

<b>State:</b> North Dakota	<b>Materials:</b> Re: Section 818- Bituminous Materials
<b>Date:</b> 2/26/25	<b>Web Address:</b> www.dot.nd.gov
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**North Dakota**

**Table 1: Requirements for Anionic Emulsified Asphalts (1)**

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting		Medium-Setting			Slow-Setting		Quick-Setting	
		RS-1	RS-2	MS-1	MS-2	MS-2h	SS-1	SS-1h	QS-1H	
<b>EMULSIONS:</b>										
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	20-100	-	20-100	100 min.	100 min.	20-100	20-100	20-100
	50 °C (122 °F)		-	75-400	-	-	-	-	-	-
Settlement, 5 days, %			-	-	-	-	-	-	-	-
Storage Stability Test, 24 hours, % (2)			1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.
Sieve Test, % (2,3)			0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.	0.10 max.
Demulsibility, % (4)			60 min.	60 min.	-	-	-	-	-	-
Cement Mixing Test, %			-	-	-	-	-	2.0 max.	2.0 max.	-
Coating Ability and Water Resistance	Dry Aggregate		-	-	Good	Good	Good	-	-	-
	After Spraying		-	-	Fair	Fair	Fair	-	-	-
	Wet Aggregate		-	-	Fair	Fair	Fair	-	-	-
	After Spraying		-	-	Fair	Fair	Fair	-	-	-
Residue, %			55 min.	65 min.	55 min.	65 min.	65 min.	65 min.	57 min.	57 min.
<b>DISTILLATION RESIDUE:</b>										
Penetration, 25 °C (77 °F), tenths of mm		T49	90-150	90-150	90-250	90-250	40-90	90-250	40-90	40-90
Ductility, 25 °C (77 °F), cm		T51	40 min.	40 min.	40 min.	40 min.	40 min.	40 min.	40 min.	40 min.
Solubility in trichloroethylene or n-propyl bromide, %		T44	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.
<b>NOTES:</b>		<ol style="list-style-type: none"> <li>1. Refer to R5 for typical applications.</li> <li>2. This test requirement on representative samples is waived if successful application of the material has been achieved in the field.</li> <li>3. A maximum percentage of 0.30 is acceptable for samples taken at the point of use.</li> <li>4. The demulsibility test shall be performed within 30 days from the date of shipment. Use 35 ml, 0.02 N CaCl<sub>2</sub> solution.</li> </ol>								

Table 2: Requirements for Cationic Emulsified Asphalts (1)

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting		Medium-Setting		Slow-Setting		Quick-Setting	
		CRS-1	CRS-2	CMS-2	CMS-2h	CSS-1	CSS-1h	CQS-1h	
<b>EMULSIONS:</b>									
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	-	-	-	-	20-100	20-100	20-100
	50 °C (122 °F)		20-100	100-400	50-450	50-450	-	-	-
Settlement, 5 days, %	-		-	-	-	-	-	-	
Storage Stability Test, 24 hours, %	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.	
Particle Charge	Positive		Positive	Positive	Positive	Positive	Positive	Positive	
Demulsibility, % (2)	40 min.		40 min.	-	-	-	-	-	
Cement Mixing Test, %	-		-	-	-	2.0 max.	2.0 max.	-	
Coating Ability and Water Resistance	Dry Aggregate		-	-	Good	Good	-	-	-
	After Spraying		-	-	Fair	Fair	-	-	-
	Wet Aggregate		-	-	Fair	Fair	-	-	-
	After Spraying		-	-	Fair	Fair	-	-	-
Residue, %	60 min.		65 min.	65 min.	65 min.	57 min.	57 min.	57 min.	
Oil Distillate, volume of emulsion, %	3 max.		3 max.	5-15	12 max.	-	-	-	
pH	T200	-	-	-	-	-	-	-	
<b>DISTILLATION RESIDUE:</b>									
Penetration, 25 °C (77 °F), tenths of mm	T49	90-150	90-150	90-250	40-90	90-250	40-90	40-90	
Ductility, 25 °C (77 °F), cm	T51	40 min.	40 min.	40 min.	40 min.	40 min.	40 min.	40 min.	
Solubility in trichloroethylene, %	T44	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.	97.5 min.	
<b>NOTES:</b>	1. Refer to R5 for typical applications. 2. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.								

