

State: South Dakota	Materials: Section 890-Asphalt Material
Date: 2/26/25	Web Address: www.sddot.com
Bituminous Engineer: Shea Lemmel	Contact Info: shea.lemmel@state.sd.us

South 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	
EMULSIONS:											
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.								
Demulsibility, % (4)			60 min.	60 min.	-	-	-	-	-	-	
Cement Mixing Test, %			-	-	-	-	-	2.0 max.	2.0 max. (5)	-	
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.	63 min.	55 min.	65 min.	65 min.	57 min.	57 min.	57 min.		
DISTILLATION RESIDUE:											
Penetration, 25 °C (77 °F), tenths of mm		T49	100-200	100-200	100-200	100-200	40-90	100-200	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.	
Float Test at 60 °C (140 °F), seconds		T50	-	-	-	-	-	-	-	-	
NOTES:		<ol style="list-style-type: none"> 1. Refer to R5 for typical applications. 2. This test requirement on representative samples is waived if successful application of the material has been achieved in the field. The sieve test requirement on representative samples will be waived unless requested by the Engineer. 3. A maximum percentage of 0.30 is acceptable for samples taken at the point of use. 4. The demulsibility test shall be performed within 30 days from the date of shipment. Use 35 ml, 0.02 N CaCl₂ solution. 5. When SS-1h emulsified asphalt is specified for tack or flush seal coat, the cement mixing test requirement is waived. 									

South Dakota		Table 2: Requirements for Cationic Emulsified Asphalts (1)								
Property	AASHTO (T), or ASTM (D),	Rapid-Setting		Medium-Setting		Slow-Setting		Quick-Setting		
		CRS-1	CRS-2	CMS-2	CMS-2h	CSS-1	CSS-1h	CQS-1h	CQS-1P	CQS-2P
EMULSIONS:										
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	-	-	-	-	20-100	20-100	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, % (2)		1 max.								
Sieve Test, % (2,3)		0.10 max.								
Particle Charge		Positive								
Demulsibility, % (4)		40 min.	40 min.	-	-	-	-	-	-	-
Cement Mixing Test, %		-	-	-	-	2.0 max.	2.0 max. (5)	-	-	-
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.	62 min.	62 min.
Oil Distillate, volume of emulsion, %		3 max.	3 max.	12 max.	12 max.	-	-	-	-	-
DISTILLATION RESIDUE:										
Penetration, 25 °C (77 °F), tenths of mm	T49	100-250	100-250	100-250	40-90	100-250	40-90	40-90	40-90	90-200
Ductility, 25 °C (77 °F), cm	T51	40 min.						-		
Solubility in trichloroethylene, %	T44	97.5 min.						-		
Softening Point, (R&B) °F	T-53	-						135 min.	128 min.	
Elastic Recovery, %, 50°F, 20 cm, hold 5	T301	-						50	60	
Ash Content, %	T111	-						1		
NOTES:	<ol style="list-style-type: none"> 1. Refer to R5 for typical applications. 2. This test requirement on representative samples is waived if successful application of the material has been achieved in the field. The sieve test requirement on representative samples will be waived unless requested by the Engineer. 3. A maximum percentage of 0.30 is acceptable for samples taken at the point of use. 4. The demulsibility test shall be made within 30 days from the date of shipment. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution. 5. When CSS-1h emulsified asphalt is specified for tack or flush seal coat, the cement mixing test requirement is waived. 									

To ensure the most accurate and current information, the specific agency should be contacted.

Table 3: Requirements for High Float Emulsified Asphalt (1)

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting	Medium-Setting								
		HFRS-2	HFMS-1	HFMS-2	HFMS-2h	HFMS-2s	AE150S	AE150L	AE200S	AE300	
EMULSIONS:											
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	-	20-100	100 min.	100 min.	50 min.	-	-	-	-	
	50 °C (122 °F)	75-400	-	-	-	-	35-150	35-150	35-150	35-150	
Storage Stability Test, 24 hours, %	(2)	1 max.	1 max.	1 max.	1 max.	1 max.	-	-	-	-	
Sieve Test, %	(2,3)	0.10 max.									
Demulsibility, %	(4)	60 min.	-	-	-	-	-	-	-	-	
Coating Ability and Water Resistance	Dry Aggregate	-	Good	Good	Good	Good	-	-	-	-	
	After Spraying	-	Fair	Fair	Fair	Fair	-	-	-	-	
	Wet Aggregate	-	Fair	Fair	Fair	Fair	-	-	-	-	
	After Spraying	-	Fair	Fair	Fair	Fair	-	-	-	-	
Residue, %		63 min.	55 min.	65 min.	65 min.	65 min.	62 min.	65 min. (5)	62 min.	65 min.	
Oil Distillate, volume of emulsion, %		-	-	-	-	1-7	0.5-3	-	1-6	8 max.	
DISTILLATION RESIDUE:											
Penetration, 25 °C (77 °F), tenths of mm	T49	100-200	100-200	100-200	40-90	200 min.	140-225	140-225	250 min.	300 min.	
Ductility, 25 °C (77 °F), cm	T51	40 min.	40 min.	40 min.	40 min.	40 min.	40 min.	30 min.	40 min.	40 min.	
Solubility in trichloroethylene, %	(6) 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.	97.5 min.	
Float Test at 60 °C (140 °F), seconds	T50	1200 min.	1200 min.	1200 min.	1200 min.	1200 min.	1200 min.	1200 min.	1200 min.	1200 min.	
NOTES:	<ol style="list-style-type: none"> 1. Refer to R5 for typical applications. 2. This test requirement on representative samples is waived if successful application of the material has been achieved in the field. 3. A maximum percentage of 0.30 is acceptable for samples taken at the point of use. 4. The demulsibility test shall be performed within 30 days from the date of shipment. Use 35 ml, 0.02 N CaCl₂ solution. 5. Distillation as described in T59 with the following modifications: Material shall be brought to a temperature of 350 ± 10 °F (175 ± 5 °C) for a period of 20 minutes. Total time to distill, including the 20-minute hold period, shall not exceed 60 minutes. 6. N-propyl bromide may also be used for HFRS-2. 										

