State: Utah	**Materials:** Re: Section 02745-Asphalt Materials, and Section 02735-Micro-Surfacing
Date: 6/27/18	**Web Address:** www.sr.ex.state.ut.us
Contact: Kevin Van Frank	**Contact Info:** KvanFrank@utah.gov

Utah		**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.	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.	63 min.	55 min.	65 min.	65 min.	57 min.	57 min.	57 min.
DISTILLATION RESIDUE:										
Penetration, 25º C (77° F), tenths of mm		T49	100-200	100-200	100-200	100-200	40-90	100-200	40-90	40-90
Ductility, 25º 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.
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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Utah		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**	**CRS-2A (2)**	**CRS-2B (3)**	**CMS-2**	**CMS-2s**	**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	140-400	140-400	50-450	50-450	50-450	-	-	-
Settlement, 5 days, %			-	-	-	-	-	-	-	-	-	-
Storage Stability Test, 24 hours, % (4)			1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.
Sieve Test, % (4)			0.10 max.	0.10 max.	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			Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Demulsibility , % (5)			40 min.	40 min.	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.	65 min.	60 min.	65 min.	57 min.	57 min.	57 min.
Oil Distillate, volume of emulsion, %			3 max.	3 max.	0 max.	0 max.	12 max.	5-15	12 max.	-	-	-
pH		T200	-	-	-	-	-	-	-	-	-	-
DISTILLATION RESIDUE:												
Penetration, 25º C (77° F), tenths of mm		T49	100-250	100-250	100-250	-	-	100-250	40-90	100-250	40-90	40-90
Ductility, 25º 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.	97.5 min.

NOTES:

1. Refer to R5 for typical applications.
2. Use PG 58-22 as base asphalt cement. Specification for high-temperature performance-original and RTFO G*/sin (δ) within 3° C of grade.
3. Use PG 64-22 as base asphalt cement. Specification for high-temperature performance-original and RTFO G*/sin (δ) within 3° C of grade.
4. This test requirement on representative samples is waived if successful application of the material has been achieved in the field.
5. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.

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Utah		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.	50 min.	
	50° C (122° F)		75-400	-	70-300	-	-	
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	
	After Spraying		-	Fair	-	Fair	Fair	
	Wet Aggregate		-	Fair	-	Fair	Fair	
	After Spraying		-	Fair	-	Fair	Fair	
Residue, %			63 min.	55 min.	65 min.	65 min.	65 min.	
Oil Distillate, volume of emulsion, %			-	-	-	-	1-7	
DISTILLATION RESIDUE:								
Penetration, 25º C (77° F), tenths of mm		T49	100-200	100-200	50-200	40-90	200 min.	
Ductility, 25º C (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.						

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Utah		Table 4: Requirements for Polymer Modified Asphalt Emulsions	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Rapid-Setting**
			CRS-2P (1)
EMULSIONS:			
Viscosity, Saybolt Furol Seconds, range	25 °C (77 °F)	T59	-
	50 °C (122 °F)		-
	60 °C (140 °F)		100-400
Settlement, 5 days, % (1)			5 max.
Storage Stability Test, 24 hours, % (2)			-
Sieve Test, %			0.10 max.
Particle Charge Test			Positive
Demulsibility, % (3)			40 min.
Ash Content, %		-	-
Residue, %		T59	68 min.
Oil Distillate, volume of emulsion, %			0 max.
DISTILLATION RESIDUE:			
Penetration, 25 ºC (77 °F), tenths of mm		T49	80-150
Ductility, 4 ºC (39.2 °F), cm		T51	35 min.
Toughness and Tenacity, lb-in.	Toughness	D5801	75 min.
	Tenacity		50 min.
Solubility in trichloroethylene, %		T44	97.5 min.
NOTES:		1. Modify the asphalt cement before emulsification. 2. The test requirement for settlement may be waived when the emulsified asphalt is used in less than 5 days or the purchaser may require that the settlement test be run from the time the sample is received until it is used, if the elapsed time is less than 5 days. 3. The 24-hour (1-day) Storage Stability Test may be used instead of the 5-day Settlement Test. 4. The Demulsibility Test is made within 30 days from date of shipment. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution. 5. Distillation is determined by AASHTO T59 with modifications to include a 350 ± 5° F (177 ± 3 °C) maximum temperature to be held for 15 minutes.	

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Utah		Table 5: Requirements for Polymer-Modified High Float Emulsified Asphalt			
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Rapid-Setting**	**Medium-Setting**	
			HFRS-2P (1)	**HFMS-2P (2)**	**HFMS-2SP (1)**
EMULSIONS:					
Viscosity, Saybolt Furol seconds	25 °C (77 °F)	T59	-	-	-
	50 °C (122 °F)		50-450	100-450	50-450
Storage Stability Test, 24 hours, %			1 max.	1 max.	1 max.
Sieve Test, %			0.10 max.	0.10 max.	0.10 max.
Demulsibility, %			40 min.	-	-
Residue, % (3)			3 max.	7 max.	7 max.
Oil Distillate, volume of emulsion, %			65 min.	65 min.	65 min.
DISTILLATION RESIDUE:					
Penetration, 25 ºC (77 °F), tenths of mm		T49	70-150	70-300	150-300 (4)
Ductility, 25 ºC (77 °F), cm		T51	-	-	-
Elastic Recovery, 25 ºC (77 °F) %		T301	58 min.	50 min.	50 min. (5)
Solubility in trichloroethylene, %		T44	97.5 min.	97.5 min.	97.5 min.
Float Test at 60 °C (140 °F), seconds		T50	1200 min.	1200 min.	1200 min.

NOTES:

1. Supply an HFMS-2SP (anionic, polymerized, high-float) as an emulsified blend of polymerized asphalt cement, water, and emulsifiers. Polymerize the asphalt cement with at least 3.0 % polymer by weight of the asphalt cement before emulsification. The emulsion must be smooth and homogenous throughout, with no white, milky separation, pumpable, and suitable for application through a distributor after standing undisturbed for at least 24 hours.
2. Supply an HFMS-2P (anionic, polymerized, high-float) as an emulsified blend of polymerized asphalt cement, water, and emulsifiers. Polymerize the asphalt cement with at least 3.0 % polymer by weight of the asphalt cement before emulsification. The emulsion must be smooth and homogenous throughout, with no white, milky separation, pumpable, and suitable for application through a distributor after standing undisturbed for at least 24 hours.
3. Determine the distillation by AASHTO T59 with modifications to include a 350 ± 5° F (177 ± 3 °C) maximum temperature to be held for 15 minutes.
4. 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 when approved by the Engineer.
5. Report only when penetration is greater than 300 dmm.

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Utah		Table 6: Requirements for Latex Modified Emulsified Asphalts	
Property		**Test Method AASHTO (T), ASTM (D), or Other**	**Rapid-Setting**
			LMCRS-2 (1)
EMULSIONS:			
Viscosity, Saybolt Furol Seconds	25 °C (77 °F)	T59	-
	50 °C (122 °F)		140-400
Settlement, 5 days, % (2)			5 max.
Storage Stability Test, 24 hours, % (3)			1 max.
Sieve, %			0.30 max.
Particle Charge			Positive
Demulsibility, % (4)			40 min.
Residue, % (5)			65 min.
Polymer Content, % by mass of residual asphalt			0 max.
DISTILLATION RESIDUE:			
Penetration, 25 °C (77 °F), tenths of mm		T49	40-200
Ductility, 25 °C (77 °F), cm		T51	-
Torsional Recovery		CA 332	18 min.
NOTES:		1. Co-mill latex and asphalt during emulsification. 2. The test requirement for settlement may be waived when the emulsified asphalt is used in less than a 5-day time; or the purchaser may require that the settlement test be run from the time the sample is received until it is used, if the elapsed time is less than 5 days. 3. May use the 24-hour (1-day) Storage Stability Test instead of the 5-day Settlement Test. 4. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution. Make the Demulsibility Test within 30 days from date of shipment. 5. Determine distillation by AASHTO T59 with modifications to include a 350 ± 5° F (177 ± 3 °C) maximum temperature to be held for 15 minutes.	

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Utah			Table 7: Requirements for Micro-Surfacing Emulsions (1)	
Property			**Test Method AASHTO (T), ASTM (D), or Other**	**Quick-Setting**
				CQS-1
EMULSIONS:				
Viscosity, Saybolt Furol Seconds		25 °C (77 °F)	T59	20-100
		50 °C (122 °F)		-
Storage Stability Test, 24 hours, %				1 max.
Sieve, %				0.10 max.
Particle Charge				Positive
Residue, %				57 min.
DISTILLATION RESIDUE:				
Penetration, 25 °C (77 °F), tenths of mm			T49	40-90
Ductility, 25 °C (77 °F), cm			T51	40 min.
Solubility in trichloroethylene or n-propyl bromide, %			T44	97.5 min.
MODIFIED EMULSION DISTILLATION RESIDUE:				
Residue, % (2)			T59	62 min.
Penetration, 25 °C (77 °F), tenths of mm			T49	40-90
Softening Point, °C			T53	57 min.
Rotational Viscosity, 135 °C, CPS			T316	650 min.
MODIFIED EMULSION EVAPORATION RESIDUE:			**AASHTO PP 72-11**	
Orig. DSR (3)	G*, kPa	58 °C	T315	7-14
	Phase Angle, δ	58 °C		75 max.
Multiple Stress Creep Recovery (MSCR), % recovery at 3.2 kPa (3)		64 °C	D7405	25 min.
NOTES:			1. Use a quick-set polymer-modified asphalt emulsion manufactured specifically for micro-surfacing. Mill or blend the polymer material into the asphalt or emulsifier solution before the emulsification process. Obtain certification from the asphalt emulsion manufacturer that the emulsion contains at least 3.0 % polymer solids based on the weight of the asphalt (asphalt residual). 2. Modified distillation procedure-Heat emulsion residue to 177 ± 5 °C and maintain that temperature for 20 minutes. Perform the distillation within 60 ± 15 minutes. 3. Do not reheat on completion of evaporation. Complete residue testing within 48 hrs. of performing the evaporation procedure. Pull small specimens from the evaporation sample for rheological testing and ball by hand using gloves that will not affect the reside (i.e. nitrile gloves).	

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