State: Colorado	**Materials:** RE: Section 702
Date: 11/27/2024	**Web Address:** www.colorado.gov
Contact: Vincent Battista (Asphalt Pavement Program Engineer)	**Contact Info:** vincent.battista@state.co.us

Colorado		**Table 1: Requirements for Tack and Fog Coat Emulsions**		
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**CSS-1h**	**SS-1h**
EMULSIONS:				
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	20-100	20-100
	50 °C (122 °F)		-	-
Settlement, 5 days, %			-	-
Storage Stability Test, 24 hours, % (1)			1 max.	1 max.
Sieve Test, % (1)			0.10 max.	0.10 max.
Particle Charge			Positive	-
Demulsibility, %			-	-
Oil Distillate by Volume, %			3.0 max.	3.0 max.
Coating Ability and Water Resistance	Dry Aggregate		-	-
	After Spraying		-	-
	Wet Aggregate		-	-
	After Spraying		-	-
Residue, % (CP-L 2212) (2,3)			57 min.	57 min.
DISTILLATION RESIDUE:				
Penetration, 25 ºC (77 °F), tenths of mm		T49	40-120	40-120
Ductility, 25 ºC (77 °F), cm		T51	40 min.	40 min.
Solubility in trichloroethylene or n-propyl bromide, %		T44	97.5 min.	97.5 min.
NOTES:		1. If successful application is achieved in the field, the Engineer may wave this requirement.A maximum percentage of 0.30 is acceptable for samples taken at the point of use. 2. CP-L 2212 is a rapid evaporation test for determining percent residue of an emulsion and providing material for tests on residue. CP-L 2212 is for acceptance only. If the percent residue or any test on the residue fails to meet specifications, the tests will be repeated using the distillation test in accordance with AASHTO T-59 to determine acceptability. 3. For polymerized emulsions the distillation and evaporation tests will be performed in accordance with AASHTO T-59 or CP-L 2212 respectively with modifications to include 205 ± 5 ºC (400 ± 10 ºF) maximum temperature to be held for 15 minutes.		

Colorado		Table 2: Requirements for Slurry Seal and Micro-Surfacing Emulsions		
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**CQS-1hL**	**CQS-1hP**
EMULSIONS:				
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	15-100	15-100
	50 °C (122 °F)		-	
Settlement, 5 days, %			-	
Storage Stability Test, 24 hours, % (1)			1 max.	1 max.
Sieve Test, % (1)			0.10 max.	0.10 max.
Particle Charge			Positive	Positive
Demulsibility , %			-	
Cement Mixing Test, %			-	
Residue, % (2,3)		T59/ CP L-2212	62 min.	62 min.
Oil Distillate, volume of emulsion, %		T59	0.5 max.	0.5 max.
pH		T200	-	
DISTILLATION RESIDUE:				
Penetration, 25 ºC (77 °F), tenths of mm		T49	40-150	40-150
Ductility, 25 ºC (77 °F), cm		T51	50 min.	50 min.
Solubility in trichloroethylene, %		T44	97.5 min.	97.5 min.
NOTES:		1. If successful application is achieved in the field, the Engineer may waive this requirement.A maximum percentage of 0.30 is acceptable for samples taken at the point of use. 2. **CP-L 2212 is a rapid evaporation test for determining percent residue of an emulsion and providing material for tests on residue. CP-L 2212 is for acceptance only. If the percent residue or any test on the residue fails to meet specifications, the tests will be repeated using the distillation test in accordance with AASHTO T-59 to determine acceptability.** 3. For polymerized emulsions the distillation and evaporation tests will be performed in accordance with AASHTO T-59 or CP-L 2212 respectively with modifications to include 205 ± 5 ºC (400 ± 10 ºF) maximum temperature to be held for 15 minutes.		

Colorado		Table 3: Requirements for Polymerized Emulsions For Chip Seals				
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Rapid-Setting**			**Medium-Setting**
			CRS-2	**CRS-2P**	**CRS-2R**	**HFMS-2P**
EMULSIONS:						
Viscosity, Saybolt Furol Seconds, range (1)	25 °C (77 °F)	T59	-			-
	50 °C (122 °F)		50-450			50-450
Settlement, 5 days, %			-			-
Storage Stability Test, 24 hours, %			1.0 max.			1.0 max.
Sieve Test, %			0.10 max.			0.10 max.
Particle Charge Test			Positive			-
Demulsibility, % (1)			40 min.			-
Residue by Distillation/Evaporation, % (2)		T59/CP L-2212 (3)	65 min.			65 min.
Oil Distillate, volume of emulsion, %		T59	3.0 max.			3.0 max.
DISTILLATION/EVAPORATION RESIDUE:						
Penetration, 25 ºC (77 °F), tenths of mm		T49	70-150			70-150
Ductility, cm	4 ºC (39.2 °F)	T51	-		40 min.	-
	25 ºC (77 °F)		40 min	-	-	75 min.
Elastic Recovery, 25 °C (77 °F), %		T301	-			58 min.
Solubility in trichloroethylene, %		T44	97.5 min.			
Toughness and Tenacity, in-lbs.	Toughness	CP-L 2210	-	70 min.	90 min.	-
	Tenacity		-	45 min.	45 min.	-
Float Test at 60 °C (140 °F), seconds		T50	-			1200 min.
NOTES:		1. If successful application is achieved in the field, the Engineer may waive this requirement. 2. For polymerized emulsions, the distillation and evaporation tests will be in conformance with AASHTO T59 or CP-L 2212 respectively, with modifications to include 205 ± 5 °C (400 ± 10 °F) maximum temperature to be held for 15 minutes. 3. CP-L 2212 is a rapid evaporation test for determining percent residue of an emulsion and providing material for tests on residue. CP-L 2212 is for acceptance only. If the percent residue or any test on the residue fails to meet specifications, the tests will be repeated using the distillation test in conformance with AASHTO T59 to determine acceptability.				

