METHOD OF TEST FOR THE DETERMINATION OF BULK SPECIFIC GRAVITY, APPARENT SPECIFIC GRAVITY AND ABSORPTION OF COARSE AGGREGATE

SCOPE

This test method is intended to determine the specific gravity and absorption of coarse aggregate. The specific gravity may be expressed as bulk specific gravity, bulk specific gravity (saturated surface dry – SSD) or apparent specific gravity.

Absorption – the increase in the mass of aggregate due to water in the pores of the aggregate, but not including water adhering to the outside surface of the aggregate, expressed as a percentage of the dry mass.

Specific Gravity – the ratio of the weight of a volume of aggregate to the weight of an equal volume of water. Values are dimensionless.

Apparent Specific Gravity – the volume measurement only includes the volume of the aggregate; it does not include the volume of any water in the permeable voids. The ratio of the weight in air of a unit volume of the impermeable portion of aggregate to the weight in air of an equal volume of water.

Bulk Specific Gravity (Oven-Dry Basis) – the volume measurement includes the overall volume of the aggregate as well as the volume of the permeable voids filled with water. The ratio of the weight in air of a unit volume of aggregate (including the permeable and impermeable voids in the aggregates, but not including the voids between the aggregates) to the weight in air of an equal volume.

Bulk Specific Gravity (Saturated Surface Dry Basis (SSD)) – the volume measurement includes the overall volume of the aggregate particle as well as the volume of the water in the permeable voids. The ratio of the mass in air of a unit volume of aggregate, including the mass of water within the permeable voids filled to the extent achieved by submerging in water for a stated period of time, compared to the weight in air of an equal volume of water.

APPARATUS

1. Balance, having a capacity of 12,000 g and sensitive to 0.1 g.

2. Wire Basket, made of 2.36 mm (No. 8) stainless steel wire mesh with a lift style handle. Dimensions of the basket will have a minimum size of 203 mm x 203 mm (8 in. x 8 in.) diameter x height.

3. Water Tank, thick heavy-duty plastic, minimum of 30 gal. capacity and dimensions of 610 mm x 457 mm x 457 mm (24 in. x 18 in. x 18 in.) W x D x H.
4. Suspension Apparatus, suitable wire for suspending the immersed wire basket from the balance, so that the weight of the aggregate in water can be obtained.

5. Bucket, plastic, 19 L (5 gal.) capacity, deep enough to permit immersing entire sample during soaking period.

6. Towel, large absorbent cloth or towel.

7. Sieve, 4.75 mm (No. 4).

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

9. Electric hot plate or gas stove.

**SAMPLING**

Obtain a representative sample per Test Method Nev. T200.

**SAMPLE PREPARATION**

Obtain a representative sample per Test Method Nev. T203.

1 1/2 in. Aggregate = 5000 g ± 50 g
1 in. Aggregate = 4000 g ± 50 g
3/4 in. Aggregate = 3000 g ± 50 g
3/8 in. and No. 4 Aggregate = 2000 g ± 50 g

Thoroughly screen the entire sample over a 4.75 mm (No. 4) sieve ensuring that there is the correct amount of + 4.75 mm (+ No. 4) material. Weigh to the nearest 1 g and record the weight as “Weight of Sample in Air (as received condition)”.

**PROCEDURE**

1. Thoroughly wash the + 4.75 mm (+ No. 4) material over the 4.75 mm (No. 4) sieve. Place the sample in a bucket, cover with water at a temperature of 23.0 ± 1.7°C (73.4 ± 3°F) and allow to soak for 15 to 24 hrs.

2. Place the sample into the wire basket, rinse the sample clean. Drain off free water from the sample for a few seconds, then pour the sample onto the pre-moistened large absorbent towel and roll the sample in the towel until all visible films of water are removed from the surface of the sample particles. The surface of the sample particles may still appear to be damp, but not shiny. Large sample particles may be individually wiped in lieu of rolling in the towel. In order to avoid evaporation of absorbed water, perform this surface drying operation as rapidly as possible and then immediately weigh to the nearest
1 g. Record weight as “Weight of Sample in Saturated Surface-Dry Condition”.

3. Attach the empty wire basket to the suspension apparatus, immersing the wire basket in the water tank with water at 23.0 ± 1.7°C (73.4 ± 3°F). While the wire basket is immersed in the water, adjust the water level until water flows from the overflow spout. Allow the wire basket and water to stabilize. Tare the scale. Remove the wire basket from the water.

4. Place the sample back into the wire basket, suspend the wire basket from the suspension apparatus and immerse the wire basket completely in the water at 23.0 ± 1.7°C (73.4 ± 3°F) using the tared scale, allowing the wire basket with sample and water to stabilize, ensure the water level is still adjusted to where it flows out of the overflow spout, and weigh to nearest 1 g. Record weight as “Weight of Saturated Sample Immersed in Water”.

5. Place the sample into a suitable drying pan, dry the sample to constant weight per Test Method Nev. T112. Cool to room temperature, for approximately 1 to 3 hours. Place the sample into a tared pan and weigh to nearest 1 g. Record weight as “Weight of Sample in Oven-Dry Condition”.

CALCULATIONS

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

1. The bulk specific gravity (oven dry basis) shall be used for the determination of the specific gravity of aggregate for plantmix bituminous base and riprap aggregates.

\[
\text{Bulk Specific Gravity (oven-dry basis)} = \frac{A}{B - C}
\]

2. The bulk specific gravity (saturated surface-dry basis) shall be used for Portland cement concrete aggregates.

\[
\text{Bulk Specific Gravity (saturated surface-dry basis)} = \frac{B}{B - C}
\]

3. Apparent Specific Gravity = \[
\frac{A}{A - C}
\]

4. Percent absorption = \[
\left(\frac{B - A}{A}\right) \times 100
\]
NOTES

1. When tare weights are used to compensate the weight of the wire basket and/or apparatus used to suspend the basket from the balance, be certain the correct tare weight is used.

2. Maintain a constant water level for all weights obtained in the water tank.

3. Make sure the suspension apparatus is not in contact with the hole in the counter nor any other obstructions.

4. If only an absorption is required, weighing the sample in the wire basket in water can be eliminated under PROCEDURE.

REPORT

Report the specific gravity to the nearest 0.01.
Report percent absorption to the nearest 0.1.