Table 3: Requirements for High Float Emulsified Asphalt

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting	Medium-Setting	
		HFRS-2	HFMS-2	
<b>EMULSIONS:</b>				
Viscosity, Saybolt Furol seconds (1)	D244	25 °C (77 °F)	-	
		50 °C (122 °F)	75-400	
Storage Stability Test, 24 hours, % (1)		1.0 max.	100 min.	
Sieve Test, % (1)		0.10 max.	1.0 max.	
Demulsibility, % (2)		50 min.	0.10 max.	
Coating Ability and Water Resistance		Dry Aggregate	50 min.	30 min.
		After Spraying	-	-
		Wet Aggregate	-	-
		After Spraying	-	-
Residue, %		T59	65 min.	65 min.
Oil Distillate, volume of emulsion, %	3.0 max.		3.0 max.	
<b>DISTILLATION RESIDUE:</b>				
Penetration, 25 °C (77 °F), tenths of mm	D5	100-250	90-250	
Ductility, 25 °C (77 °F), cm	T51	40 min.	40 min.	
Solubility in trichloroethylene, %	D5	97.5 min.	97.5 min.	
Apparent Viscosity, 140 °F, Poise (3)	D4957	See Note 4	See Note 4	
Float Test at 60 °C (140 °F), seconds (4)	D139	1200 min.	1200 min.	
<b>NOTES:</b>	<ol style="list-style-type: none"> <li>The test results shall be reported, but the requirements may be waived if successful application of the material is achieved in the field.</li> <li>For HFRS-2, use 0.02 N CaCl<sub>2</sub> solution. For HFMS-2 0.10 N CaCl<sub>2</sub> solution.</li> <li>Penetration results shall fall within the designated area on the following chart at a shear rate of 1.0 sec<sup>-1</sup> (see ND 818.02 E). The viscosity will be determined using a Modified Koppers size 100 viscometer tube at 140 °F, and 300 mm Hg vacuum.</li> <li>When testing HFMS-2, the residue from distillation shall be poured immediately into the float collar at 500 °F.</li> </ol>			

Table 4: Requirements for Polymer Modified Asphalt Emulsions

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting	
		CRS-2P	CRS-2L
<b>EMULSIONS:</b>			
Viscosity, Saybolt Furol seconds	T59	25 °C (77 °F)	-
		50 °C (122 °F)	100-400
Settlement, 5 days, %		-	
Storage Stability Test, 24 hours, %		1 max.	
Sieve Test, %		0.10 max.	
Particle Charge Test		Positive	
Demulsibility, %		40 min.	
Residue by Distillation, %		T59	65 min.
<b>DISTILLATION RESIDUE:</b>			
Penetration, 25 °C (77 °F), tenths of mm	T49	90-150	100-175
Ductility, 5 cm/minute, cm	T51	4 °C (39.2 °F)	30 min.
		25 °C (77 °F)	125 min.
Force Ratio (f2/f1)	T300	0.30 min.	-
Elastic Recovery, 25 °C (77 °F), %	T301	50 min.	-
Polymer Solids content, %	-	2.5 min.	2.5 min.
Solubility in Trichloroethylene, %	T44	97.5 min. (1)	97.5 min. (1)
<b>NOTES:</b>	1. If the solubility of the residue is less than 97.5 percent, the base asphalt binder for the emulsion shall be tested. The solubility of the base asphalt binder shall be greater than 99%.		

Table 5: Requirements for Polymer-Modified High Float Emulsified Asphalt

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting	
		HFRS-2P	
<b>EMULSIONS:</b>			
Viscosity, Saybolt Furol seconds	T59	25 °C (77 °F)	-
		50 °C (122 °F)	75-400
Storage Stability Test, 24 hours, % (1)		Passes	
Sieve Test, %		0.10 max.	
Demulsibility, % (2)		40 min.	
Cure Test (3)		See Note 3	Passes
Residue, %		T59	65 min.
Oil Distillate, volume of emulsion, % (4)			3.0 max.
<b>DISTILLATION RESIDUE:</b>			
Penetration, 25 °C (77 °F), tenths of mm	T49	100-200	
Ductility, 4 °C (39.2 °F), cm	T51	30 min.	
Elastic Recovery, 10 °C (50 °F) %	T301	60 min.	
Softening Point, Ring and Ball, °F	T53	100 min.	
Float Test at 60 °C (140 °F), seconds	T50	1200 min.	
<b>NOTES:</b>	<ol style="list-style-type: none"> <li>In addition to requirement of AASHTO T59, on examination of the test cylinder after the emulsion has been standing undisturbed for 24 hours, the surface shall show no white, milky covered substance but shall be a homogeneous brown color throughout.</li> <li>This test is not a requirement on representative samples and is waived if successful application of the material has been achieved in the field. Use 50 ml, 0.10 N CaCl<sub>2</sub> solution.</li> <li>The cure test is performed as follows: Pour approximately 1 gram of (HFMS-2P or HFRS-2P) emulsion onto a metal surface (lid of a 3 oz. Ointment tin). Allow the test sample to cure at temperature of at least 80 °F under a heat light for 4 hours. The outdoor sunlight may be used as a testing sight. After the 4-hour curing period, the (HFMS-2P or HFRS-2P) emulsion shall show no tackiness or tendency to stick to the fingers when pressed.</li> <li>The Distillation Test for HFRS-2P emulsion shall be in accordance with AASHTO T59, 8-12 except that the distillation temperature shall be what the emulsion manufacturer recommends.</li> </ol>		