Designation: D7196 – 16

Standard Test Method for Raveling Test of Cold Mixed Emulsified Asphalt Samples[1]

This standard is issued under the fixed designation D7196; 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.

1. Scope

1.1 This test method measures the resistance to raveling characteristics of emulsified asphalt and field aggregates or Recycled Asphalt Pavement (RAP) mixtures by simulating an abrasion similar to early return to traffic.

1.2 A precision and bias statement for this standard has not been developed at this time. Therefore, this standard should not be used for acceptance or rejection of a material for purchasing purposes.

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 establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D75 Practice for Sampling Aggregates
D977 Specification for Emulsified Asphalt
D979 Practice for Sampling Bituminous Paving Mixtures
D2397 Specification for Cationic Emulsified Asphalt
D3910 Practices for Design, Testing, and Construction of Slurry Seal
D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing
D6372 Practice for Design, Testing, and Construction of Microsurfacing
D6925 Test Method for Preparation and Determination of the Relative Density of Asphalt Mix Specimens by Means of the Superpave Gyratory Compactor

2.2 *ISSA Document:*

ISSA Technical Bulletin No. 100 Test Method for Wet Track Abrasion of Slurry Surfaces

3. Summary of Test Method

3.1 An aggregate or RAP, or both, is mixed together with a preset amount of additives (if shown to be necessary), water (if necessary) and emulsified asphalt. This may be a field blended mixture (Method A) or a laboratory blended mixture (Method B). The mixture is compacted in a gyratory compactor and cured at the specified conditions for a designated period of time. After the assigned curing time, a rotating rubber hose exerts an abrasion force on the specimen for a preset time period and the abraded loss of material is calculated.

4. Significance and Use

4.1 This test is useful for classifying the curing and formulation of cold mixed emulsified asphalt samples through ravel testing of compacted specimens. This performance test should be used to rank the mix conditions and approximate curing time for return to traffic and resistance to weather damage.

5. Apparatus

5.1 *Hobart Mixer*—The ⅓ H.P. Fixed Speed Motor, model A 120 will be used to abrade the sample.

5.2 *Raveling Test Adapter Base*—This base must fit the Hobart mixer in 5.1 and be an adequate and level support for clamping the test specimen in place. The test specimen should not move during abrasion. A picture of the base can be seen in Fig. 1.[3]

5.3 *Raveling Test Abrasion Head with Hose*—The abrasion head should be free floating over the sample and have a mass of 600 ± 15 g. This mass shall include the rubber hose. The rubber hose shall be a Parker 290 Ozex General Purpose Hose or equivalent. The hose shall be 19 mm ID by 6.25 mm wall thickness and cut to 127 mm in length. The rubber hose shall

[1] This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.27 on Cold Mix Asphalts.

Current edition approved Oct. 1, 2016. Published October 2016. Originally approved in 2006. Last previous edition approved in 2012 as D7196 – 12. DOI: 10.1520/D7196-16.

[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.

[3] The sole source of supply of the Raveling Test Adapter Base known to the committee at this time is Precision Machine and Welding, Salina, Kansas. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

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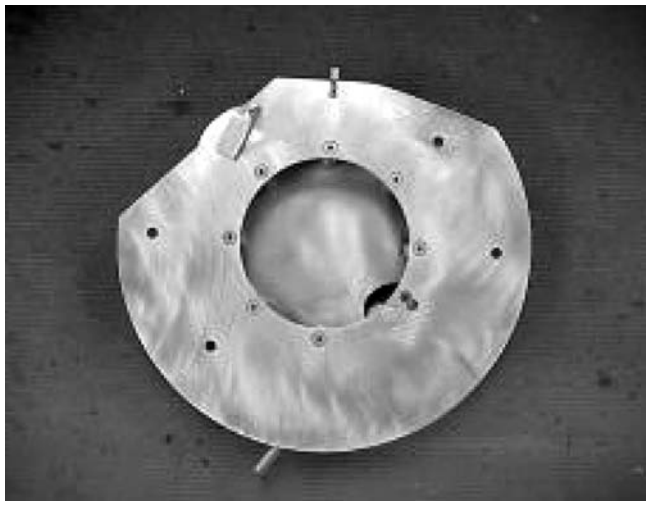

FIG. 1 Raveling Test Adapter Base

be easily removed so that it may be rotated or changed prior to testing to insure a clean surface for abrasion.[4]

5.4 *Oven or Environmental Chamber*—If required for other than ambient laboratory curing conditions, the oven shall be a constant temperature forced draft oven. The shelves in the oven shall be placed at least 150 mm apart and 100 mm away from the top and floor.

5.5 *Balance*—A balance capable of weighing 3000 g or more to within ± 0.1 g and conforming to the requirements of Guide D4753, Class GP2. A minimum platform length and width of 200 mm is required.

5.6 *Gyratory Compactor*—A gyratory compactor meeting the requirements of Test Method D6925.

5.7 *Mechanical Mixer*—A mixer capable of mixing up to 3000 g of the cold emulsified asphalt mixture.

