



## **Test Method for Classification of Slurry Surfacing Materials Compatibility by Schulze-Breuer and Ruck Procedures**

### **1. Scope**

- 1.1 This test method covers the determination of the compatibility between aggregate fines of specific gradation and emulsified asphalt residue.
- 1.2 It is the responsibility of the user of this Technical Bulletin to establish appropriate Safety, Health, and Environmental practices and to consider all pertinent regulatory issues.

### **2. Referenced Documents**

- 2.1 ISSA Technical Bulletins:  
TB No. 113 Test Method for Determining Mix Time for Slurry Surfacing Systems  
TB No. 114 Test Method for Wet Stripping of Cured Slurry Surfacing Mixtures  
TB No. 115 Determination of Slurry System Compatibility
- 2.2 ASTM Standards:  
C 136 Sieve Analysis of Fine and Coarse Aggregates  
D 6933 Standard Test Method for Oversized Particles in Emulsified Asphalts (Sieve Test)  
D 6372 Standard Practices for Design, Testing, and Construction of Micro Surfacing  
E 145 Standard Specification for Gravity-Convection and Forced-Ventilation Ovens
- 2.3 Additional Document:  
Benedict, C. Robert, "Classification of Bitumen-Aggregate Filler Compatibility by Schulze-Breuer and Ruck Procedures" presented at the 27th Annual ISSA Convention Kona, Hawaii, 1989.

### **3. Significance**

- 3.1 The method provides a rating system for abrasion loss, integrity and adhesion characteristics of a specified aggregate fines-emulsified asphalt residue. The test values may relate to the field performance of paving mixtures.

### **4. Summary of Method**

- 4.1 A fine portion of the aggregate is mixed with the emulsified asphalt. The cured mixture is compacted into a pill which is evaluated for abrasion, integrity, and adhesion.

### **5. Apparatus**

- 5.1 Non-absorbent mixing containers, such as bowls or pans, suitably sized to contain 200 g of mixture.
- 5.2 Mixing utensil, such as a spatula suitably sized for the mixing container.
- 5.3 Balance, capable of weighing 500 grams to within 0.01 g.
- 5.4 Forced draft oven set at 60°C (140°F) to meet ASTM E145 Specifications for Gravity-Convection and Forced Ventilation Ovens.
- 5.5 Pill mold(s) made of mild steel consisting of a base, a case 30 mm inside diameter by 70 mm in height and 29 mm in diameter ram.
- 5.6 Constant force press capable of exerting a force of 1000 kg (2204 lb)  $\pm$ 2.5%.
- 5.7 Shuttle cylinders consisting of acrylic tubes 60 mm inside diameter x 400 mm inside length with water tight metal caps at each end, one of which is removable.
- 5.8 Abrasion Machine capable of holding at least four shuttle cylinders and rotating them end for end about a central axis at 20 RPM.
- 5.9 Open top 6 mm (1/4") galvanized hardware cloth baskets 50 mm in diameter x 50 mm in height (2" x 2") with suitable means for suspension in a beaker.
- 5.10 800 ml Pyrex beaker.
- 5.11 White paper towels.
- 5.12 Adjustable temperature hot plate or Bunsen burner with suitable beaker support.
- 5.13 Sieves. Metric sizes 2.00mm, 710 $\mu$ m, 250 $\mu$ m, 90 $\mu$ m, and pan. U.S. sizes No.10, No.30, No. 50, No. 200, and pan.
- 5.14 Mixing container capable of holding 200 g of mix.

5.15 Water bath capable of maintaining water temperature of  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 5.4^{\circ}\text{F}$ ) for 6 days.

## 6. Materials

- 6.1 Potable water.
- 6.2 Emulsified asphalt shall be representative of the material to be used on the project and should be uniformly mixed. Oversized particles of asphalt shall be removed by pouring the sample through the No.20 (850 $\mu\text{m}$ ) sieve.
- 6.3 Mineral fillers and other liquid and/or solid additives shall be representative of the materials to be used on the project. 1% of Type 1 Portland cement shall be used as a standard reference. If required, the type and/or concentration of additives should be recorded.
- 6.4 The starting aggregate shall be representative of the material to be used on the project. There are two aggregate gradation alternatives.
  - 6.4.1 The dry aggregate may be screened to 100% passing the 2.00mm (No.10) sieve. When this method is used, it should be noted in the report.
  - 6.4.2 The dry aggregate may be screened and re-graded as follows in either Table 1 and 2:

Table 1

Metric Sieve Size, %
Passing 2.00 mm, retained on 710 $\mu\text{m}$ = 25%
Passing 710 $\mu\text{m}$ , retained on 250 $\mu\text{m}$ = 40%
Passing 250 $\mu\text{m}$ , retained on 90 $\mu\text{m}$ = 15%
Passing 90 $\mu\text{m}$ , retained on 0.0 = 20%

Table 2

U.S. Sieve Size, %
Passing No. 10, retained on No. 30 = 35%
Passing No. 30, retained on No. 50 = 25%
Passing No. 50, retained on No. 200 = 22%
Passing No. 200, retained in the Pan = 18%

