
Special Specification 8005

Emulsions (Materials Only)



1. DESCRIPTION

Furnish emulsified asphalts as specified on the plan sheets.

2. MATERIALS

Provide asphalt materials that meet the stated requirements when tested in accordance with the referenced Department, AASHTO, and ASTM test methods. Use asphalt containing recycled materials only if the recycled components meet the requirements of Article 6.9, "Recycled Materials." Provide asphalt materials that have been preapproved for use by the Department in accordance with [Tex-545-C](#), "Asphalt Binder Quality Program."

Inform the Department of all additives or modifiers included in the asphalt binder as part of the facility quality plan, as required by Tex-545-C, "Asphalt Binder Quality Program," and provide that information to Department personnel. The Department reserves the right to prohibit the use of any asphalt additive or modifier.

Limit the use of polyphosphoric acid to no more than 0.5% by weight of the asphalt binder.

The use of re-refined engine oil bottoms is prohibited.

Acronyms used in this Item are defined in Table 1.

Table 1
Acronyms

Acronym	Definition
Test Procedure Designations	
Tex T or R D	Department AASHTO ASTM
Polymer Modifier Designations	
P SBR or L SBS TR	polymer-modified styrene-butadiene rubber (latex) styrene-butadiene-styrene block co-polymer tire rubber (from ambient temperature grinding of truck and passenger tires)
AC	asphalt cement
AE	asphalt emulsion
AE-P	asphalt emulsion prime
A-R	asphalt-rubber
C	cationic
EAP&T	emulsified asphalt prime and tack
H-suffix	harder residue (lower penetration)
HF	high float
MC	medium-curing
MS	medium-setting
PCE	prime, cure, and erosion control
PG	performance grade
RC	rapid-curing
RS	rapid-setting
S-suffix	stockpile usage
SCM	special cutback material
SS	slow-setting

Emulsified Asphalt. Provide emulsified asphalt that is homogeneous, does not separate after thorough mixing, and meets the requirements for the specified type and grade in Tables 2, 3, 4, and 5.

Table 2
Emulsified Asphalt

Property	Test Procedure	Type-Grade									
		Rapid-Setting		Medium-Setting				Slow-Setting			
		HFRS-2		MS-2		AES-300		SS-1		SS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	-	-	-	-	75	400	20	100	20	100
Sieve test, %	T 59	-	0.1	-	0.1	-	0.1	-	0.1	-	0.1
Miscibility	T 59	-	-	-	-	-	-	Pass	Pass	Pass	Pass
Cement mixing, %	T 59	-	-	-	-	-	-	-	2.0	-	2.0
Coating ability and water resistance: Dry aggregate/after spray Wet aggregate/after spray	T 59	-	-	-	-	Good/Fair	-	-	-	-	-
Demulsibility, 35 mL of 0.02 N CaCl ₂ , %	T 59	50	-	-	30	-	-	-	-	-	-
Storage stability, 1 day, %	T 59	-	1	-	1	-	1	-	1	-	1
Freezing test, 3 cycles ¹	T 59	-	-	Pass	Pass	-	-	Pass	Pass	Pass	Pass
Distillation test: Residue by distillation, % by wt. Oil distillate, % by volume of emulsion	T 59	65	-	65	-	65	-	60	-	60	-
		-	0.5	-	0.5	-	5	-	0.5	-	0.5
Tests on residue from distillation: Penetration, 77°F, 100 g, 5 sec.	T 49	100	140	120	160	300	-	120	160	70	100
Solubility in trichloroethylene, %	T 44	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-
Ductility, 77°F, 5 cm/min., cm	T 51	100	-	100	-	-	-	100	-	80	-
Float test, 140°F, sec.	T 50	1,200	-	-	-	1,200	-	-	-	-	-