5.8 *100 to 150 mm Fine Bristle Paint Brush*—A fine bristled paint brush capable of sweeping loose material from abraded sample without damaging surface.

6. Materials

6.1 *Emulsified Asphalt*—The emulsified asphalt should meet all applicable specifications for the required project. The emulsion specifications shall be provided by the agency or requirements such as those given in Specification D977 or D2397. The emulsified asphalt shall be brought to equilibrium to the specified temperature, if other than laboratory ambient, for a minimum of one hour prior to mixing with the aggregates or RAP.

6.2 *Aggregates/RAP*—The job aggregates or RAP, or both, for Method B should be sampled and split according to Practice D75.

6.3 *Cold Bituminous Paving Mixture*—The job mixture for Method A should be sampled according to Practice D979.

6.4 *Additives*—Any additional additives that are shown to be necessary must meet the specifications required by the agency and mixed or blended with the materials as recommended by the agency or as recommended by the additive supplier if the agency does not specifically detail the method of mixing or blending.

7. Test Specimens

7.1 *Method A (Field Blended Cold Bituminous Paving Mixture):*

7.1.1 Make sure that sample integrity was maintained while transferring from the field to the testing facility. Loss of moisture and excessive curing time will affect the results of the test.

7.1.2 Scalp the mixture sample through a 25.0-mm sieve and split out two samples to a quantity of 2750 g in mass. The 2750 g is an approximate mass to give 70 ± 5 mm of height after compaction.

NOTE 1—A test mix for compaction may be necessary to get appropriate mass of sample.

7.2 *Method B (Lab Blended Mixture):*

7.2.1 Split out two samples of aggregate/RAP from the 25.0-mm scalped design gradation to a quantity of 2700 g in mass. The 2700 g is an approximate mass to yield a 70 ± 5 mm high cylinder after compaction.

NOTE 2—A test mix for compaction may be necessary to get appropriate mass of sample.

7.2.2 Place the sample into a container of adequate size for mixing.

7.2.3 Add the additive or water contents, or both, to each of the samples and mix with the mechanical mixer for 60 s.

7.2.4 Add the emulsion to the sample and mix with the mechanical mixer for 60 s.

7.3 Place the sample immediately into a 150 mm gyratory compaction mold and compacted for 20 gyrations. If the sample height is not 70 ± 5 mm, the sample mass should be adjusted.

NOTE 3—Various additives and emulsified asphalt may be effected by the mechanical mixer and mix times used in 7.2.3 and 7.2.4. The degree of coating, time to optimum coating, and type of mechanical mixer may be noted for later reference.

8. Conditioning

8.1 Remove the samples immediately from the compaction molds and allow to cure at the proper time, temperature, and humidity prescribed by the specifications.

NOTE 4—The specimens tested for raveling resistance have been conditioned in temperatures ranging from 10 to 60°C for time frames of 1 to 24 h for design purposes. Typical testing parameters for the raveling test are ambient lab conditions 18 to 24°C for 4 h ± 5 min.

8.2 Weigh the specimens after the curing, just prior to testing. This mass shall be recorded as the Specimen Mass (prior to test).

[4] An abrasion head similar to that used in the Wet Track Abrasion of Slurry Surfaces (Practices D3910, D6372, and ISSA TB-100) may meet the requirements with the ring weight removed.

The sole source of supply of the abrasion head known to the committee at this time is Precision Machine and Welding, Salina, Kansas. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

9. Procedure

9.1 Place the specimen on the raveling test adapter base. Care should be taken that the specimen is centered and well supported. There must be a minimum of 10 mm of the specimen above the raveling test adapter base. The abrasion head should be checked so that the area of hose to be in contact with the specimen has not been previously used. It is acceptable to rotate the hose to a non-abraded section. The abrasion head (with hose) shall be free to move vertically downward a minimum of 10 mm after initial contact with specimen. Fig. 2 shows an example of the Set-Up of the test process.

9.2 Abrade the sample for the specified period of time. After abrasion time is completed, remove the specimen carefully from the base and brush with the fine bristle paintbrush to remove any loose material and immediately weigh the specimen. This mass should be recorded as the Specimen Mass (abraded).

FIG. 2 Apparatus Set-Up

NOTE 5—Typical testing time for the raveling test is 15 min. When brushing the specimen, care should be taken not to dislodge any significant amount of material that was not abraded during testing.

10. Calculation

10.1 This equation is used to determine the total percent mass loss based on the initial sample weight. The percent mass loss is calculated as follows:

$$\% \text{ Mass Loss} = 100 \times (A - B)/A \quad (1)$$

where:

A = specimen mass (prior to test), and
B = specimen mass (abraded).

NOTE 6—Report the mass loss to the nearest 0.1 % as an average of the two tested specimens.

11. Precision and Bias

11.1 The precision of this test method is being further developed. Initial testing results show that replicate samples are producing results within 0.5 % mass loss when the specimens are less than 5 % total mass loss.

11.2 No information can be presented on the bias for measuring % Mass Loss in this test method because no material having an acceptable reference value is available.

12. Keywords

12.1 aggregate; emulsified asphalt; cold mix; raveling; recycled asphalt pavement (RAP)

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