Table 4: Requirements for Polymer Modified Asphalt Emulsions

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting	
		CRS-2P	
EMULSIONS:			
Viscosity, Saybolt Furol Seconds	T59	25 °C (77°F)	-
		50 °C (122°F)	100-400
Settlement, 5 days, %		-	
Storage Stability Test, 24 hours, % (1)		Pass	
Sieve Test, % (5)		0.10 max.	
Particle Charge Test		Positive	
Demulsibility, % (2)		40 min.	
Cure Test (3)		Pass	
Classification Test		Pass	
Ash Content, %		-	
Residue, % (4)	T59	65 min.	
Oil Distillate, volume of emulsion, % (4)		1.0 max.	
DISTILLATION RESIDUE:			
Penetration, 25 °C (77 °F), tenths of mm	T49	100-150	
Ductility, 4 °C (39 °F), cm	T51	30 min.	
Elastic Recovery, 10° C (50 °F) %	T301	55 min.	
Softening Point (Ring and Ball), °F	T53	100 min.	
Solubility in trichloroethylene, %	T44	97.5 min.	
NOTES:	<ol style="list-style-type: none"> 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. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution. The cure test is performed as follows: Pour approximately 1 gram of emulsion onto a metal surface (lid of a 3 oz. Ointment tin). Allow the test sample to cure at temperatures of at least 80 °F under a heat light for 4 hours. The outdoor sunlight may be used as a testing site. After the 4-hour curing period, the emulsion shall show no tackiness or tendency to stick the fingers when pressed. The distillation test for CRS-2P emulsion shall be in accordance with AASHTO T59, 8-12 except that the distillation temperature shall be what the emulsion manufacturer recommends. A maximum percentage of 0.30 is acceptable for samples taken at the point of use. 		

Table 5: Requirements for Polymerized High Float Emulsified Asphalt

Property	Test Method AASHTO (T), ASTM (D), or Other	Rapid-Setting	Medium-Setting
		HFRS-2P	HFMS-2P
EMULSIONS:			
Viscosity, Saybolt Furol seconds		25 °C (77 °F)	-
		50 °C (122 °F)	50-400
Storage Stability Test, 24 hours, %	(1) T59	Pass	Pass
Sieve Test, %	(5)	0.10 max.	0.10 max
Demulsibility, %	(2)	30 min.	40 min.
Cure Test	(3) -	Pass	Pass
Residue, %	(4) T59	65 min.	65 min.
Oil Distillate, volume of emulsion, %	(4)	3.0 max.	3.0 max.
DISTILLATION RESIDUE:			
Penetration, 25 °C (77 °F), tenths of mm	T49	100-200	100-200
Ductility, 4 °C (39 °F), cm	T51	30 min.	30 min.
Elastic Recovery, 10 °C (50 °F), %	T301	55 min.	55 min.
Softening Point (Ring and Ball), °F	T53	100 min.	100 min.
Float Test at 60 °C (140 °F), seconds	T50	1200 min.	1200 min.
NOTES:	<ol style="list-style-type: none"> 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. For HFRS-2P, use 50 ml, 0.02 N CaCl₂ solution. For HFMS-2P, use 50 ml, 0.10 N CaCl₂ solution. The cure test is performed as follows: Pour approximately 1 gram of emulsion onto a metal surface (lid of a 3 oz. Ointment tin). Allow the test sample to cure at temperatures of at least 80 °F under a heat light for 4 hours. The outdoor sunlight may be used as a testing site. After the 4-hour curing period, the emulsion shall show no tackiness or tendency to stick the fingers when pressed. The distillation temperature shall be as recommended by the emulsion manufacturer. A maximum percentage of 0.30 is acceptable for samples taken at the point of use. 		

Table 6: Requirements for Micro-Surfacing Emulsions

Property	Test Method AASHTO (T), ASTM (D), or Other	CQS-1h	
EMULSIONS:			
Viscosity, Saybolt Furol seconds	T59	25 °C (77 °F)	20-100
		50 °C (122 °F)	-
Storage Stability Test, 24 hours, % (1)		1 max.	
Sieve, % (2)		0.10 max.	
Particle Charge		Positive	
Residue, % (3)		62 min.	
Polymer Content, % by mass of residual asphalt	-	-	
RESIDUE FROM DISTILLATION:			
Penetration @ 25 °C (77 °F), tenths of mm	T49	40-90	
Ductility @ 25 °C (77 °F), cm	T51	40 min.	
Softening Point, °C (°F)	T53	57 (135) min.	
Solubility in trichloroethylene, %	T44	97.5 min.	
NOTES:	<ol style="list-style-type: none"> 1. This test requirement on representative samples is waived if successful application of the material has been achieved in the field. The sieve test requirement on representative samples will be waived unless requested by the Engineer. 2. A maximum percentage of 0.30 is acceptable for samples taken at the point of use. 3. The standard distillation procedure shall be modified as follows: The temperature on the lower thermometer shall be brought slowly to 350 ± 10 °F (177 ± 5°C) and maintained at this level for 20 minutes. The total distillation shall be completed in 60 ± 5 minutes from the first application of heat. 		