# SPECIFIC GRAVITY

**OBJECTIVE**

Determine the specific gravity of soil fraction passing 4.75 mm I.S sieve by density bottle.

**NEED AND SCOPE**

The knowledge of specific gravity is needed in calculation of soil properties like void ratio, degree of saturation etc.

**DEFINITION**

Specific gravity G is defined as the ratio of the weight of an equal volume of distilled water at that temperature both weights taken in air.

**APPARATUS REQUIRED**

1. Density bottle of 50 ml with stopper having capillary hole.

2. Balance to weigh the materials (accuracy 10gm).

3. Wash bottle with distilled water.

4. Alcohol and ether.

**PROCEDURE**

1. Clean and dry the density bottle

   a.  wash the bottle with water and allow it to drain.

   b.  Wash it with alcohol and drain it to remove water.

   c.   Wash it with ether, to remove alcohol and drain ether.

2. Weigh the empty bottle with stopper ($W_1$)

3. Take about 10 to 20 gm of oven soil sample which is cooled in a desiccator. Transfer it to the bottle. Find the weight of the bottle and soil ($W_2$).

4. Put 10ml of distilled water in the bottle to allow the soil to soak completely. Leave it for about 2 hours.

5. Again fill the bottle completely with distilled water put the stopper and keep the bottle under constant temperature water baths ($T_x^0$ ).

6. Take the bottle outside and wipe it clean and dry note. Now determine the weight of the bottle and the contents  ($W_3$).

7. Now empty the bottle and thoroughly clean it. Fill the bottle with only distilled water and weigh it. Let it be $W_4$ at temperature $(T_x^0 C)$.

8. Repeat the same process for 2 to 3 times, to take the average reading of it.

**OBSERVATIONS**

| S. No. | Observation Number | 1 | 2 | 3 |
|---|---|---|---|---|
| 1 | Weight of density bottle ($W_1$ g) | | | |
| 2 | Weight of density bottle + dry soil ($W_2$ g) | | | |
| 3 | Weight of bottle + dry soil + water at temperature $T_x^0 C$ ($W_3$ g) | | | |
| 4 | Weight of bottle + water ($W_4$ g) at temperature $T_x^0 C$ | | | |
| | Specific gravity G at $T_x^0 C$ | | | |
| | Average specific gravity at $T_x^0 C$ | | | |

CALCULATIONS

$$Specific\ gravity\ of\ soil\ =\ \frac{Density\ of\ water\ at\ 27\ C}{Weight\ of\ water\ of\ equal\ volume}$$

$$=\frac{(W_2 - W_1)}{(W_4 - W_1) - (W_3 - W_2)}$$

$$=\frac{(W_2 - W_1)}{(W_2 - W_1) - (W_3 - W_4)}$$

INTERPRETATION AND REPORTING

Unless or otherwise specified specific gravity values reported shall be based on water at $27^0C$.

So the specific gravity at $27^0C$ = K  Sp. gravity at $T_x^0C$.

$$\text{where} \quad K = \frac{\text{Density of water at temperature } T_x^0 C}{\text{Density of water at temperature } T_x^0 C}$$

The specific gravity of the soil particles lie with in the range of 2.65 to 2.85. Soils containing organic matter and porous particles may have specific gravity values below 2.0. Soils having heavy substances may have values above 3.0.

Quiz:


References: