

## SECTION 713

## EMULSIFIED ASPHALTS MATERIALS

## 713.1 GENERAL:

Emulsified asphalts shall be composed of a paving asphalt base uniformly emulsified with water and an emulsifying or stabilizing agent, which stabilizes the mixture and provides a charge. The resultant charge is either positive, cationic (C) or negative, anionic. # The emulsion shall be homogeneous throughout and if stored, shall show no separation of ingredients within 30 days after delivery. Emulsified asphalt shall be classified as quick setting, rapid setting, medium setting or slow setting type in either anionic or cationic emulsions, by charge, set time, penetration, and viscosity. Paving asphalts may be modified with the use of solid polymer or latex modifiers.

Emulsified asphalt shall be specified classified as follows:

~~(A) Penetration type and high viscosity type emulsion shall be designated by the letters RS Rapid Setting.~~

~~(B) Mixing type emulsion shall be designated by the letters SS Slow Setting, MS Medium Setting and QS Quick Setting.~~

(A) Charge: Positive charge, cationic (C) or negative charge, anionic.

(B) Modifier: Polymer Modified (PM), Latex Modified (LM)

(C) Set Time: Slow Set (SS), Medium Set (MS), Quick Set (QS), Rapid Set (RS).

## 713.2 TESTING REQUIREMENTS:

The emulsified asphalt shall conform to the requirements set forth in Table [713-1](#) or Table [713-2](#).

## 713.3 TESTS REPORT AND CERTIFICATION:

Test reports and certifications shall be made in accordance with Section [711](#).

TABLE 713-1																	
REQUIREMENTS FOR ANIONIC EMULSIFIED ASPHALT (Specification Designation)																	
ASTM Test Method	Type	Quick Setting		Rapid-Setting				Medium-Setting			Slow-Setting						
	Grade	QSH		RS-1		RS-2h		MS-1	MS-2	MS-2h	SS-1	SS-1h					
	Laboratory Tests	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max				
	<b>Tests on emulsions:</b>																
D7496	Viscosity, Saybolt Furol at 77°F (25°C), sec.	20	100	20	100			20	100	100	100	20	100	20	100		
D7496	Viscosity, Saybolt Furol at 122°F (50°C), sec.					75	400										
D6936	Demulsibility, 35 ml. 0.02 N. CaCl <sub>2</sub> , percent			60		60											
D244	Coating ability and water resistance																
	Coating, dry and aggregate							good	good	good							
	Coating, after spraying							fair	fair	fair							
	Coating, wet aggregate							fair	fair	fair							
	Coating, after spraying							fair	fair	fair							
D6935	Cement mixing test, percent										2		2				
D6933	Sieve test, percent		0.10		0.10		0.10		0.10		0.10		0.10		0.10		
D6997	Residue by distillation, percent	57		55		63		55		65		65		57			
	<b>Tests on Residue from Distillation Test:</b>																
D5	Penetration 77°F (25°C), 100g, 5 sec.	40	110	100	200	40	90	100	200	100	200	40	90	100	200	40	90
D113	Ductility, 77°F (25°C), 5 cm/min. cm.	40		40		40		40		40		40		40		40	
D2402	Solubility in trichloroethylene, %	98		97.5		97.5		97.5		97.5		97.5		97.5		97.5	

