State: Missouri	**Materials:** Re: Section 1015 – Bituminous Material
Date: 2/26/25	**Web Address:** www.modot.org
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Missouri		**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**	**SS-1vh**	**QS-1H**
EMULSIONS:											
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	20-100	-	20-100	100 min.		20-100			
	50 °C (122 °F)		-	75-400	-						
Storage Stability Test, 24 hours, % (2)			1.0 max.								
Sieve Test, % (2,3)			0.10 max.							0.30 max	0.10 max.
Demulsibility, % (4)			60 min.		-						
Cement Mixing Test, %			-					2.0 max.		-	
Coating Ability and Water Resistance	Dry Aggregate		-		Good			-			
	After Spraying		-		Fair			-			
	Wet Aggregate		-		Fair			-			
	After Spraying		-		Fair			-			
Residue, %			55 min.	63 min.	55 min.	65 min.		57 min.		50 min.	57 min.
DISTILLATION RESIDUE:											
Softening Point, °F		T53	-							149-200	-
G*/sin delta, 76 ºC, 10 rad/sec, kPa		T315	-							1.0	-
Penetration, 25 ºC (77 °F), tenths of mm		T49	100-200				40-90	100-200	40-90		40-90
Ductility, 25 ºC (77 °F), cm		T51	40 min.								
Solubility in trichloroethylene or n-propyl bromide, %		T44	97.5 min.								
NOTES:		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* $CaCl_2$ solution.									

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Missouri		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**
EMULSIONS:									
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, % (2)			1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.
Sieve Test, % (2)			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 , % (3)			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.	12 max.	12 max.	-	-	-
DISTILLATION RESIDUE:									
Penetration, 25 ºC (77 °F), tenths of mm		T49	100-250	100-250	100-250	40-90	100-250	40-90	40-90
Ductility, 25 ºC (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.
NOTES:		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. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.							

Missouri		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**	
EMULSIONS:								
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	-	20-100	100 min.	100 min.	50 min.	
	50 °C (122 °F)		75-400	-	-	-	-	
Storage Stability Test, 24 hours, % (2)			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.	
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.	
Oil Distillate, volume of emulsion, %			-	-	-	-	1-7	
DISTILLATION RESIDUE:								
Penetration, 25 ºC (77 °F), tenths of mm		T49	100-200	100-200	100-200	40-90	200 min.	
Ductility, 25 ºC (77 °F), cm		T51	40 min.	40 min.	40 min.	40 min.	40 min.	
Solubility in trichloroethylene, % (5)		T44	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.	
NOTES:		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* $CaCl_2$ solution. 5. N-propyl bromide may also be used for HFRS-2.						

Missouri		Table 4: Requirements for Polymer Modified Asphalt Emulsions			
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Anionic**	**Cationic**	
			EA-90P	**CRS-2P**	**CHFRS-2P**
EMULSIONS:					
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	-	-	-
	50 °C (122 °F)		100-400	100-400	100-400
Storage Stability Test, 24 hours, %			1 max. (1)	1 max. (1)	1 max.
Sieve Test, %			0.30 max.	0.30 max.	0.10 max.
Particle Charge Test			-	Positive	Positive
Demulsibility, % (2)			30 min.	-	60 min.
Classification Test			-	Pass	-
Residue, % (3)			65 min.	65 min.	65 min.
Oil Distillate, volume of emulsion, % (3)			3 max.	3 max.	0.5 max.
DISTILLATION RESIDUE:					
Penetration, 25 °C (77 °F), tenths of mm		T49	100-200	100-200	80-130
Ductility, 4 ºC (39.2 °F), cm		T51	25 min.	30 min.	-
Elastic Recovery, 10 ºC (50 °F), % (4)		T301	58 min.	58 min.	65 min.
Softening Point, °C		T53	-	-	54 min.
Viscosity, 60 °C (140 °F), Poise		T202	-	-	1300 min.
Ash Content, %		T111	1 max.	1 max.	-
Polymer Content, weight, % (solids based)		-	-	-	3.0 min.
Solubility in trichloroethylene, %		T44	-	-	95 min.
Float Test at 60° C (140° F), seconds		T50	1200 min.	-	1800 min.

For Table 4 Notes, see Page 5

TABLE 4 NOTES:	1. In addition to AASHTO T59, upon examination of the test cylinder, and after standing undisturbed for 24 hours, the surface shall know no appreciable white, milky colored substance and shall be a homogeneous brown color throughout. 2. For EA-90P, use 0.02 *N* $CaCl_2$ solution. For CHFRS-2P, use 35 ml 0.8% sodium dioctyl sulfosuccinate solution. 3. For EA-90P and CRS-2P, AASHTO T59 shall be modified to maintain a 399 °F ± 10 °F maximum temperature for 15 minutes. For CHFRS-2P, AASHTO T59 shall me modified to maintain a 177 °C ± 5 °C maximum temperature to be held for 20 minutes. Complete the total distillation in 60 ± 5 minutes from the first application of heat. 4. Elastic Recovery shall be determined as follows: Condition the ductilometer and samples to be treated at 10 °C. Prepare the brass plate, mold, and briquet specimen in accordance with AASTHO T51. Keep the specimen at the specified temperature of 10 °C for 85-95 minutes. Immediately after conditioning, place the specimen in the ductilometer and proceed to elongate the sample to 20cm at a rate of pull of 5 cm/min. After the 20 cm elongation has been reached, stop the ductilometer and hold the sample in the elongated position for 5 minutes. After the 5 minutes, clip the sample approximately in half by means of scissors or other suitable cutting devices. Let the sample remain in the ductilometer in an undisturbed condition for 1 hour. At the end of this time period, retract the half sample specimen until the two broken ends touch. At this point note the elongation recovery (X) in cm. Calculate the % recovery by the following formula: % Recovery = [(20-X)/20] x 100

