

## A. Scope

Use this test method to determine the resistance to plastic flow and percent water absorption of specimens made from compressed sand-bituminous mixtures composed of sand and cutback asphalt bituminous materials.

## B. Apparatus

The apparatus consists of the following:

1. **Compaction Mold**—Use a cylindrical, hardened-steel mold with an inside diameter of  $2.000, \pm 0.001$  in ( $50.8, \pm 0.025$  mm), a length of 5.25 in (133.35 mm), and an outside diameter of 2.5 in or more.
2. **Compaction Plungers**—Use a hardened-steel plunger with a circular face,  $1.997, \pm 0.001$  in ( $50.72, \pm 0.025$  mm) diameter, and a length of 5.5 in (139.7 mm); and a hardened-steel plunger with a diameter of  $1.997, \pm 0.001$  in ( $50.72, \pm 0.025$  mm) and a length of 2.5 in (63.5 mm).
3. **Testing Mold and Ring**—Use a cylindrical testing mold  $2.02, \pm 0.002$  in ( $51.3, \pm 0.051$  mm) inside diameter for the bottom 1.5 in (38.1 mm) of the mold, tapering to a maximum inside diameter of  $2.06, \pm 0.002$  in ( $52.32, \pm 0.051$  mm) at the top, and approximately 3.02 in (76.71 mm) outside diameter. The mold must be 4-1/2 in (114.3 mm) high.

Ensure the testing mold has a hardened steel test ring,  $3.02 \pm 0.005$  in ( $76.71, \pm 0.127$  mm) outside diameter and  $0.25, \pm 0.01$  in ( $6.35, \pm 0.254$  mm) thickness, with a circular orifice  $1.75, \pm 0.001$  in ( $43.75, \pm 0.025$  mm) diameter on 1 face. This orifice must have a distinct vertical edge 1/16 in (1.59 mm) thick and  $1.75, \pm 0.001$  in ( $43.75, \pm 0.025$  mm) diameter, and must taper to a diameter of about 2 in (50.8 mm) on the opposite face.

Use a testing ring clamp to hold the testing ring snugly in a concentric position against the bottom of the testing mold and to serve as base for the testing mold.

4. **Testing Machine**—Use a device capable of applying a load of 10,000 lbs (44.482 kN) force at a uniform rate of head movement of at least 2.5 in (63.5 mm).
5. **Oven**—Use a device capable of maintaining temperatures not exceeding 225 °F (107.2 °C).
6. **Pans**—Use two pie pans.
7. **Mixing Apparatus**—Use a spoon and bowl.
8. **Water Bath**—Use a water bath that can maintain a water temperature at  $140^\circ, \pm 1.8^\circ$  F ( $60^\circ, \pm 1^\circ$  C).

## C. Sample Size and Preparation

1. For sand-bituminous mixture prepared in the laboratory, weigh, to the nearest 0.00022 lb (0.1g), a sufficient quantity of dry sand to produce four test specimens.
2. Heat the sand in a tared mixing bowl to the desired temperature, not exceeding 225 °F (107.2 °C).
3. Mix the sand thoroughly.
4. Place the bowl containing the sand on the balance and add the desired amount of bituminous material at a suitable temperature, not exceeding 225 °F (107.2 °C), accurate to 0.00022 lb (0.1g).
5. Thoroughly and uniformly mix the materials and break up all lumps in the mixture.
6. Make the test specimens of compressed bituminous mixture 2 in (50.8 mm) diameter and 1 in (25.4 mm) high. This size of specimen is suitable for testing sand mixtures that pass a No. 10 (2 mm) sieve.
7. Cool the mixture to room temperature.
8. Insert the bottom plungers into each 2 in (50.8 mm) mold.
9. In each mold, place an amount of the mixture sufficient to get the required 1-in (25.4 mm) compressed height.
10. Insert the top plunger.
11. Consolidate the specimen by applying 9425 pounds-force (42.207 kN) for a specimen 2 in (50.8 mm) diameter.
12. Maintain this pressure for two minutes and then release.
13. Remove the specimen carefully and store for testing.

**D. Procedures**

1. Determine the weight per cubic foot (meter) of the specimens.
2. Place two of the specimens in a pie pan (use the remaining specimens for control tests) and pour enough water into the pans to cover the lower one-half of the specimens.
3. Cover this pan with the other pie pan and place in a moisture room for 7 days.
4. Remove after 7 days and determine the percent of absorption by the following formula:

$$\text{Percent Absorption} = \frac{B-A}{A} \text{ where}$$

A = Weight of specimens before conditioning

B = Weight of specimens after conditioning

5. Bring the control and conditioned specimens to the desired temperature of test by placing the specimens in the testing mold.
6. Place the mold in a 140 °, ± 1.8 °F (60 °, ± 1 °C) water bath for 1 hour.
7. Insert the plunger in the testing mold and place under the testing machine.
8. Apply the load at 2.5 in (63.5 mm) per minute.
9. Record the maximum load, in pounds-force, registered on the testing machine as the resistance to plastic flow of the specimen.

**E. Calculations**

Determine the percent of absorption:

$$\text{Percent Absorption} = \frac{B-A}{A} \text{ where}$$

A = Weight of specimens before conditioning

B = Weight of specimens after conditioning

**F. Report**

1. Report the following information on Form 66:
  - a. Gallons per square yard per inch (liters per square meter per millimeter) thickness of sand-bituminous material
  - b. Mix density in pounds per cubic foot (kilograms per cubic meter)
  - c. Percent absorption after 7 days
  - d. Maximum load in pounds-force (kN) of control specimen
  - e. Maximum load in pounds-force (kN) of conditioned specimen
2. Send the completed original form to the Office of Materials and Research in Forest Park.
3. Send copies of the form to the Branch Lab and the Area Engineer.
4. Notify the department head of any material that fails.