
Test Procedure for

**ABSORPTION AND DRY BULK SPECIFIC GRAVITY
OF LIGHTWEIGHT COARSE AGGREGATE**



TxDOT Designation: Tex-433-A

Effective Date: August 1999

1. SCOPE

- 1.1 Use this method to determine the absorption characteristics and dry bulk specific gravity of lightweight coarse aggregate. In addition, Porosity and the 100-Minute Saturation Value are calculated.
 - 1.2 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.
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2. APPARATUS

- 2.1 *Balance*, minimum capacity of 4000 g, accurate and readable to 0.5 g or 0.1% of the mass of the test sample, whichever is greater.
 - 2.2 *Mason jar*, fitted with a pycnometer cap, 2 L (0.5 gal.) capacity.
 - 2.3 *Funnel*, wide-mouthed.
 - 2.4 *Distilled or demineralized water*.
 - 2.5 *Syringe*.
 - 2.6 *Drying oven*, maintained at $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$).
 - 2.7 *Desiccator*.
 - 2.8 *Timing device*, such as a stopwatch.
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3. PROCEDURE

- 3.1 Obtain a representative test sample of approximately 600 g.
 - 3.2 Oven-dry sample to a constant mass and then cool to room temperature in a desiccator.
Note 1—Run this test in a room with an ambient temperature between 20 and 25°C (68 and 77°F).
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- 3.3 Weigh the oven-dried test sample to the nearest 0.5 g and record as X under Section 4.
- 3.4 Fill pycnometer with water and weigh to the nearest 0.5 g. Record the mass as Y under Section 4. Empty the water from the jar and dry.
- 3.5 Place dry sample in pycnometer jar by means of wide-mouthed funnel, taking care not to lose any of the material. Fill jar with water to within 12.5 mm (0.5 in.) of the rim. Screw cap on jar and then fill completely with water. Begin timing the instant water is introduced into the jar.
- 3.6 Cover hole in cap with a finger and agitate sample by rolling and shaking. Place jar on the balance and dry outside of jar thoroughly. Prior to weighing jar, use syringe to fill jar completely to a rounded bead. Weigh the jar with sample and water to the nearest 0.5 g.
- 3.7 Take weighings at 2, 4, 6, 8, 10, 20, 30, 60, 90, and 120 minutes from the beginning of the test. Repeat Section 3.6 prior to each weighing and record the weight as Z_2 , Z_4 , Z_6 , etc. under Section 4.
- Note 2**—Take weights for as long as 24 hours or more, if desired, for special purposes.
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4. CALCULATIONS

- 4.1 Graph Time vs. Mass Sample and Water:

Draw time, in minutes, on the abscissa (x-axis) and mass, in grams, on the ordinate (y-axis). Extend the curve back to include initial time = 0 minutes and the initial mass of the pycnometer jar plus sample and water, Z_0 .

- 4.2 Calculate Percent Absorption at time t (A_t):

$$A_t = 100 \bullet (Z_t - Z_0) / X$$

- 4.3 Calculate Dry Bulk Specific Gravity (G_b):

$$G_b = X / (X + Y - Z_0)$$

Where:

X = mass of oven-dried test sample

Y = mass of calibrated pycnometer jar filled with water

Z_t = mass of pycnometer containing sample and water to fill at time t

Z_0 = mass of pycnometer containing sample and water to fill at time 0.

- 4.4 Plot Percent Absorption vs. Time with time on the abscissa (x-axis) and absorption on the ordinate (y-axis).
- 4.5 Determine the Theoretical Maximum Specific Gravity, G_r , according to Tex-227-F.

4.6 Calculate the porosity of the aggregate (N):

$$N = 1 - (G_b / G_r)$$

4.7 Calculate the 100-Minute Saturation Value (S_{100}):

$$S_{100} = A_{100} \bullet G_b / N$$

5. REPORT

5.1 Report results to nearest 0.01.