Missouri		Table 5: Requirements for Polymer Modified Emulsion Membrane				
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Anionic**		**Cationic**	
			PEM-1	**SS-1HP**	**CPEM-1**	**CSS-1HP**
EMULSIONS:						
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	-	20-100	-	20-100
	50 °C (122 °F)		25-125	-	25-125	-
Storage Stability Test, 24 hours, % (1)			1 max.			
Sieve Test, % (2)			0.30 max.	0.50 max.	0.30 max.	0.50 max.
Demulsibility, % (3)			60 min.	-	60 min.	-
Residue, % (4)			63 min.	57 min.	63 min.	57 min.
Oil Distillate, volume of emulsion, % (4)			2 max.	-	2 max.	-
Particle Charge			-	Negative	-	Positive
DISTILLATION RESIDUE:						
Penetration, 25 °C (50 °F), tenths of mm		T49	90-150	40-90	90-150	40-90
Elastic Recovery, 25 ºC (77 °F), %		T301	60 min.	30 min.	60 min.	30 min.
Solubility in Trichloroethylene, % (5)		T44	-	97.5 min.	-	97.5 min.
NOTES:		1. In addition to AASHTO T59, upon examination of the test cylinder, and after standing undisturbed for 24 hours, the surface shall know no appreciable white, milky colored substance and shall be a homogeneous brown color throughout. 2. The Sieve Test will be waived if successful application of the material has been achieved in the field. 3. For PEM-1, use 35 ml 0.02 *N* $CaCl_2$ solution. For CPEM-1, use 35 ml 0.8% sodium dioctyl sulfosuccinate solution. 4. AASHTO T59 shall be modified to maintain a 400 °F ± 10 °F maximum temperature to be held for a period of 15 minutes. 5. Ash Test (T111, 1.0 % max.) may be performed in lieu of Solubility.				

Missouri		Table 6: Requirements for Micro-Surfacing Emulsions	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**MSE-1**
EMULSIONS:			
Viscosity, Saybolt Furol Seconds	25 °C (77 °F)	T59	20-100
	50 °C (122 °F)		-
Storage Stability Test, 24 hours, % (1)			1 max.
Sieve, %			0.50 max.
Particle Charge (2)			Positive
Residue, %			62 min.
RESIDUE FROM EVAPORATION:			
Penetration, 25 °C (77 °F), tenths of mm		T49	40-90
Ductility, 25 °C (77 °F), cm		T51	40 min.
Solubility in trichloroethylene, %		T44	97.50 min.
NOTES:		1. The Storage Stability Test may be waived provided the asphalt emulsion storage tank at the project site has adequate provisions for circulating the entire contents of the tank, and provided satisfactory field results are obtained. 2. If the Particle Charge Test is inconclusive, material having a maximum pH value of 6.7 will be acceptable.	

Missouri		Table 7: Requirements for Scrub Seal Emulsion	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**SSE-1**
EMULSIONS:			
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	30-100
	50 °C (122 °F)		-
Storage Stability Test, 24 hours, % (1)			1 max.
Sieve Test, % (2)			0.30 max.
Demulsibility, % (3)			60 min.
Residue, % (4)			60 min.
Oil Distillate, volume of emulsion, % (4)			3 max.
DISTILLATION RESIDUE:			
Penetration, 25 °C (77 °F), tenths of mm		T49	100-300
Elastic Recovery, 10 ºC (50 °F), % (5)		D5976	30 min.
Ash Content, %		T111	1 max.
Float Test at 60° C (140° F), seconds		T50	1200 min.
Saturates, % (6)		D4124	20 max.
NOTES:		1. Upon examination of the test cylinder, and after standing undisturbed for 24 hours, the surface shall know no appreciable white, milky colored substance and shall be a homogeneous brown color throughout. 2. A percentage of 0.30 will be acceptable for samples taken at the point of use or shipped to the Central Laboratory for testing. 3. Use 35 ml 0.02 *N* $CaCl_2$ solution. 4. 205 °C ± 5 °C maximum temperature to be held for 15 minutes. 5. 20 cm elongation, 60 minute recovery. 6. ASTM D2124 shall be modified to use Alumina, CG-20 Grade, available from Aluminum Company of America, Pittsburgh, PA.	