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**TABLE 713-2 (continued)**

**REQUIREMENTS FOR ANIONIC/ CATIONIC (C) EMULSIFIED ASPHALT  
(Specification Designation)**

ASTM Test Method	Type	Quick Setting		Rapid Setting		Medium Setting		Slow Setting		Modified Quick Setting
	Grade	QSH	CQSH	CRS-1	CRS-2h	CMS-2	CMS-2h	CSS-1	CSS-1h	PMCQS-1h LMCQS-1h
	Laboratory Tests	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max
	<b>Tests on emulsions:</b>									
D7496	Visc., Saybolt Furol at 77°F., sec.	20 400	20 100					20 100	20 100	20 100
D7496	Visc., Saybolt Furol at 122°F., sec			20 100	100 400	50 450	50 450			
D6930	Storage Stability Test, 1 day, %	1	1	1	1	1	1	1	1	1
D6936	Demulsibility, 35 ml 0.8% sodium dioctyl sulfosuccinate, %			40	40					
D244	<b>Coating ability and water resistance:</b>									
	Dry aggregate					Good	Good			
	After spraying					Fair	Fair			
	Wet aggregate					Fair	Fair			
	After spraying					Fair	Fair			
D7402	Particle charge test		Positive	Positive	Positive	Positive	Positive	Positive (1)	Positive (1)	Positive
D6933	Sieve Test, %	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.30
D6935	Cement Mixing test, %							2.0	2.0	
D6997	Distillation:									
D6997	Oil distillate, by volume of emulsion, %			3	3	12	12			
D6997	Residue, %	57	57	60	65	65	65	57	57	60
Arizona 512 (2)	Residue by Evaporation, %									60
	<b>Test on residue from distillation test:</b>									Arizona 504 (3)
D5	Penetration, 25°C (77°F), 100 g. 5 sec.	40 110	40 110	100 250	40 90	100 250	40 90	100 250	40 90	5540 7590
D113	Ductility, 25°C (77°F.) 5 cm per min, cm. (4)	40	40	40	40	40	40	40	40	40
D36	Ring and Ball Softening Point; AASHTO T-53-(5)									130
D6084 (Procedure b)	Elastic Recovery, %									55
D2402	Solubility in trichloroethylene, %	98	98	98	9897.5	98	98	97.5	97.5	97.5

- (1) \*If the Particle Charge Test result is inconclusive for CSS-1 or CSS-1h, material having a maximum pH value of 6.7 will be accepted.
- (2) Residue by evaporation may be determined in accordance with the requirements of Arizona Test Method 512; however, in case of dispute, ASTM 6934 shall be used.
- (3) \*If using PMCQS-1h or LMCQS-1h the residue from distillation shall be obtained from ARIZ-504. In case of dispute, testing on residue by distillation at 350° F (ASTM 6997) shall be performed.
- (4) When Micro-surfacing emulsion is specified the ductility shall be a minimum of 60 cm.
- (5) When Micro-surfacing emulsion is specified the softening point shall be a minimum of 140° F.

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**713.4 TEMPERATURES:**

Unless otherwise specified, the various grades of emulsified asphalt shall be applied at temperatures within the limits specified in Table ~~713-23~~ the exact temperature to be determined by the Engineer. Emulsified asphalt shall be reheated if necessary. But at no time, after loading into a tank car or truck for transportation to the work site, shall the temperature of the emulsion be raised above the maximum temperature shown in Table ~~713-23~~. During all reheating operations, the emulsified asphalt shall be agitated to prevent localized overheating. Emulsified asphalt shall not be permitted to cool to a temperature of less than 40 degrees F.

<b>TABLE 713-<del>23</del></b>		
<b>APPLICATION TEMPERATURE OF EMULSIFIED ASPHALT</b>		
<b>Grade of Emulsified Asphalt</b>	<b>Minimum °F.</b>	<b>Maximum °F.</b>
RS-1, MS-1, SS-1, SS-1h, CSS-1, CSS-1h	70°F.	140°F.
RS-2, MS-2, MS-2h, CRS-1, PMCQS-1h, <b>LMCQS-1h</b> , CRS-1h, CRS-2h, CMS-2, CMS-2h, QSH, CQSH	125°F.	185°F.

Emulsified asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the emulsified asphalt during heating.

**713.5 CONVERSION OF QUANTITIES:**

When pay quantities of emulsified asphalt are determined from volumetric measurements, the volumetric measurement at any temperature shall be reduced to the volume the material would occupy at 60 degrees F. in accordance with ASTM [D1250](#). In converting volume to weight, the computations shall be based on Table ~~713-34~~.

