



Standard Practice for Classifying Emulsified Recycling Agents¹

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1. Scope

1.1 This practice identifies emulsified petroleum products that may be used as recycling agents in recycled mixes. These materials are classified by viscosity or by low temperature penetration after aging.

1.2 This practice addresses emulsified materials designed specifically for use in recycling. The use of emulsified materials for recycling shall not be limited to this practice. For instance, the emulsified asphalts specified in Specifications [D977](#) and [D2397](#) may be used.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

- [D5](#) Test Method for Penetration of Bituminous Materials
- [D140](#) Practice for Sampling Bituminous Materials
- [D977](#) Specification for Emulsified Asphalt
- [D1754](#) Test Method for Effects of Heat and Air on Asphaltic Materials (Thin-Film Oven Test)
- [D2042](#) Test Method for Solubility of Asphalt Materials in Trichloroethylene
- [D2170](#) Test Method for Kinematic Viscosity of Asphalts (Bitumens)
- [D2397](#) Specification for Cationic Emulsified Asphalt
- [D2872](#) Test Method for Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)

¹ This practice 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.

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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.

- [D4124](#) Test Method for Separation of Asphalt into Four Fractions
- [D6930](#) Test Method for Settlement and Storage Stability of Emulsified Asphalts
- [D6933](#) Test Method for Oversized Particles in Emulsified Asphalts (Sieve Test)
- [D6937](#) Test Method for Determining Density of Emulsified Asphalt
- [D6997](#) Test Method for Distillation of Emulsified Asphalt
- [D7402](#) Practice for Identifying Cationic Emulsified Asphalts
- [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. Significance and Use

3.1 Recycling of deteriorated asphalt pavements is being used as a routine method of maintenance and rehabilitation. Utilization of existing materials as the major component of this procedure may yield benefits in quality, economy, and preservation of natural resources. Recycling takes many forms; hot, cold, in-situ, central plant and surface. This practice may be used for various recycling methods.

3.2 This practice describes emulsified recycling (ER) agents as belonging to three groups; ER-1, ER-2, and ER-3 as shown in [Table 1](#). The range of recycling methods demands several emulsified recycling agents. The groups should provide adequate freedom of selection for most recycling methods.

3.2.1 ER-1 is a material whose main function is to rejuvenate aged asphalt. The material is a petroleum derivative, and highly compatible with asphalts. It is classified by viscosity.

3.2.2 ER-2 and ER-3 are materials that combine rejuvenators and asphalt components in one emulsified asphalt. These soft residues are classified by low temperature penetration after aging. They are typically used in recycling where there is an increased demand for asphalt as when new aggregates are added, or where immediate cohesiveness is desired.

3.3 The choice of ER will be determined by the properties of the asphalt binder in the aged pavement, the methods of recycling planned, the amount, if any, of new aggregates, and other design needs.

TABLE 1 Specifications for Emulsified Recycling Agents

Tests	Test Method	ER-1		ER-2		ER-3	
		min	max	min	max	min	max
Viscosity, 50°C, SFS	D7496		100	20	450	20	450
Sieve, %	D6933		0.1		0.1		0.1
Storage stability, 24 h, %	D6930		1.5		1.5		1.5
Residue, by distillation, %	D6997	65		65		65	
Dilution			report ^A				
Specific gravity	D6937		report		report		report
Compatibility ^B	D7402		report		report		report
Tests on residue from distillation							
Kinematic Viscosity, 60°C, mm ² /s	D2170	50	200				
Saturates, %	D4124		30		30		30
Solubility, %	D2042 or D7553	97.5		97.5		97.5	
Tests on residue from distillation and RTFO ^C							
Penetration, 4°C, 50 g, 5 s	D5			75	200	5	75
RTFO, mass change, %	D2872		4		4		4

^A ER-1 shall be certified for dilution with potable water.

^B This specification allows a variety of emulsified asphalts. The engineer should take the steps necessary to keep incompatible materials from co-mingling in tanks or other vessels. It would be prudent to have the chemical charge nature certified by the supplier.

^C RTFO shall be the referee method. When approved by the engineer, the Thin Film Oven Test (Test Method D1754) may be substituted for compliance testing.

4. Properties

4.1 All emulsified recycling agents shall be homogenous, free flowing at pumping temperature, and shall conform to the requirements of Table 1.

4.2 Emulsified recycling agent residue should be combined with aged asphalts and evaluated to determine proper ER selection and to determine quantity of treatment. Resulting asphalt binder properties shall be judged suitable for the intended use.

5. Sampling

5.1 Carry out sampling in accordance with Practice D140.

5.2 Store samples in new, clean, airtight sealed containers as specified in Practice D140 at a temperature not less than 4°C until tested.

6. Test Methods

6.1 The properties of the Emulsified Recycling Agents given in Table 1 shall be determined in accordance with the following ASTM Test Methods:

6.1.1 Viscosity—Test Method D7496.

6.1.2 Sieve—Test Method D6933.

6.1.3 Storage Stability—Test Method D6930.

6.1.4 Residue by Distillation—Test Method D6997.

6.1.5 Specific Gravity—Test Method D6937.

6.1.6 Compatibility—Practice D7402.

6.1.7 Tests on Residue from Distillation:

6.1.7.1 Kinematic Viscosity—Test Method D2170.

6.1.7.2 Saturates—Test Method D4124.

6.1.7.3 Solubility—Test Method D2042 or D7553.

6.1.7.4 RTFO Conditioning—Test Method D2872.

6.1.7.5 Tests on RTFO Residue:

(1) Penetration—Test Method D5.

(2) Mass Change—Test Method D2872.

7. Keywords

7.1 emulsified recycling agent; emulsified asphalt; recycling

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