1. Applies only when the Engineer designates material for winter use.

Table 3
Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		CRS-2		CRS-2H		CMS-2		CMS-2S		CSS-1		CSS-1H	
Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	-	-	-	-	-	-	-	-	20	100	20	100
		150	400	150	400	100	300	100	300	-	-	-	-
Sieve test, %	T 59	-	0.1	-	0.1	-	0.1	-	0.1	-	0.1	-	0.1
Cement mixing, %	T 59	-	-	-	-	-	-	-	-	-	2.0	-	2.0
Coating ability and water resistance: Dry aggregate/after spray Wet aggregate/after spray	T 59	-	-	-	-	Good/Fair	Good/Fair	Good/Fair	Good/Fair	-	-	-	-
		-	-	-	-	Fair/Fair	Fair/Fair	Fair/Fair	Fair/Fair	-	-	-	-
Demulsibility, 35 mL of 0.8% Sodium dioctyl sulfosuccinate, %	T 59	70	-	70	-	-	-	-	-	-	-	-	-
Storage stability, 1 day, %	T 59	-	1	-	1	-	1	-	1	-	1	-	1
Particle charge	T 59	Positive		Positive		Positive		Positive		Positive		Positive	
Distillation test: Residue by distillation, % by wt. Oil distillate, % by volume of emulsion	T 59	65	-	65	-	65	-	65	-	60	-	60	-
		-	0.5	-	0.5	-	7	-	5	-	0.5	-	0.5
Tests on residue from distillation: Penetration, 77°F, 100 g, 5 sec. Solubility in trichloroethylene, % Ductility, 77°F, 5 cm/min., cm	T 49	120	160	70	110	120	200	300	-	120	160	70	110
	T 44	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-
	T 51	100	-	80	-	100	-	-	-	100	-	80	-

Table 4
Polymer-Modified Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		RS-1P		HFRS-2P		AES-150P		AES-300P		AES-300S		SS-1P	
Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	-	-	-	-	75	400	75	400	75	400	30	100
		50	200	150	400	-	-	-	-	-	-	-	-
Sieve test, %	T 59	-	0.1	-	0.1	-	0.1	-	0.1	-	0.1	-	0.1
Miscibility	T 59	-		-		-		-		-		Pass	
Coating ability and water resistance: Dry aggregate/after spray Wet aggregate/after spray	T 59	-	-	-	-	Good/Fair	Good/Fair	Good/Fair	Good/Fair	Good/Fair	Good/Fair	-	-
		-	-	-	-	Fair/Fair	Fair/Fair	Fair/Fair	Fair/Fair	Fair/Fair	Fair/Fair	-	-
Demulsibility, 35 mL of 0.02 N CaCl ₂ , %	T 59	60	-	50	-	-	-	-	-	-	-	-	-
Storage stability, 1 day, %	T 59	-	1	-	1	-	1	-	1	-	1	-	1
Breaking index, g	Tex-542-C	-	80	-	-	-	-	-	-	-	-	-	-
Distillation test: ¹ Residue by distillation, % by wt. Oil distillate, % by volume of emulsion	T 59	65	-	65	-	65	-	65	-	65	-	60	-
		-	3	-	0.5	-	3	-	5	-	7	-	0.5
Tests on residue from distillation: Polymer content, wt. % (solids basis) Penetration, 77°F, 100 g, 5 sec. Solubility in trichloroethylene, % Viscosity, 140°F, poise Float test, 140°F, sec. Ductility, ² 39.2°F, 5 cm/min., cm Elastic recovery, ² 50°F, %	Tex-533-C	-	-	3.0	-	-	-	-	-	-	-	3.0	-
	T 49	225	300	90	140	150	300	300	-	300	-	100	140
	T 44	97.0	-	97.0	-	97.0	-	97.0	-	97.0	-	97.0	-
	T 202	-	-	1,500	-	-	-	-	-	-	-	1,300	-
	T 50	-	-	1,200	-	1,200	-	1,200	-	1,200	-	-	-
	T 51	-	-	50	-	-	-	-	-	-	-	50	-
	Tex-539-C	55	-	55	-	-	-	-	-	-	-	-	-
Tests on RTFO curing of distillation residue Elastic recovery, 50°F, %	Tex-541-C	-	-	-	-	50	-	50	-	30	-	-	-
	Tex-539-C	-	-	-	-	-	-	-	-	-	-	-	-

- Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ±10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 min. (±5 min.) from the first application of heat.
- HFRS-2P must meet one of either the ductility or elastic recovery requirements.

