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 12,000 g and sensitive to 0.1 g.

2. Pycnometer (Figure 1), 1 L (1 qt) glass jar fitted with a conical lid having a small opening at the top of the cone.

3. Mold (Figure 1), conical metal mold 40 ± 3 mm (1 1/2 ± 1/8 in.) inside diameter at the top, 90 ± 3 mm (3 1/2 ± 1/8 in.) inside diameter at the bottom and 75 ± 3 mm (3 ± 1/8 in.) in height.

4. Tamper (Figure 1), metal tamper having a mass of 340 ± 15 g and having a flat circular tamping face 25 ± 3 mm (1 ± 1/8 in.) in diameter.

5. Rubberized Cloth (Figure 1), approximately 0.9 x 0.9 m (3 x 3 ft).

6. Electric Fan or hair dryer (Figure 1) (both optional).

7. Container (Figure 1), 12" mold with lid or 5 gal. bucket with lid

8. Oven, capable of maintaining a temperature of 110 ± 5° C (230 ± 9°F)

SAMPLE PREPARATION

1. Obtain a representative sample per Test Method Nev. T200.

2. Obtain approximately 1,200 g representative portion of the sample per Test Method Nev. T203.

3. Dry the representative sample per Test Method Nev. T112.

4. Add 4.5 % water to the dry representative sample, thoroughly mix and soak in a sealed container for 15 to 24 hours.

PROCEDURE

1. Record the weight of the pycnometer filled to its calibration level with water between $25 \pm 5°C$ ($77 \pm 9°F$), to the nearest 0.1 g.

2. Partially fill the pycnometer with water. Water temperature in the pycnometer should be maintained between $25 \pm 5°C$ ($77 \pm 9°F$).

3. Decant excess water from the fine aggregate sealed sample container, take care to avoid loss of fines. Spread the fine aggregate on a flat non–absorbent surface (rubberized cloth) and stir frequently to ensure homogeneous drying. If desired, mechanical aids such as tumbling, stirring, an electric fan or a hair dryer 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 per Test Method Nev. T112, cool sample and record "Weight of sample in oven–dry condition" (A), to the nearest 0.1 g.

5. Take another 500 ± 0.2 g portion of the remaining saturated surface–dry fine aggregate and place into the pycnometer. Record the "Weight of sample in saturated surface-dry condition" (B), 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. Fill the pycnometer to its calibrated level with water between 25 ± 5°C (77 ± 9°F).

   NOTE: It takes approximately 15 to 20 minutes to eliminate air bubbles. It has been found useful to dip the tip of a paper towel into the pycnometer to help 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.

6. Record the weight of the pycnometer with fine aggregate and water filled to calibration level as "Weight of sample immersed in water" (C), to the nearest 0.1 g.

CALCULATIONS

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

   Bulk specific gravity (saturated surface–dry basis) = A / (B – C)

        A = Weight of sample in oven–dry condition

        B = Weight of sample in saturated surface–dry condition

        C = Weight of saturated sample immersed in water

2. Calculate the percentage of absorption as follows:

   Absorption, percent = [(B – A) / A] x 100

        A = Weight of sample in oven–dry condition

        B = Weight of sample in saturated surface–dry condition

REPORT

Report results of specific gravity to the nearest 0.01 and absorption to the nearest 0.1 percent.
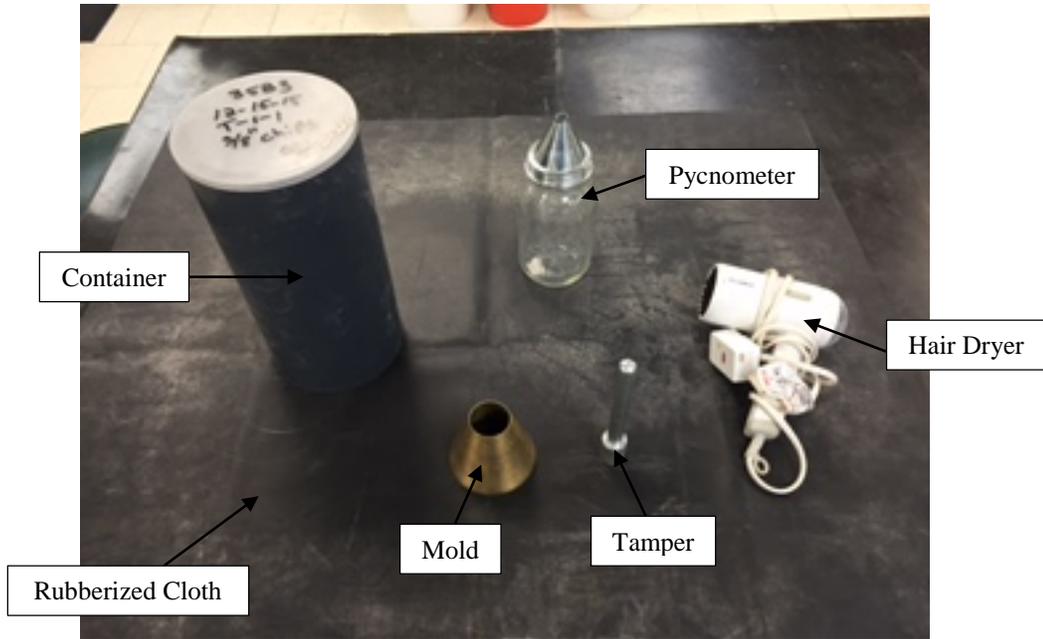
Figure 1