



**INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF MATERIALS AND TESTS**

**MASS RETENTION OF EMULSIFIED ASPHALTS
SUBJECTED TO WATER DROPLETS
ITM No. 598-23**

1.0 SCOPE.

- 1.1** This test method gives a measure of water resistivity and how quickly an applied asphalt emulsion can become water resistant. This test method is used to measure material runoff caused by a rain effect at different time intervals, allowing the method to measure differences in drying times between products of different formulations.
- 1.2** This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

2.1 ASTM Standards.

D6934 Test Method for Residue by Evaporation of Emulsified Asphalt
D6997 Test Method for Distillation of Emulsified Asphalt
E1 Standard Specification for ASTM Liquid-in-Glass Thermometers

3.0 TERMINOLOGY. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101.

4.0 SIGNIFICANCE AND USE. ITM is used to measure the effects of secondary additives in Void Filling Emulsions or modified asphalt emulsions on the ability to dry quickly and become resistant to water droplets simulating rainfall.

5.0 APPARATUS.

- 5.1** Receiver/pan, a large pans for collection of water runoff during test.
- 5.2** Paint can, for collection of excess emulsion during application.
- 5.3** Water Release Device, 100 mL titration burette with stopcock, able to measure to tolerance of ± 1 mL and that allows a discharge of 10 ± 0.5 mL of water at an average flow rate of 0.75 ± 0.16 ml/sec. Equipped with spacer bar (stir rod) to ensure consistent distance from the sample. (See Figure 1)

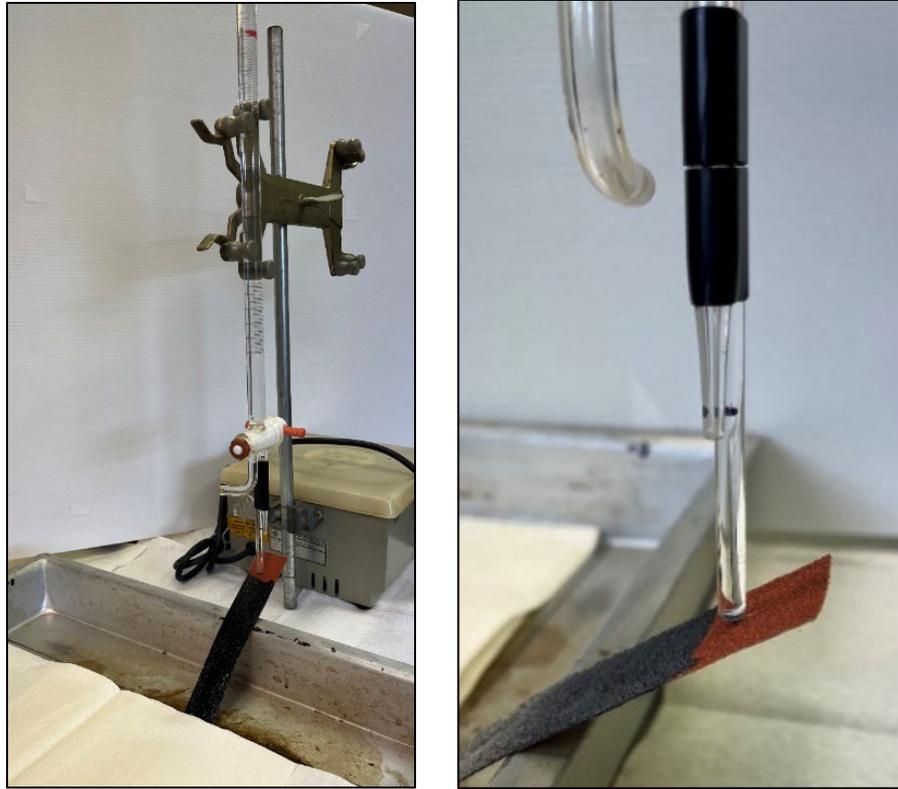


Figure 1: Water release device (left) and detail of burette tip and spacer bar (right)

- 5.4 Balance, capable of weighing 10 ± 0.01 g.
 - 5.5 Oven, capable of maintaining a temperature of $50^\circ \pm 3^\circ\text{C}$ and $163 \pm 3^\circ\text{C}$
 - 5.6 Thermometric Device, thermometer 15C or 15F as prescribed in ASTM E1, or equivalent thermometric device.
 - 5.7 Timer, capable of measuring time to ± 5 seconds
 - 5.8 Drying Apparatus, wire rack or flat metal pan for drying at room temperature and in conditioning oven.
- 6.0 **SAMPLING.** Sampling shall be as stated in the referenced ASTM methods.
- 7.0 **PREPARATION OF SAMPLE.**
- 7.1 All emulsified asphalts shall be properly stirred to achieve homogeneity before testing. If the emulsified asphalt requires dilution before testing, the diluted emulsion shall be tested within 48 hours of initial dilution.