Colorado		Table 4: Requirements for High Float Emulsified Asphalt (Polymerized)	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Medium-Setting**
			HFMS-2sP
EMULSIONS:			
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	-
	50 °C (122 °F)		50-450
Storage Stability Test, 24 hours, %			1.0 max.
Sieve Test, %			0.10 max.
Residue, % (1)			65 min.
Oil Distillate, volume of emulsion, %			1-7
DISTILLATION RESIDUE:			
Penetration, 25 ºC (77 °F), tenths of mm		T49	150-300 (2)
Ductility, 25 ºC (77 °F), cm		T51	-
Elastic Recovery, 4 ºC (39.2 °F) %		T301	50 min.
Solubility in trichloroethylene, %		T44	97.5 min.
Float Test at 60 °C (140 °F), seconds		T50	1200 min.
NOTES:		1. 400 ± 10 °F maximum temperature to be held for 15 minutes. 2. When approved by the Engineer. Emulsified Asphalt (HFMS-2sP) with a residual penetration greater than 300 dmm may be used with Cold Bituminous Pavement (Recycle) to address problems with cool weather or extremely aged existing pavement. Emulsified Asphalt (HFMS-2sP) with a residual penetration greater than 300 dmm shall meet all the properties listed in Table 702-4 except that Elastic Recovery shall be reported for information only.	

Colorado		Table 5: Requirements for Emulsified Recycling Agent	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Emulsified Recycling Agent**
EMULSIONS:			
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	D244	20-200
	50 °C (122 °F)		-
Miscibility			-
Sieve Test, % (1)			0.10 max.
Particle Charge			Positive
Cement Mixing, %			2.0 max.
Pumping Stability		GB Method (2)	Pass
Conc. Of Oil Phase (3)		D244	64 min.
Residue, %			-
EVAPORATION RESIDUE:			
Viscosity, 60 °C, CST		D2170	2000-4000
Flash Point, COC, °C (°F)		D92	232 min.
Maltenes Distribution Ratio $(PC+A_1)/(S+A_2)$ (4)		D2006	0.3-0.6
PC/S Ration			0.4 min.
Asphaltenes, %			11.0 max.
NOTES:		1. Test procedure identical with ASTM D244 except that distilled water shall be used in place of 2 % sodium oleate solution. 2. Pumping stability is determined by charging 450 ml of emulsion into 1-liter beaker and circulating the emulsion through a gear pump (Roper 29.B22621) having a 6.3 mm (1/4 inch) inlet and outlet. The emulsion passes if there is no significant separation after circulating 10 minutes. 3. ASTM D244 Evaporation Test for percent of residue is modified by heating 50 g sample to 149 °C (300 °F) until foaming ceases, then cooling immediately and calculating results. 4. In the Maltenes Distribution Ratio Test by ASTM Method D 2006: PC=Polar Compounds S=Saturates A_1=First Acidaffins A_2=Second Acidaffins	

Colorado		Table 6: Requirements for Asphalt Emulsion for Prime Coat Emulsions	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Asphalt Emulsion for Prime Coat (AEP)**
EMULSIONS:			
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	-
	50 °C (122 °F)		20-150
Residue, % (1)			65 min.
Oil Distillate, volume of emulsion, %			7 max.
DISTILLATION RESIDUE:			
Solubility in trichloroethylene, %		T44	97.5 min.
NOTES:		1. T59 to 260 °C (500 °F)	

Colorado		Table 7: Requirements for Asphalt Rejuvenating Agent	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Asphalt Rejuvenating Agent**
EMULSIONS:			
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	D244	20-40
	50 °C (122 °F)		-
Miscibility	(1)		No coagulation
Sieve Test, %	(2)		0.10 max.
Particle Charge			Positive
Residue, %	(3)		60-65
EVAPORATION RESIDUE:			
Viscosity, 60 °C, mm^2/s		D445	100-200
Flash Point, COC, °C (°F)		D92	196 min.
Maltenes Distribution Ratio $(PC+A_1)/(S+A_2)$	(4)	D2006	0.3-0.6
Asphaltenes, %			1.0 max.
Saturated Hydrocarbons, %			21-28
NOTES:		1. Test procedure identical with ASTM D244 except that 0.02 Normal calcium Chloride solution shall be used in place of distilled water. 2. Test procedure identical with ASTM D244 except that distilled water shall be used in place of 2 % sodium oleate solution. 3. ASTM D244 Evaporation Test for percent of residue is modified by heating 50 g sample to 149 °C (300 °F) until foaming ceases, then cooling immediately and calculating results. 4. In the Maltenes Distribution Ratio Test by ASTM Method D 2006: PC=Polar Compounds S=Saturates A_1=First Acidaffins A_2=Second Acidaffins	

Colorado		Table 8: Requirements for ARA 1P	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**ARA 1P**
EMULSIONS:			
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	D244	100 max.
	50 °C (122 °F)		-
Sieve Test, %			0.10 max
Residue, %	(1)		60 min.
Oil Distillate, volume of emulsion, %			2.0 max.
DISTILLATION RESIDUE:			
Penetration, 4 ºC (39.2 °F), tenths of mm		D5-Modified	150-250
Asphaltenes, %		D4124	15 max.
NOTES:		1. At 350 °F	