Table 5
Polymer-Modified Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade													
		Rapid-Setting								Medium-Setting				Slow-Setting	
		CRS-1P		CRS-2P		CHFRS-2P		CRS-2TR		CMS-1P ³		CMS-2P ³		CSS-1P	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	-	-	-	-	-	-	--	--	10	100	-	-	20	100
Sieve test, %	T 59	-	0.1	-	0.1	-	0.1	--	0.1	-	0.1	-	0.1	-	0.1
Demulsibility, 35 ml of 0.8% sodium dioctyl sulfosuccinate, %	T 59	60	-	70	-	60	-	40	--	-	-	-	-	-	-
Storage stability, 1 day, %	T 59	-	1	-	1	-	1	--	1	-	1	-	1	-	1
Breaking index, g	Tex-542-C	-	80	-	-	-	-	--	--	-	-	-	-	-	-
Particle charge	T 59	Positive		Positive		Positive		Positive		Positive		Positive		Positive	
Distillation test ¹ :	T 59														
Residue by distillation, % by weight		65	-	65	-	65	-	65	--	30	-	60	-	62	-
Oil distillate, % by volume of emulsion		-	3	-	0.5	-	0.5	--	3	-	0.5	-	0.5	-	0.5
Tests on residue from distillation:															
Polymer content, wt. % (solids basis)	Tex-533-C	-	-	3.0	-	3.0	-	5.0 ⁷	--	-	-	-	-	3.0	-
Penetration, 77°F, 100 g, 5 sec.	T 49	225	300	90	150	80	130	90	150	30	-	30	-	55	90
Viscosity, 140°F, poise	T 202	-	-	1,300	-	1,300	-	1,000	--	-	-	-	-	-	-
Solubility in trichloroethylene, %	T 44	97.0	-	97.0	-	95.0	-	98	--	-	-	-	-	97.0	-
Softening point, °F	T 53	-	-	-	-	130	-	--	--	-	-	-	-	135	-
Ductility, 77°F, 5 cm/min., cm	T 51	-	-	-	-	-	-	40	--	-	-	-	-	70	-
Float test, 140°F, sec.	T 50	-	-	-	-	1,800	-	--	--	-	-	-	-	-	-
Ductility, ² 39.2°F, 5 cm/min., cm	T 51	-	-	50	-	-	-	--	--	-	-	-	-	-	-
Elastic recovery, ² 50°F, %	Tex-539-C	45	-	55	-	55	-	--	--	-	-	-	-	-	-
Tests on residue from evaporative recovery:	R 78, Procedure B														
Nonrecoverable creep compliance of residue, 3.2 kPa, 52°C, kPa ⁻¹	T 350									-	2.0	-	4.0		
Tests on rejuvenating agent:															
Viscosity, 140°F, cSt	T 201	-	-	-	-	-	-	--	--	50	175	50	175	-	-
Flash point, C.O.C., °F	T 48	-	-	-	-	-	-	--	--	380	-	380	-	-	-
Saturates, % by weight	D 2007	-	-	-	-	-	-	--	--	-	30	-	30	-	-
Solubility in n-pentane, % by weight	D 2007	-	-	-	-	-	-	--	--	99	-	99	-	-	-
Tests on rejuvenating agent after TFO or RTFO:	T 240 or T 179														
Weight Change, %		-	-	-	-	-	-	--	--	-	6.5	-	6.5	-	-
Viscosity Ratio		-	-	-	-	-	-	--	--	-	3.0	-	3.0	-	-
Tests on latex ⁴ :															
Tensile strength, die C dumbbell, psi	D 412 ⁵	-	-	-	-	-	-	--	--	800	-	800	-	-	-
Change in mass after immersion in rejuvenating agent, %	D 471	-	-	-	-	-	-	--	--	-	40 ⁶	-	40 ⁶	-	-

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1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ($\pm 0^\circ\text{F}$). Maintain at this temperature for 20 min. Complete total distillation in 60 min. (± 5 min.) from the first application of heat.
 2. CRS-2P must meet one of either the ductility or elastic recovery requirements.
 3. With all precertification samples of CMS-1P or CMS-2P, submit certified test reports showing that the rejuvenating agent and latex meet the stated requirements. Submit samples of these raw materials if requested by the Engineer.
 4. Preparation of latex specimens: Use any substrate and recovery method which produces specimens of uniform dimensions and which delivers enough material to achieve desired residual thickness.
 5. Cut samples for tensile strength determination using a crosshead speed of 20 in./min.
 6. Specimen must remain intact after exposure and removal of excess rejuvenating agent.
 7. Modifier type is tire rubber.
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Table 5B