- 7.2 Determine residue of the emulsified asphalt sample by distillation (ASTM D6997) or evaporation for 3 h at $163 \pm 3^\circ\text{C}$. (ASTM D6934).
- 7.3 Warm the emulsified asphalt to $50 \pm 3^\circ\text{C}$ in an oven or water bath. After the sample reaches 50°C , stir the sample to achieve homogeneity.
- 7.4 All sandpaper strips shall be measured and cut from 9" x 11" sheets of red Gator® brand P60 grit bare wood sandpaper with garnet abrasive at room temperature.
- 7.4.1 Strips shall be cut to 5.5 ± 0.1 in. tall by 2 ± 0.1 in. wide.
- 7.4.2 The strips shall be placed in stacks of three on a nonstick pan. Flat weights of sufficient mass to flatten the sandpaper shall be applied across all of the strips. (See Figure 2)
- 7.4.3 The pan shall be placed in a $163 \pm 3^\circ\text{C}$ oven for 8 ± 1 hour to condition and flatten. The pan shall be removed from the oven, and the weights removed as soon as possible. The sandpaper strips shall be placed in a desiccator to cool. Once cool to the intended testing temperature, the strips are considered ready for use.



Figure 2: Weights covering sandpaper strips

8.0 PROCEDURE.

- 8.1 Fill the titration burette to a volume that allows a discharge of 10 ± 0.5 mL of room temperature water at an average flow rate of 0.75 ± 0.16 mL/sec. Use this volume for all testing trials.
- 8.2 Prepare your data collection table as shown in *Table 1*.
- 8.3 Record the dry weight of each sandpaper strip individually into the data table as measurement A to the nearest 0.01 g.
- 8.4 Hold the sandpaper strip at approximately a 60-degree angle over the can. Use a dropper to add two full pipettes of 50°C emulsion across the sandpaper. Start approximately $\frac{1}{2}$ inch from the top of the sandpaper strip and directing the flow of

the emulsion to cover the entire width of the strip by slowly moving the pipette down the strip. Complete the coating action within 10 seconds.

- 8.5** Start the 15-minute timer. Dab the bottom of the strip against a paper towel to remove any excess emulsion and record the mass of the sample within 10 seconds of completing the application. Record this as measurement B to the nearest 0.01 g.
- 8.6** Allow the strip to cure lying flat for 15 ± 1 minute at 21 ± 2 °C.
- 8.7** Position the strip in the collection pan below the titration burette at a 45-degree angle. The burette tip shall be 1.5 ± 0.1 inches above the sandpaper strip.
- 8.8** Fully open the burette and drip 10 ± 0.5 mL of room temperature water onto the strip at full flow rate. Dab off any excess water at the bottom edge of the strip.
- 8.9** Immediately place the strip into a 163 °C oven to cure lying flat for 2 hours. Repeat for the remaining strips.
- 8.10** Remove the strips from the oven and place on a clean counter or pan surface and allow to cool to ambient temperature, but no longer than 20 minutes.
- 8.11** Immediately after cooling, weigh the final mass of the strip with dried residue and record under Measurement C.

9.0 DATA COLLECTION.

Emulsion			
Measurement	A	B	C
Replicate 1			
Replicate 2			
Replicate 3			

Table 1: Data Collection Table

10.0 CALCULATION.

	R _a	R _c	%R _{Ret}
Replicate 1			
Replicate 2			
Replicate 3			

10.1 $R_a = (B - A) * X$

Where:

A = Mass of dry sandpaper strip

B = Mass of sandpaper strip and applied material immediately after application

X = Tested Emulsion Residue by distillation or evaporation, %

R_a = Residue applied before curing and water resistance test

10.2 $R_c = (C - A)$

Where:

A = Mass of dry sandpaper strip

C = Mass of sandpaper strip and residue after 2 hours curing in oven

R_c = Residue after oven curing

10.3 % Residue Retention = $\%R_{Ret} = \frac{R_c}{R_a} * 100\%$

11.0 REPORT.

11.1 The average of three tests for % Residue Retention, reported to the nearest 0.1%. If any one value of the average is below 55%, the water resistance test shall be considered invalid.