



Designation: D977 – 20

# Standard Specification for Emulsified Asphalt<sup>1</sup>

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 reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

## 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:*<sup>2</sup>

[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](#)

<sup>1</sup> 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 July 1, 2020. Published July 2020. Originally approved in 1948. Last previous edition approved in 2019 as D977 – 19a. DOI: 10.1520/D0977-20.

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

[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](#)

[D8078 Test Method for Ash Content of Asphalt and Emulsified Asphalt Residues](#)

## 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](#).

4.2 Samples shall be stored in clean, airtight, sealed containers as specified in Practice [D140/D140M](#) at a temperature of not less than 4 °C until tested.

## 5. Test Methods

5.1 The properties of the emulsified asphalts given in [Table 1](#) shall be determined in accordance with the following ASTM test methods:

5.1.1 *Viscosity*—Test Method [D7496](#) or [D7226](#).

5.1.2 *Storage Stability*—Test Method [D6930](#).

5.1.3 *Demulsibility*—Test Method [D6936](#).

5.1.4 *Coating Ability and Water Resistance*—Test Methods [D244](#).

5.1.5 *Cement Mixing*—Test Method [D6935](#).

5.1.6 *Sieve Test*—Test Method [D6933](#).

5.1.7 *Distillation*—Test Method [D6997](#).

5.1.8 *Tests on Residue from Distillation*—Test Methods [D244](#).

5.1.8.1 *Penetration*—Test Method [D5/D5M](#).

**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.

NOTE 4—Specify either ash content (Test Method D8078) or solubility tests (Test Method D2042 or D7553).

Type	Rapid-Setting				Medium-Setting				Quick-Setting					
	RS-1		RS-2		HFRS-2		MS-1		MS-2		MS-2h		QS-1h	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max
<b>Tests on Emulsified Asphalts:</b>														
Viscosity, Saybolt Furol at 25 °C SFS	20	100	...	...	...	...	20	100	100	...	100	...	...	...
Viscosity, Saybolt Furol at 50 °C SFS	...	...	75	400	...	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	...	880	...	...	...	...	...	...	...	...
Storage stability test, 24 h, % <sup>A</sup>	...	1	...	1	...	1	...	...	1	...	...	1	...	...
Demulsibility, 35 mL, 0.02 N CaCl <sub>2</sub> , %	60	...	60	...	...	...	...	...	...	...	...	...	...	...
Coating ability and water resistance:														
Coating, dry aggregate	...	...	...	...	...	...	good	good	good	good	good	good	good	good
Coating, after spraying	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	fair	fair
Coating, wet aggregate	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	fair	fair
Coating, after spraying	...	...	...	...	...	...	fair	fair	fair	fair	fair	fair	fair	fair
Cement mixing test, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sieve test, % <sup>A</sup>	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10
Residue by distillation, %	55	...	63	...	...	...	55	...	65	...	65	...	65	...
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<b>Tests on Residue from Distillation Test:</b>														
Penetration, 25 °C, 100 g, 5 s	100	200	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	...	40	...
Solubility in trichloroethylene or n-propyl bromide, %	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...
Ash content, %	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0
Float test, 60 °C s	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<b>Tests on Emulsified Asphalts:</b>														
Viscosity, Saybolt Furol at 25 °C SFS	20	100	100	...	100	...	50	...	20	100	100	20	100	100
Viscosity, Saybolt Furol at 50 °C SFS	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Viscosity, Rotational Paddle at 25 °C, mPa s	45	220	220	...	220	...	110	...	45	220	220	45	220	220
Viscosity, Rotational Paddle at 50 °C, mPa s	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Storage stability test, 24 h, % <sup>A</sup>	...	1	...	1	...	1	...	1	...	1	...	1	...	1
Demulsibility, 35 mL, 0.02 N CaCl <sub>2</sub> , %	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coating ability and water resistance:														
Coating, dry aggregate	good	good	good	good	good	good	good	good	good	good	good	good	good	good
Coating, after spraying	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
Coating, wet aggregate	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
Coating, after spraying	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
Cement mixing test, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sieve test, % <sup>A</sup>	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10	...	0.10
Residue by distillation, %	55	...	65	...	...	...	65	...	57	...	57	...	57	...
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<b>Tests on Residue from Distillation Test:</b>														
Penetration, 25 °C, 100 g, 5 s	100	200	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	...	40	...
Solubility in trichloroethylene or n-propyl bromide %	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...
Ash content, %	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0
Float test, 60 °C s	...	...	...	...	...	...	...	...	...	...	...	...	...	...

<sup>A</sup> This test requirement on representative samples is waived if successful application of the material has been achieved in the field.