Non-Tracking Tack Coat Emulsion

Property	Test Procedure	Quick Setting	
		QS-1HH	
		Min	Max
Viscosity, Saybolt Furol, 77° F, sec	T 72	15	--
Storage stability, 1 Day, %	T 59	--	1
Settlement, 5-day, %	T 59	2	5
Sieve test, %	T 59	--	0.30
Distillation test: ¹	T 59		
Residue by distillation, % by wt.		50	--
Oil distillate, by volume of emulsion		--	1.0
Test on residue from distillation:			
Penetration, 77°F, 100 g, 5 sec.	T 49	--	20
Solubility in trichloroethylene, %	T 44	97.5	--
Softening point, °F	T 53	150	--
Dynamic shear, G ² /sin(δ), 82°C, 10 rad/s, kPa	T 315	1.0	--

1. Exception to AASHTO T-59: Bring the temperature on the lower thermometer slowly to 350°F ± 10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ± 5 min. from first application of heat.

Specialty Emulsions. Provide specialty emulsion that is either asphalt-based or resin-based and meets the requirements of Table 6 or Table 6A.

Table 6
Specialty Emulsions

Property	Test Procedure	Type-Grade					
		Medium-Setting				Slow-Setting	
		AE-P		EAP&T		PCE ¹	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec.	T 72	--	--	--	--	10	100
122°F, sec.		15	150	--	--	--	--
Sieve test, %	T 59	--	0.1	--	0.1	--	0.1
Miscibility ²	T 59	--	--	Pass	--	Pass	--
Demulsibility, 35 mL of 0.10 N CaCl ₂ , %	T 59	--	70	--	--	--	--
Storage stability, 1 day, %	T 59	--	1	--	1	--	--
Particle size, ⁵ % by volume < 2.5 μm	Tex-238-F³	--	--	90	--	90	--
Asphalt emulsion distillation to 500°F followed by Cutback asphalt distillation of residue to 680°F:	T 59 & T 78						
Residue after both distillations, % by wt.		40	--	--	--	--	--
Total oil distillate from both distillations, % by volume of emulsion		25	40	--	--	--	--
Residue by distillation, % by wt.	T 59	--	--	60	--	--	--
Residue by evaporation, ⁴ % by wt.	T 59	--	--	--	--	60	--
Tests on residue after all distillation(s):							
Viscosity, 140°F, poise	T 202	--	--	800	--	--	--
Kinematic viscosity, ⁵ 140°F, cSt	T 201	--	--	--	--	100	350
Flash point C.O.C., °F	T 48	--	--	--	--	400	--
Solubility in trichloroethylene, %	T 44	97.5	--	--	--	--	--
Float test, 122°F, sec.	T 50	50	200	--	--	--	--

1. Supply with each shipment of PCE:
a copy of a lab report from an approved analytical lab, signed by a lab official, indicating the PCE formulation does not meet any characteristics of a Resource Conservation Recovery Act (RCRA) hazardous waste;
a certification from the producer that the formulation supplied does not differ from the one tested and that no listed RCRA hazardous wastes or Polychlorinated Biphenyls (PCBs) have been mixed with the product; and
a Safety Data Sheet.

- Exception to T 59: In dilution, use 350 mL of distilled or deionized water and a 1,000-mL beaker.
- Use [Tex-238-F](#), beginning at "Particle Size Analysis by Laser Diffraction," with distilled or deionized water as a medium and no dispersant, or use another approved method.
- Exception to T 59: Leave sample in the oven until foaming ceases, then cool and weigh.
- PCE must meet either the kinematic viscosity requirement or the particle size requirement.

