



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

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

1. Scope

1.1 This specification covers thirteen 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.

2. Referenced Documents

2.1 ASTM Standards:²

D5 Test Method for Penetration of Bituminous Materials
D113 Test Method for Ductility of Bituminous Materials
D139 Test Method for Float Test for Bituminous Materials
D140 Practice for Sampling Bituminous Materials
D244 Test Methods and Practices for Emulsified Asphalts
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
D7553 Test Method for Solubility of Asphalt Materials in N-Propyl Bromide
D2042 Test Method for Solubility of Asphalt Materials in Trichloroethylene

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 Dec. 1, 2012. Published December 2012. Originally approved in 1948. Last previous edition approved in 2012 as D977-12a. DOI: 10.1520/D0977-12b.

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.

D7496 Test Method for Viscosity of Emulsified Asphalt by Saybolt Furol Viscometer

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.

4. Sampling

4.1 Samples of emulsified asphalt shall be taken in accordance with Practice D140.

4.2 Samples shall be stored in clean, airtight sealed containers as specified in Practice D140 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.
- 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
 - 5.1.8.2 Ductility—Test Method D113
 - 5.1.8.3 Solubility—Test Method D2042 or D7553
 - 5.1.8.4 Float Test—Test Method D139

6. Keywords

6.1 emulsion; emulsified asphalt; high float; medium setting; rapid setting; slow setting

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.

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
<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	...	...	...	...	...	...
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 100g, 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	
	HFMS-1		HFMS-2		HFMS-2h		HFMS-2s		SS-1h	
	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
Viscosity, Saybolt Furol at 50°C SFS	...	...	...	...	...	...	...	...	...	...
Storage stability test, 24-h, % ^A	...	1	...	1	...	1	...	1	...	1
Demulsibility, 35 ml, 0.02 N CaCl ₂ , %	...	...	...	...	...	...	...	...	...	...
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
Residue by distillation, %	55	...	65	...	65	...	65	...	57	...
Oil distillate by volume of emulsion, %	...	...	...	...	...	...	1	...	...	...
<i>Tests on residue from distillation test:</i>										
Penetration, 25°C, 100 g, 5 s	100	200	100	200	40	90	200	...	100	200
Ductility, 25°C 5 cm/min, cm	40	...	40	...	40	...	40	...	40	...
Solubility in trichloroethylene or n-propyl bromide %	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...
Float test, 60°C s	1200	...	1200	...	1200	...	1200	...	...	...

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

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the ASTM website (www.astm.org/COPYRIGHT/).