



## Standard Practice for Classifying Emulsified Recycling Agents<sup>1</sup>

This standard is issued under the fixed designation D 5505; 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.

### 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 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.*

1.3 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 emulsions specified in Specifications D 977 and D 2397 may be used.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 5 Test Method for Penetration of Bituminous Materials<sup>2</sup>
- D 70 Test Method for Specific Gravity and Density of Semi-Solid Bituminous Materials<sup>2</sup>
- D 140 Practice for Sampling Bituminous Materials<sup>2</sup>
- D 244 Test Methods for Emulsified Asphalts<sup>2</sup>
- D 977 Specification for Emulsified Asphalt<sup>2</sup>
- D 1754 Test Method for Effect of Heat and Air on Asphaltic Materials (Thin Film Oven Test)<sup>2</sup>
- D 2007 Test Method for Characteristic Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method<sup>3</sup>
- D 2042 Test Method for Solubility of Asphalt Materials in Trichloroethylene<sup>2</sup>
- D 2170 Test Method for Kinematic Viscosity of Asphalts (Bitumens)<sup>2</sup>
- D 2397 Specification for Cationic Emulsified Asphalt<sup>2</sup>
- D 2872 Test Method for Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)<sup>2</sup>

### 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.

### 4. Classification

4.1 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.

4.1.1 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.

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

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

### 5. Properties

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

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

### 6. Sampling

6.1 Carry out sampling in accordance with Practice D 140.

6.2 Store samples in new, clean, airtight sealed containers as specified in Practice D 140 at a temperature not less than 4°C until tested.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D-4 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.41 on Emulsified Asphalt Specifications.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 04.03.

<sup>3</sup> Annual Book of ASTM Standards, Vol 05.01.

**TABLE 1 Specifications for Emulsified Recycling Agents**

Tests	Test Method	ER-1		ER-2		ER-3	
		min	max	min	max	min	max
On emulsion							
Viscosity, 50°C, SFs	D 244	100	20	450	20	450	
Sieve, %	D 244	0.1		0.1		0.1	
Storage stability, 24 h, %	D 244	1.5		1.5		1.5	
Residue, by distillation, %	D 244	65		65		65	
Dilution			report <sup>A</sup>				
Specific gravity	D 70		report	report		report	
Compatibility <sup>B</sup>	varies		report	report		report	
On residue from distillation							
Kinematic Viscosity, 60°C, mm <sup>2</sup> /s	D 2170	50	200				
Saturates, %	D 2007	30		30		30	
Solubility in Tri-chloroethylene	D 2042	97.5		97.5		97.5	
On residue from distillation after RTFO <sup>C</sup>							
Penetration, 4°C, 50 g, 5 s	D 5		75	200		5	75
RTFO, weight change, %	D 2872	4		4		4	

<sup>A</sup> ER-1 shall be certified for dilution with potable water.

<sup>B</sup> This specification allows a variety of emulsions, including high-float and cationic emulsions. 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 nature (float test for high float emulsions, particle charge test for cationic emulsions, or other tests as necessary) certified by the supplier.

<sup>C</sup> RTFO shall be the standard. When approved by the engineer, the Thin Film Oven Test (Test Method D 1754) may be substituted for compliance testing.

## 7. Keywords

### 7.1 emulsified recycling agent; emulsions; recycling

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