## 7. Preparation of Test Specimen

- 7.1 Weigh 200 g of the prepared aggregate into the mixing bowl. Dry mix 2 g (1%), or the desirable amount, of the mineral filler into the aggregate until uniformly distributed. Add sufficient water and, if required, other additives to produce a workable slurry and mix until all the components are uniformly wet. The type and amount of mineral filler and/or other additives should be reported.
- 7.2 Add the equivalent of 8.125% $\pm$  0.1% emulsified asphalt residue (e.g. 25 g of 65% residue emulsified asphalt) and stir until the mix is broken. (NOTE: Mixing beyond the break may result in stripping of the residue which may affect test results.) If the break does not occur in 3-5 minutes and the mixture consistency is homogeneous, allow the mix to stand and monitor until broken. If the mix is not homogeneous, the mix must be remade.
- 7.3 Crumble the mixture into a suitable drying pan, exercising caution to avoid stripping of the aggregate. After a minimum of 1 hour air curing, dry to constant weight in a forced draft  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ ) oven (about 18 hours may be required).
- 7.4 Place 40 g  $\pm$  1 g of the  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ ) dried, uniformly crumbled mixture into the mold, preheated to  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ ). Immediately press the crumbled mixture to a pressure of 1000 kg (2204 lb)  $\pm$ 2.5% and maintain pressure for one minute. Remove the resulting pill from the mold by aligning the mold over a metal cylinder with sufficient outside diameter to support the mold and inside diameter greater than that of the pill. Use the ram to press the pill into the cylinder, releasing it from the mold. Allow the pill to cool to room temperature.

## 8. Test Procedure

- 8.1 Absorption
  - 8.1.1 Remove any loose flashing from the pill, weigh to the nearest .01 gram and submerge in a  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 5.4^{\circ}\text{F}$ ) water bath for 6 days.
  - 8.1.2 After the 6 day (144 $\pm$ 4 hours) soaking period, surface dry the pill by blotting with a paper towel until no wet spots appear on the towel. Immediately weigh to the nearest .01 g and record the weight of the saturated pill.

## 8.2 Abrasion

8.2.1 Fill the shuttle cylinder with water at  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 5.4^{\circ}\text{F}$ ) water to  $750\text{ ml} \pm 25\text{ ml}$ . Place the pill in the cylinder. Close the cylinder and place securely in the abrasion machine.

8.2.2 Run the abrasion machine for 3 hours  $\pm$  3 minutes at 20 RPM (3600 cycles).

8.2.3 Remove the pill from the cylinder and surface dry the abraded pill as in 8.1.2. Immediately weigh to the nearest .01 g to determine the abrasion loss in grams. Abrasion loss is calculated by subtracting the abraded pill weight from the saturated pill weight as determined in 8.1.2.

## 8.3 Integrity

8.3.1 Place the saturated, abraded pill in the hardware cloth basket. In an 800 ml beaker of boiling water, suspend the basket so that there is a minimum of  $\frac{1}{4}$  inch of water above and below the basket. Boil for 30 minutes.

8.3.2 Place the remains of the boiled pill on a paper towel. When surface dry, weigh the largest remaining piece and record as integrity weight. Percent integrity is calculated by dividing the integrity weight by the saturated pill weight as determined in 8.1.2. and multiplying by 100.

## 8.4 Adhesion

8.4.1 After air drying the piece from Section 8.3 for 24 hours, estimate the percent aggregate completely coated with asphalt. This percentage of coating is recorded as "Adhesion."

## 9. Report

9.1 Record the average of four specimens to include:

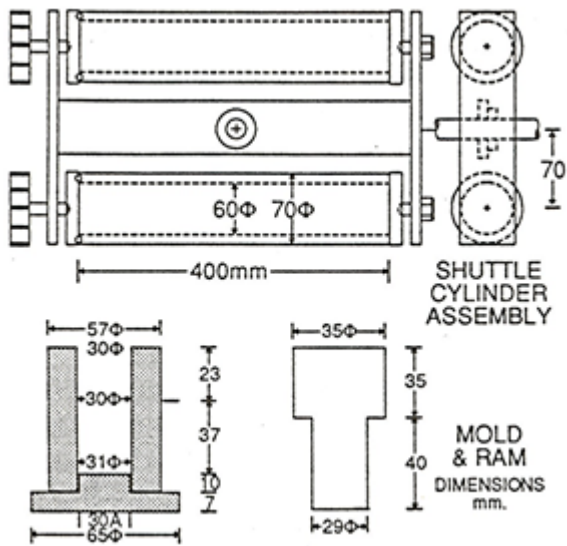
- Abrasion loss, in g
- Integrity, in percent
- Adhesion, in percent

9.2 Table 2 shows the suggested Compatibility Classification system to simplify and facilitate communication:

Table 2

Grade Rating	Point Rating	Abrasion Loss, g	Integrity, % Retained	Adhesion, % Coated
A	4	0 – 0.7	90 – 100	90 – 100
B	3	0.8 – 1.0	75 – 89	75 – 89
C	2	1.1 – 1.3	50 – 74	50 – 74
D	1	1.4 – 2.0	10 – 49	10 – 49
0	0	2.1+	0	0

The grade point value of the system is determined by adding the point ratings of the abrasion loss, integrity, and adhesion.



Conversion Table	
Mm	Inches
7	0.276
10	0.394
23	0.906
29	1.142
30	1.181
31	1.220
35	1.378
37	1.457
40	1.575
57	2.244
60	2.362
65	2.559
70	2.756
400	15.748



**ABRASION MACHINE - CLOSED**



**SHUTTLE CYLINDER ASSEMBLY**



**PILL PRESS**