<b>TABLE 713-<del>34</del></b>		
<b>EMULSIFIED ASPHALTS QUANTITY CONVERSION</b>		
<b>Grade of Material</b>	<b>Gals Per Ton at 60°F.</b>	<b>Lbs Per Gal. at 60°F.</b>
All grades	<del>23840</del>	<del>8.4033</del>

*-End of Section -*

**SECTION 713**

**EMULSIFIED ASPHALT MATERIALS**

**713.1 GENERAL:**

Emulsified asphalts shall be composed of a paving asphalt base uniformly emulsified with water and an emulsifying or stabilizing agent, which stabilizes the mixture and provides a charge. The resultant charge is either positive, cationic (C) or negative, anionic. The emulsion shall be homogeneous throughout and if stored, shall show no separation of ingredients within 30 days after delivery. Emulsified asphalt shall be classified by charge, set time, penetration, and viscosity. Paving asphalts may be modified with the use of solid polymer or latex modifiers.

Emulsified asphalt shall be classified as follows:

- A. Charge: Positive charge, cationic (C) or negative charge, anionic.
- B. Modifier: Polymer Modified (PM), Latex Modified (LM)
- C. Set Time: Slow Set (SS), Medium Set (MS), Quick Set (QS), Rapid Set (RS).

**713.2 TESTING REQUIREMENTS:**

The emulsified asphalt shall conform to the requirements set forth in Table [713-1](#) or Table [713-2](#).

**713.3 TESTS REPORT AND CERTIFICATION:**

Test reports and certifications shall be made in accordance with Section [711](#).

TABLE 713-1									
REQUIREMENTS FOR ANIONIC EMULSIFIED ASPHALT (Specification Designation)									
	Type	Quick Setting	Rapid-Setting		Medium-Setting			Slow-Setting	
ASTM Test Method	Grade	QSH	RS-1	RS-2h	MS-1	MS-2	MS-2h	SS-1	SS-1h
	Laboratory Tests	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max
D7496	<b>Tests on emulsions:</b> Viscosity, Saybolt Furol at 77°F (25°C), sec.	20 100	20 100		20 100	100	100	20 100	20 100
D7496	Viscosity, Saybolt Furol at 122°F (50°C), sec.			75 400					
D6936	Demulsibility, 35 ml. 0.02 N. CaCl <sub>2</sub> , percent		60	60					
D244	Coating ability and water resistance								
	Coating, dry aggregate				good	good	good		
	Coating, after spraying				fair	fair	fair		
	Coating, wet aggregate				fair	fair	fair		
	Coating, after spraying				fair	fair	fair		
D6935	Cement mixing test, percent							2	2
D6933	Sieve test, percent	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
D6997	Residue by distillation, percent	57	55	63	55	65	65	57	57
D5	<b>Tests on Residue from Distillation Test:</b> Penetration 77°F (25°C), 100g, 5 sec.	40 110	100 200	40 90	100 200	100 200	40 90	100 200	40 90
D113	Ductility, 77°F (25°C), 5 cm/min. cm.	40	40	40	40	40	40	40	40
D2402	Solubility in trichloroethylene, %	98	97.5	97.5	97.5	97.5	97.5	97.5	97.5

