Method of Test for Specific Gravity and Absorption of Fine Aggregate

1.   Scope:

This test is for determining the bulk specific gravity and absorption of fine aggregate.

2.   Apparatus:

2.1   Scale or balance having the capacity to weigh any sample which may be tested utilizing this procedure and readable to the nearest 0.1 gram.

2.2   Flask. A volumetric flask having a capacity of 500 mL with a known tare weight.

2.3   Mold. A metal, cone shaped mold with the following dimensions: top, 1 ½"; bottom, 3 ½"; height, 2 ⅞".

2.4   Tamper. A metal tamping rod weighing 12 oz. and having a flat circular tamping face 1" in diameter.

2.5   Drying oven capable of maintaining a temperature of 230° ± 9°F.

2.6   Funnel. A small funnel to introduce the fine aggregate into the flask.

3.   Procedure:

3.1   Obtain a sample of at least 1000g in accordance with SD 201.

3.2   Dry the sample in an oven at 230° ± 9°F to a constant weight as per SD 108. Weigh the material to the nearest 0.1 gram.

3.3   Allow the sample to cool to a comfortable handling temperature, cover with water, either by immersion or by the addition of at least 6% moisture to the fine aggregate, and permit to stand for 15 to 19 hours. | 18

3.4   Decant excess water with care to avoid loss of fines, spread on a flat non-absorbent surface exposed to a gently moving current of warm air, and stir frequently to secure homogenous drying. Continue until the test specimen approaches a free flowing condition.

3.5   Test the material to determine if surface moisture is present with the cone and tamper. Hold the mold firmly on a smooth non-absorbent surface with the large diameter down. Place a portion of the partially dried fine aggregate loosely in mold by filling it to overflowing and heaping additional material above the top of the mold by holding it with cupped fingers of the hand holding the mold.

Lightly tamp the fine aggregate into the mold with 25 light drops of the tamper. The height of each drop shall be about 1/4" above the surface

elevation of the fine aggregate. Distribute the drops over the entire surface of the fine aggregate.

Remove the loose sand from the base of the mold and lift it vertically. If surface moisture is still present, the fine aggregate will retain the shape of the mold. When the fine aggregate slumps slightly, it indicates that it has reached a surface dry condition. (It is intended that the first trial of the cone test be made with some surface water in the specimen. If the first test indicates that moisture is not present on the surface, mix a few milliliters of water with the fine aggregate; allow to stand covered for approximately 30 minutes, then proceed with the cone test.)

3.6 Immediately weigh a 500.0 g sample of the surface dry material and place it in the flask. Add water at 73.4° ± 3°F to the material and roll the flask to eliminate air bubbles. After all air bubbles have been removed, place the flask in a constant temperature bath at 73.4° ± 3°F for 1 hour.

Fill the flask with water to the 500 mL mark and weigh the flask, water and fine aggregate to the nearest gram.

Remove the fine aggregate from the flask and dry to a constant weight. Weigh the dry aggregate to the nearest 0.1 gram. In lieu of drying the material from the flask, a second 500.0 gram of surface dry sample may be used to determine the dry weight.

4. Report:

4.1 Bulk specific gravity:

Calculate the bulk specific gravity, 73.4°/73.4°F, as follows:

$$\text{Bulk Sp. Gr.} = A / (B + S - C)$$

Where: A = Mass of oven-dry specimen in air, g;

B = Mass of pycnometer filled with water, g;

C = Mass of pycnometer with specimen and water to calibration mark, g;

S = Mass of saturated surface-dry specimen, g;

A. Bulk specific gravity (Saturated surface-dry basis).

Calculate the bulk specific gravity, 73.4°/73.4°F, on the basis of mass of saturated surface-dry aggregate as follows:

$$\text{Bulk Sp. Gr. (saturated surface-dry basis)} = S / (B + S - C)$$

B. Apparent specific gravity.

Calculate the apparent specific gravity, 73.4°/73.4°F, as follows:

Apparent Sp. Gr.   = $A / (B + A - C)$

C.   Absorption.

Calculate the percentage of absorption, as defined in ASTM C125, as follows:

Absorption, percent = $((S - A) / A) \times 100$

4.2   Report the concrete specific gravity to the nearest 0.01 and the absorption to the nearest 0.1%. Report the asphalt specific gravity to 0.001 and absorption to the nearest 0.1%.

5.   References:

AASHTO T 84
ASTM C 125
SD 108
SD 201