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METHOD OF TEST FOR SPECIFIC GRAVITY AND ABSORPTION OF FINE AGGREGATE

A. SCOPE

This test method, which is a modification of AASHTO Designation T 84, is used for determining bulk specific gravity (saturated surface-dry basis) and absorption (after prescribed soaking) of fine aggregate proposed for use in portland cement concrete.

B. APPARATUS

The apparatus shall consist of the following:

1. A balance having a capacity of 1000 g or more, and sensitive to 0.1 g.
2. A volumetric flask of 500 mL capacity, calibrated to 0.15 mL at 73°F.
3. A conical metal mold in the form of a frustum of a cone with dimensions as follows: 40 mm \pm 3 mm inside diameter at the top, 90 mm \pm 3 mm inside diameter at the bottom, and 75 mm \pm 3 mm in height, with the metal having a minimum thickness of 0.8 mm.
4. A metal tamping rod weighing 12 oz \pm 0.5 oz and having a flat circular tamping face 1 in. \pm 1/8 in. in diameter.

C. PREPARATION OF SAMPLE

1. Split or quarter a representative test sample of approximately 1000 g from the fine aggregate to be tested.
2. Place the sample in a suitable container and inundate with water for a minimum of 15 hours (overnight).
3. Dry the test sample to saturated surface-dry (SSD) condition using the following procedures. (A material is in saturated surface-dry condition when it retains its capacity of absorbed water and no excess free water is present on the surface of the particles.)
 - a. Pour off the free water and spread the wet sample on a flat surface.
 - b. Drying can be expedited by placing the sample on a smooth porous surface such as heavy wrapping paper and using an electric fan to gently circulate warm air.
 - c. Stir or roll the sample frequently to promote uniform drying.

- d. When the sample approaches a free-flowing condition, place the conical mold on a flat surface with the small opening up.
- e. Fill the mold loosely to overflowing with a portion of the sample.
- f. Lightly tamp the surface of the aggregate 25 times with the metal tamping rod. Do not add additional aggregate to the mold while tamping or after tamping is completed.
- g. Lift the mold vertically from the formed cone of fine aggregate.
- h. If the sand retains its conical shape, free moisture is still present in the sample and drying must be continued. As the saturated surface-dry condition is approached, the sample must be constantly stirred and tested at frequent intervals until the cone of sand slumps as the mold is removed.
- i. Slumping of the sand as the mold is removed indicates that the sand is in a saturated surface-dry condition.
- j. If the cone of sand slumps upon removal of the cone on the first trial, the sand may have been dried past the saturated surface-dry condition before the first test was made. In this case, add a few milliliters of water to the sample, thoroughly mix and allow the sample to stand in a covered container for 30 minutes. Then proceed with the process of drying and testing prescribed above.

D. TEST PROCEDURE

1. Weigh the dry, empty flask to the nearest 0.1 g.
2. When the aggregate reaches the saturated surface-dry condition, immediately weigh out a 500 g representative portion, pour it into the flask, and fill the flask almost to the 500 mL mark with water at a temperature of approximately 73°F.
3. Weigh the remaining portion of the saturated surface-dry sand to the nearest 0.1 g and record this mass as the SSD mass. Dry this portion to a constant mass at 230°F ± 9°F and record this mass as the oven-dry mass.
4. Eliminate entrapped air from the flask by gently rolling the flask in an inclined position or by whirling it in a horizontal circle in such a manner as to agitate the sand particles.
5. Place the flask in a water bath or constant temperature room maintained at 73°F ± 3°F.
6. After approximately 1 hour, remove the flask and again roll it to eliminate any remaining air bubbles. Fill the flask with water to exactly the 500 mL mark, wipe moisture off the outer surface of the flask, and weigh the flask and its contents to the nearest 0.1 g.

E. CALCULATIONS

1. Calculate the specific gravity to the nearest 0.01 using the following formula:

$$\text{Bulk specific gravity (SSD)} = 500 / (V - M)$$

Where:

V = volume in milliliters of flask, and

M = mass (to the nearest 0.1 g) of water added to flask $M = (\text{Mass of flask} + \text{sample} + \text{water}) - (\text{Mass of flask} + \text{sample})$.

2. Calculate the absorption to the nearest 0.1%, from the following formula using the data obtained in Paragraph D-3 above:

$$\text{Percent absorption} = [(\text{SSD mass} - \text{Oven-dry mass}) / \text{Oven-dry mass}] \times 100$$

F. PRECAUTIONS

1. Frequent stirring of the sample is required during the process of drying the wet sand to a saturated surface-dry condition in order to ensure uniform drying throughout the sample. If non-uniform drying is allowed, the specific gravity obtained may be in error because the oven-dried portions of the sample will not be saturated.
2. Weigh both portions of the sample immediately after it reaches a saturated surface-dry condition to avoid undue moisture loss due to evaporation.
3. Exercise care to eliminate all air bubbles from the sample in the flask before making the final weighing.

G. SAFETY AND HEALTH

Aggregates may contain bacteria and/or organisms that can be harmful to one's health. The wearing of dust masks and protective gloves when handling materials is advised.

Use of heat resistant gloves/mitts or potholders is required for removing samples from the ovens.

It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Prior to handling, testing or disposing of any materials, testers must be knowledgeable about safe laboratory practices, hazards and exposure, chemical procurement and storage, and personal protective apparel and equipment.

Caltrans Laboratory Safety Manual is available at:

http://www.dot.ca.gov/hq/esc/ctms/pdf/lab_safety_manual.pdf

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