

State of Nevada
Department of Transportation
Materials Division

**METHOD OF TEST FOR BULK SPECIFIC GRAVITY AND
ABSORPTION OF FINE AGGREGATE**

SCOPE

This test method describes the procedure used for determining the bulk specific gravity (saturated surface-dry condition) and absorption of fine aggregate.

APPARATUS

1. Balance, having a capacity of 12000 g and sensitive to 0.1 g.
2. Pycnometer, a volumetric flask of 500 mL capacity or a (1 L) 1 qt fruit jar fitted with a pycnometer top.
3. Mold, conical metal mold 40 ± 3 mm ($1 \frac{1}{2} \pm \frac{1}{8}$ in.) inside diameter at the top, 90 ± 3 mm ($3 \frac{1}{2} \pm \frac{1}{8}$ in.) inside diameter at the bottom and 75 ± 3 mm ($3 \pm \frac{1}{8}$ in.) in height.
4. Tamper, metal tamper having a mass of 340 ± 15 g and having a flat circular tamping face 25 ± 3 mm ($1 \pm \frac{1}{8}$ in.) in diameter.
5. Rubberized Cloth, approximately 0.9 x 0.9 m (3 x 3 ft).
6. Electric Fan (optional).

SAMPLING

Sampling shall be accomplished in accordance with Test Method Nev. T200.

PREPARATION OF SAMPLE

Obtain a representative sample of the fine aggregate, by quartering, weighing approximately 1200 g. Do not dry the fine aggregate prior to testing. Add at least 6 percent water to the fine aggregate, thoroughly mix, and permit to stand in a sealed container for 15 to 24 hours.

PROCEDURE

1. Record Weight (B) of the pycnometer filled to its calibration level with water between 18.3 and 23.9°C (65 and 75°F), to the nearest 0.1 g.
2. Partially fill the pycnometer with water. Water temperature in the pycnometer should be maintained between 18.3 and 23.9°C (65 and 75°F).
3. Decant excess water from the fine aggregate sample container, take care to avoid loss of fines. Spread the fine aggregate on a flat nonabsorbent surface (rubberized cloth) and stir frequently to ensure homogeneous drying. If desired, mechanical aids such as tumbling or stirring, or an electric fan may be employed to assist in achieving the saturated surface-dry condition. As the fine aggregate begins to dry sufficiently, it may be necessary to work it with the hands in a rubbing motion to break up any conglomerations, lumps, or balls of material that develop. Continue this operation until the fine aggregate approaches a free-flowing condition. Follow the Cone Test for Surface Moisture, as shown below, to determine whether or not surface moisture is present on the fine aggregate particles. The first trial of the cone test will be performed at a moisture content above the saturated surface-dry condition. Continue drying with constant stirring, and if necessary, work the fine aggregate with a hand rubbing motion, and test at frequent intervals until the test indicates that a saturated surface-dry condition has been reached. If the first trial of the surface moisture test indicates that moisture is not present on the surface, it has been dried past the saturated surface-dry condition. In this case, thoroughly mix a few milliliters of water with the fine aggregate and permit it to stand in a sealed container for 30 minutes. Resume the process of drying and testing at frequent intervals, until a saturated surface-dry condition is achieved.

Cone Test for Surface Moisture - Hold the mold firmly on a smooth nonabsorbent surface (rubberized cloth) with the large diameter down. Place a portion of the partially dried fine aggregate loosely in the mold by filling until overflow occurs and heaping additional fine aggregate above the top of the mold by holding it with the cupped fingers of the hand holding the mold. Lightly tamp the fine aggregate into the mold with 25 light drops of the tamper (cup fingers around the top edge of the mold to prevent damage to mold). Each drop should start about 5 mm (0.2 in.) above the top surface of the fine aggregate. The tamping force shall not be more than that applied by the weight of the tamping rod. Adjust the starting height to the new surface elevation after each drop and distribute the drops over the surface. Do not add additional fine aggregate after the tamping is completed. Remove loose sand from around the base and lift the mold vertically. If surface moisture is still present, the fine aggregate will retain the molded shape. When the fine aggregate slumps slightly, it indicates that it has reached a saturated surface-dry condition.

4. Remove one 500 ± 0.2 g portion of fine aggregate from the saturated surface-dry sample and dry to a constant weight as described in Test Method Nev. T112, cool to room temperature and record Weight of dry sample (A), to the nearest 0.1 g.
5. Immediately introduce into the pycnometer a 500 ± 0.2 g portion of the remaining saturated surface-dry fine aggregate as prepared above. Record the Weight of saturated surface-dry sample (S), to the nearest 0.1 g. Fill with additional water to approximately 90 percent of capacity. Manually roll, invert, and

agitate the pycnometer to eliminate all air bubbles (see Note 1). Fill the pycnometer to its calibrated level with water between 18.3 and 23.9°C (65 and 75°F).

Note 1: It normally takes about 15 to 20 minutes to eliminate air bubbles. Dipping the tip of a paper towel into the pycnometer has been found to be useful in dispersing the foam that sometimes builds up when eliminating the air bubbles, or adding a few drops of isopropyl alcohol after removal of air bubbles and just prior to bringing the water to its calibrated level, has also been found useful.

6. Record the Weight of the pycnometer with fine aggregate and water filled to calibration level (C), to the nearest 0.1 g.

CALCULATIONS

1. Calculate bulk specific gravity (saturated surface-dry basis) as follows:

$$\text{Bulk specific gravity (saturated surface-dry basis)} = S / (B + S - C)$$

A = Weight of dry sample

B = Weight of pycnometer filled with water to calibration level

C = Weight of pycnometer with fine aggregate and water filled to calibration level

S = Weight of saturated surface-dry sample

2. Calculate the percentage of absorption as follows:

$$\text{Absorption, percent} = [(S - A) / A] \times 100$$

A = Weight of dry sample

S = Weight of saturated surface-dry sample

REPORT

Report results of specific gravity to the nearest 0.01 and absorption to the nearest 0.1 percent.