2M: ASTM D244, with modifications to include a 204 °C (± 6 °C) maximum temperature to be held for 15 minutes.		

Property		Test Method AASHTO (T), ASTM (D), or Other	Chip Seal Emulsified Asphalt
<b>EMULSIONS (1) :</b>			
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	D88	-
	50 °C (122 °F)		75-400
Storage Stability Test, 24 hours, %		D244	1 max.
Sieve Test, %			0.10 max.
Particle Charge			Positive
Demulsibility, % (2)			50 min.
Residue, % (3)			68 min.
Oil Distillate, volume of emulsion, %			3.0 max.
<b>DISTILLATION RESIDUE:</b>			
Penetration, 25 °C (77 °F), tenths of mm		D5	70-100
Ductility, 25 °C (77 °F), cm		D113	40 min.
Elastic Recovery, 10 °C (50 °F), %		D6084	75 min.
Solubility in trichloroethylene, %		D2042	97.5 min.
Toughness and Tenacity	Toughness, nM	D5801	9.0 min.
	Tenacity, nM		7.0 min.
Ash Content, %		D128	2 max.
Dynamic Shear, 64 °C	G*/Sin (delta)	D6373	Report
	Delta, °		Report
<b>NOTES:</b>		<ol style="list-style-type: none"> <li>1. Samples of emulsified asphalt will be taken in accordance with ASTM D140. Samples shall be stored at a temperature of not less than 4 °C until tested.</li> <li>2. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.</li> <li>3. Residue determination and preparation may use the alternate ASTM D244 method. "Residue by low-temperature vacuum distillation" so as to not destroy the properties of any polymer modifiers contained therein.</li> </ol>	

Michigan		Table 5: Requirements for Low Tracking Bond Coat			
Property		Test Method AASHTO (T), ASTM (D), or Other	LTBC-1		LTBC-2
<b>EMULSIONS:</b>					
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	15-100		
	50 °C (122 °F)		-		
Storage Stability Test, 24 hours, %			1 max.	-	
Storage Stability Test, 5 days, %			5 max.		
Sieve Test, %			0.30 max.		
Particle Charge			-		
Demulsibility, %			-		
Residue, %			50 min.		
Oil Distillate, volume of emulsion, %			1.0 max.		
<b>DISTILLATION RESIDUE:</b>					
Penetration, 25 °C (77 °F), tenths of mm		T49	20 max.	40 max.	
Softening Point Range, °C		T53	60 min.	-	
Elastic Recovery, 10 °C (50 °F), %		D6084	-		
Solubility in trichloroethylene, %		T44	97.5 min.		
Toughness and Tenacity	Toughness, nM	D5801	-		
	Tenacity, nM		-		
Ash Content, %		D128	-		
Dynamic Shear, 64 °C	G*/Sin (delta)	D6373	-		
	Delta, °		-		
<b>NOTES:</b>		None.			