



SPECIFIC GRAVITY TEST

(IS-2720-PART-3/section-1-1980) (Reaffirmed-2002)

THEORY:

The specific gravity of a soil is the ratio of the mass of a given volume of the material at a stated temperature to the mass of an equal volume of de-aired or gas-free distilled water at a stated temperature. The specific gravity of a soil is used in the phase relationship of air, water, and solids in a given volume of the soil.

NEED AND SCOPE:

The specific gravity of a soil is used in relating a weight of soil to its volume and in calculation of phase relationship, i.e. the relative volume of solids to water and air in a given volume soil. The specific gravity is used in the computations of most of the laboratory tests, and is needed in nearly all pressure, settlement, and stability problems in soil engineering.

APPARATUS REQUIRED:

1. Specific gravity- glass bottle of 50 ml capacity with a fitted glass stopper
2. Stopper - glass with small hole through center to permit emission of air and water
3. Balance - 0.001 g sensitivity
4. Oven - capable of $105^{\circ}\text{C} \pm 1^{\circ}\text{C}$
5. Thermometer
6. Funnel
7. Sand bath for heating

PROCEDURE:

1. First weigh 'W₁' the specific gravity bottle
2. Transfer the oven dried soil sample to the specific gravity bottle (about 50gm when the 250ml volumetric flask is used, about 10-20gm when 50cc stoppered bottle is used or 100gm when 500ml pycnometer is used).
3. Weigh the bottle 'W₂' again with the soil
4. Add distilled water to fill the bottle to fill about three fourths
5. Remove the entrapped air either by subjecting the contents to a partial vacuum or by boiling gently in a sand-bath till the air bubbles cease to appear while occasionally rolling the bottle to assist in removal of air
6. Then cool to room temperature and fill the bottle with distilled water up to the mark and clean and dry the outside surface with a clean, dry cloth and note down the temperature.
7. Determine the weight of the bottle with water and soil, 'W₃'
8. Then remove the soil and water from the bottle and clean it
9. Again weigh 'W₄' after filling with distilled water up to the mark and drying outside
10. From data obtained determine specific gravity of the soil.



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TABULATION AND RESULTS:

TEST No.	1	2	3
TEMPERATURE °C			
BOTTLE No.			
WEIGHT OF SP. GR. BOTTLE (W_1) (g)			
WEIGHT OF SP. GR. BOTTLE + SOIL (W_2) (g)			
WEIGHT OF SP. GR. BOTTLE + SOIL + WATER (W_3) (g)			
WEIGHT OF SP. GR. BOTTLE + WATER (W_4) (g)			
SPECIFIC GRAVITY OF SOIL AT TEMPERATURE ____ °C $G'_s = \frac{(W_2 - W_1)}{(W_4 - W_1) - (W_3 - W_2)}$			
Temperature Correction, K_{27}			
SPECIFIC GRAVITY OF SOIL AT TEMPERATURE 27 °C $G_s = K_{27} \times G'_s$ (see K_{27} from Table I)			
AVERAGE			

The specific gravity of the given soil is = (No unit)

Determine the type of soil according to your interpretations from specific gravity of the soil



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Table-I: Correction Factor for Variation in Specific Gravity of water due to Temperature

Temperature °C	K ₂₇
15	1.0026
16	1.0024
17	1.0023
18	1.0021
19	1.0019
20	1.0017
21	1.0015
22	1.0013
23	1.0010
24	1.0008
25	1.0005
26	1.0003
27	1
28	0.9997
29	0.9994
30	0.9991
31	0.9988
32	0.9985
33	0.9982
34	0.9979
35	0.9975
36	0.9972
37	0.9968
38	0.9964
39	0.9961
40	0.9957