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**TABLE 713-2**

**REQUIREMENTS FOR CATIONIC (C) EMULSIFIED ASPHALT  
(Specification Designation)**

ASTM Test Method	Type Grade	Quick Setting		Rapid Setting				Medium Setting				Slow Setting				Modified Quick Setting	
		CQSH		CRS-1		CRS-2P		CMS-2		CMS-2h		CSS-1		CSS-1h		PMCQS-1h LMCQS-1h	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
	<b>Tests on emulsions:</b>																
D7496	Visc., Saybolt Furol at 77°F., sec.	20	100									20	100	20	100	20	100
D7496	Visc., Saybolt Furol at 122°F., sec.			20	100	100	400	50	450	50	450						
D6930	Storage Stability Test, 1 day, %		1		1		1		1		1		1		1		1
D6936	Demulsibility, 35 ml 0.8% sodium dioctyl sulfosuccinate, %			40		40											
D244	<b>Coating ability and water resistance:</b>																
	Dry aggregate							Good	Good								
	After spraying							Fair	Fair								
	Wet aggregate							Fair	Fair								
	After spraying							Fair	Fair								
D7402	Particle charge test		Positive		Positive		Positive		Positive		Positive		Positive (1)		Positive (1)		Positive
D6933	Sieve Test, %		0.10		0.10		0.10		0.10		0.10		0.10		0.10		0.30
D6935	Cement Mixing test, %											2.0		2.0			
D6997	Distillation:																
D6997	Oil distillate, by volume of emulsion, %				3		3		12		12						
D6997	Residue, %	57		60		65		65		65		57		57			
Arizona 512 (2)	Residue by Evaporation, %																60
	<b>Test on residue from distillation test:</b>																Arizona 504 (3)
D5	Penetration, 25°C (77°F), 100 g, 5 sec.	40	110	100	250	40	90	100	250	40	90	100	250	40	90	40	90
D113	Ductility, 25°C (77°F.) 5 cm per min, cm. (4)	40		40		40		40		40		40		40		40	
D36	Ring and Ball Softening Point (5)																130
D6084 (Procedure b)	Elastic Recovery, %					55											55
D2402	Solubility in trichloroethylene, %	98		98		97.5		98		98		97.5		97.5		97.5	

- (1) If the Particle Charge Test result is inconclusive for CSS-1 or CSS-1h, material having a maximum pH value of 6.7 will be accepted.
- (2) Residue by evaporation may be determined in accordance with the requirements of Arizona Test Method 512; however, in case of dispute, ASTM D6934 shall be used.
- (3) If using PMCQS-1h or LMCQS-1h the residue from distillation shall be obtained from ARIZ-504. In case of dispute, testing on residue by distillation at 350° F (ASTM D6997) shall be performed.
- (4) When micro-surfacing emulsion is specified, the ductility shall be a minimum of 60 cm.
- (5) When micro-surfacing emulsion is specified, the softening point shall be a minimum of 140° F.

SECTION 713

713.4 TEMPERATURES:

Unless otherwise specified, the various grades of emulsified asphalt shall be applied at temperatures within the limits specified in Table 713-3 with the exact temperature to be determined by the Engineer. Emulsified asphalt shall be reheated if necessary. But at no time, after loading into a tank car or truck for transportation to the work site, shall the temperature of the emulsion be raised above the maximum temperature shown in Table 713-3. During all reheating operations, the emulsified asphalt shall be agitated to prevent localized overheating. Emulsified asphalt shall not be permitted to cool to a temperature of less than 40 degrees F.

TABLE 713-3		
APPLICATION TEMPERATURE OF EMULSIFIED ASPHALT		
Grade of Emulsified Asphalt	Minimum °F.	Maximum °F.
RS-1, MS-1, SS-1, SS-1h, CSS-1, CSS-1h	70°F.	140°F.
RS-2, MS-2, MS-2h, CRS-1, PMCQS-1h, LMCQS-1h, CRS-1h, CRS-2h, CMS-2, CMS-2h, QSH, CQSH	125°F.	185°F.

Emulsified asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the emulsified asphalt during heating.

713.5 CONVERSION OF QUANTITIES:

When pay quantities of emulsified asphalt are determined from volumetric measurements, the volumetric measurement at any temperature shall be reduced to the volume the material would occupy at 60 degrees F. in accordance with ASTM D1250. In converting volume to weight, the computations shall be based on Table 713-4.

TABLE 713-4		
EMULSIFIED ASPHALTS QUANTITY CONVERSION		
Grade of Material	Gals Per Ton at 60°F.	Lbs. Per Gal. at 60°F.
All grades	238	8.40

-End of Section -