Table 6A
Hard Residue Surface Sealant

Property	Test Procedure	Min	Max
Viscosity, Krebs unit, 77°F, Krebs units	D 562	45	75
Softening point, °F	T 53 ¹	250	--
Uniformity	D 2939	Pass ²	
Resistance to heat	D 2939	Pass ³	
Resistance to water	D 2939	Pass ⁴	
Wet flow, mm	D 2939	--	0
Resistance to Kerosene (optional) ⁵	D 2939	Pass ⁶	
Ultraviolet exposure, UVA-340, 0.77 W/m ² , 50°C chamber, 8 hr. UV lamp, 5 min spray, 3 hr. 55 min. condensation, 1000 hr total exposure ⁷	G 154	Pass ⁸	
Abrasion loss, 1.6 mm thickness, liquid only, %	ISSA TB-100	--	1.0
Residue by evaporation, % by weight	D 2939	33	--
Tests on residue from evaporation: Penetration, 77°F, 100 g, 5 sec. Flash point, Cleveland open cup, °F	T 49 T 48	15 500	30
Tests on base asphalt before emulsification Solubility in trichloroethylene, %	T 44	98	--

1. Cure the emulsion in the softening point ring in a 200°F ± 5°F oven for 2 hr.
2. Product will be homogenous and show no separation or coagulation that cannot be overcome by moderate stirring.
3. No sagging or slippage of film beyond the initial reference line.
4. No blistering or re-emulsification.
5. Recommended for airport applications or where fuel resistance is desired.
6. No absorption of Kerosene into the clay tile past the sealer film. Note sealer surface condition and loss of adhesion.
7. Other exposure cycles with similar levels of irradiation and conditions may be used with Department approval.
8. No cracking, chipping, surface distortion, or loss of adhesion. No color fading or lightening.

Recycling Agent. Recycling agent and emulsified recycling agent must meet the requirements in Table 7. Additionally, recycling agent and residue from emulsified recycling agent, when added in the specified proportions to the recycled asphalt, must meet the properties specified on the plans.

Table 7
Recycling Agent and Emulsified Recycling Agent

Property	Test Procedure	Recycling Agent		Emulsified Recycling Agent	
		Min	Max	Min	Max
Viscosity, Saybolt Furol, 77°F, sec.	T 72	--	--	15	100
Sieve test, %	T 59	--	--	--	0.1
Miscibility ¹	T 59	--		No coagulation	
Residue by evaporation, ² % by wt.	T 59	--	--	60	--
Tests on recycling agent or residue from evaporation: Flash point, C.O.C., °F Kinematic viscosity, 140°F, cSt 275°F, cSt	T 48 T 201	400 75 --	-- 200 10.0	400 75 --	-- 200 10.0

1. Exception to T 59: Use 0.02 N CaCl₂ solution in place of water.
2. Exception to T 59: Maintain sample at 300°F until foaming ceases, then cool and weigh.

Crumb Rubber Modifier. Crumb rubber modifier (CRM) consists of automobile and truck tires processed by ambient temperature grinding.

CRM must be:

- free from contaminants including fabric, metal, and mineral and other nonrubber substances;
- free-flowing; and
- nonfoaming when added to hot asphalt binder.

Ensure rubber gradation meets the requirements of the grades in Table 8 when tested in accordance with [Tex-200-F](#), Part I, using a 50-g sample.

Table 8
CRM Gradations

Sieve Size (% Passing)	Grade A		Grade B		Grade C		Grade D	Grade E
	Min	Max	Min	Max	Min	Max		
#8	100	-	-	-	-	-	As shown on the plans	As approved
#10	95	100	100	-	-	-		
#16	-	-	70	100	100	-		
#30	-	-	25	60	90	100		
#40	-	-	-	-	45	100		
#50	0	10	-	-	-	-		
#200	-	-	0	5	-	-		

3. MEASUREMENT AND PAYMENT

This Item will be measured by the gallon.

The materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Emulsion" of the specified type.

Material (Pick up). Payment will be made for the type and grade specified. This price is full compensation for furnishing materials, loading provided vehicles, equipment, labor, tools, and incidentals.

Material (Delivery). Payment will be made for the type and grade specified. This price is full compensation for furnishing materials, delivery, transfer, equipment, labor, tools and incidentals. Delivery fees should be subsidiary to the Item to locations designated in the plan.