



Designation: **D977 – 19a** **D977 – 19a**^{ε1}

Standard Specification for Emulsified Asphalt¹

This standard is issued under the fixed designation D977; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

^{ε1} NOTE—The headings in Table 1 were corrected editorially in December 2019.

1. Scope

- 1.1 This specification covers 13 grades of emulsified asphalt for use in pavement construction in the manner designated.
- 1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.
- 1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D5/D5M Test Method for Penetration of Bituminous Materials](#)

[D113 Test Method for Ductility of Asphalt Materials](#)

[D139 Test Method for Float Test for Bituminous Materials](#)

[D140/D140M Practice for Sampling Asphalt Materials](#)

[D244 Test Methods and Practices for Emulsified Asphalts](#)

[D2042 Test Method for Solubility of Asphalt Materials in Trichloroethylene](#)

[D3910 Practices for Design, Testing, and Construction of Slurry Seal](#)

[D6930 Test Method for Settlement and Storage Stability of Emulsified Asphalts](#)

[D6933 Test Method for Oversized Particles in Emulsified Asphalts \(Sieve Test\)](#)

[D6935 Test Method for Determining Cement Mixing of Emulsified Asphalt](#)

[D6936 Test Method for Determining Demulsibility of Emulsified Asphalt](#)

[D6997 Test Method for Distillation of Emulsified Asphalt](#)

[D7226 Test Method for Determining the Viscosity of Emulsified Asphalts Using a Rotational Paddle Viscometer](#)

[D7496 Test Method for Viscosity of Emulsified Asphalt by Saybolt Furol Viscometer](#)

[D7553 Test Method for Solubility of Asphalt Materials in N-Propyl Bromide](#)

3. Requirements

3.1 The emulsified asphalt shall be tested within 14 days of delivery. The emulsified asphalt shall be homogeneous after thorough mixing, provided separation has not been caused by freezing. Emulsified asphalts separated by freezing shall not be tested.

3.2 Emulsified asphalt shall conform to the requirements prescribed in [Table 1](#). Specify the test method to be used. Specify either Test Method [D7226](#) or [D7496](#).

4. Sampling

4.1 Samples of emulsified asphalt shall be taken in accordance with Practice [D140/D140M](#).

¹ This specification is under the jurisdiction of ASTM Committee [D04](#) on Road and Paving Materials and is the direct responsibility of Subcommittee [D04.41](#) on Emulsified Asphalt Specifications.

Current edition approved Nov. 1, 2019. Published November 2019. Originally approved in 1948. Last previous edition approved in 2019 as D977 – 19. DOI: [10.1520/D0977-19A-10.1520/D0977-19AE01](#).

² For referenced ASTM standards, visit the ASTM website, [www.astm.org](#), or contact ASTM Customer Service at [service@astm.org](#). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 Requirements for Emulsified Asphalt

NOTE 1—QS-1h emulsions shall meet the requirements outlined in Practices D3910.

NOTE 2—QS-1h is used for quick-set slurry seal systems.

NOTE 3—For viscosity, specify either Test Method D7226 or D7496.

Type	Rapid-Setting						Medium-Setting					
	Type RS-1		RS-2		HFRS-2		MS-1		MS-2		MS-2h	
	min	max	min	max	min	max	min	max	min	max	min	max
<i>Tests on Emulsions:</i>												
Viscosity, Saybolt Furol at 25 °C SFS	20	100	...	...	...	...	20	100	100	...	100	...
Viscosity, Saybolt Furol at 50 °C SFS	...	...	75	400	75	400	...	...	...	...	...	...
Viscosity, Rotational Paddle at 25 °C, mPa s	45	220	...	...	...	...	45	220	220	...	220	...
Viscosity, Rotational Paddle at 50 °C, mPa s	...	...	165	880	165	880	...	...	...	...	...	...
Storage stability test, 24 h, % ^A	...	1	...	1	...	1	...	1	...	1	...	1
Demulsibility, 35 mL, 0.02 N CaCl ₂ , %	60	...	60	...	60	...	...	...	...	...	...	...
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	...
Cement mixing test, %	...	...	...	...	...	...	...	...	...	...	...	...
Sieve test, % ^A	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10
Residue by distillation, %	55	...	63	...	63	...	55	...	65	...	65	...
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	...	...	...	...	...	...
<i>Tests on Residue from Distillation Test:</i>												
Penetration, 25 °C, 100 g, 5 s	100	200	100	200	100	200	100	200	100	200	40	90
Ductility, 25 °C, 5 cm/min, cm	40	...	40	...	40	...	40	...	40	...	40	...
Solubility in trichloroethylene or n-propyl bromide, %	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...
Float test, 60 °C s	...	...	...	...	1200	...	...	...	...	...	...	...

Type	Medium-Setting						Slow-Setting				Quick-Setting			
	Type HFMS-1		HFMS-2		HFMS-2h		HFMS-2s		SS-1		SS-1h		QS-1h	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max
<i>Tests on Emulsions:</i>														
Viscosity, Saybolt Furol at 25 °C SFS	20	100	100	...	100	...	50	...	20	100	20	100	20	100
Viscosity, Saybolt Furol at 50 °C SFS	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Viscosity, Rotational Paddle at 25 °C, mPa s	45	220	220	...	220	...	110	...	45	220	45	220	45	220
Viscosity, Rotational Paddle at 50 °C, mPa s	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Storage stability test, 24 h, % ^A	...	1	...	1	...	1	...	1	...	1	...	1	...	1
Demulsibility, 35 mL, 0.02 N CaCl ₂, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Type	Rapid-Setting						Medium-Setting							
	RS-1		RS-2		HFRS-2		MS-1		MS-2		MS-2h			
	min	max	min	max	min	max	min	max	min	max	min	max		
Coating ability and water resistance:														
Coating, dry aggregate	good	...	good	...	good	...	good	...	...	...	...	...
Coating, after spraying	fair	...	fair	...	fair	...	fair	...	...	...	...	...
Coating, wet aggregate	fair	...	fair	...	fair	...	fair	...	...	...	...	...
Coating, after spraying	fair	...	fair	...	fair	...	fair	...	...	...	...	...
Cement mixing test, %	...	...	...	...	...	...	...	...	...	2.0	...	2.0
Sieve test, % ^A	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10		
Residue by distillation, %	55	...	65	...	65	...	65	...	57	...	57	...		
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	1	7	...	...	...	...
<i>Tests on Residue from Distillation Test:</i>														
Penetration, 25 °C, 100 g, 5 s	100	200	100	200	40	90	200	...	100	200	40	90	40	90
Ductility, 25 °C, 5 cm/min, cm	40	...	40	...	40	...	40	...	40	...	40	...	40	...