

## **6.SPECIFIC GRAVITY AND WATER ABSORPTION TEST.**

( IS : 2386 – PART – 3 )

### **INTRODUCTION:**

The specific gravity of an aggregate is considered to be a measure of strength or quality of the material. The specific gravity test helps in the identification of stone.

Water absorption gives an idea of strength of aggregate. Aggregates having more water absorption are more porous in nature and are generally considered unsuitable unless they are found to be acceptable based on strength, impact and hardness tests.

### **Object:**

To determine the specific gravity and water absorption of aggregates by perforated basket.

### **Apparatus:**

- a) A wire basket of not more than 6.3mm mesh or a perforated container of convenient size with thin wire hangers for suspending it from the balance.
- b) A thermostatically controlled oven to maintain temperature of 100<sup>0</sup> to 110<sup>0</sup>C.
- c) A container for filling water and suspending the basket.
- d) An airtight container of capacity similar to that of the basket.
- e) A balance of capacity about 5 kg, to weigh accurate to 0.5 g, and of such a type and shape as to permit weighing of the sample container when suspended in water.
- f) A shallow tray and two dry absorbent clothes, each not less than 750 X 450 mm.

### **Procedure:**

About 2 kg of the aggregate sample is washed thoroughly to remove fines, drained and then placed in the wire basket and immersed in distilled water at a temperature between 22<sup>0</sup> to 32<sup>0</sup>C with a cover of at least 50mm of water above the top of the basket. Immediately after immersion the entrapped air is removed from the sample by lifting the basket containing it 25mm above the base of the tank and allowing it to drop 25 times at the rate of about one drop per second. The basket and the aggregate should remain completely immersed in water for a period of 24 +/- 0.5 hours afterwards.

The basket and the sample are then weighed while suspended in water at a temperature of 22<sup>0</sup> to 32<sup>0</sup>C. In case it is necessary to transfer the basket and the sample to a different tank for weighing, they should be jolted 25 times as described above in the new tank to remove air before weighing. This weight is noted while suspended in water W1 g. The basket and the aggregate are then removed from water and allowed to drain for a few minutes, after which the aggregates are transferred to one of the dry absorbent clothes. The empty basket is then returned to the tank of water, jolted 25 times and weight in water W2 g.

The aggregates placed on the absorbent clothes are surface dried till no further moisture could be removed by this cloth. Then the aggregates are transferred to the second dry cloth spread in a single layer, covered and allowed to dry for at least 10 minutes until the aggregates are completely surface dry. 10 to 60 minutes drying may be needed. The aggregates should not be exposed to the atmosphere, direct sunlight or any other source of heat while surface drying. A gentle current of unheated air may be used during the first ten minutes to accelerate the drying of aggregate surface. The surface dried aggregate is then weighed W3 g. The aggregate is placed in a shallow tray and kept in an oven maintained at a temperature of 110°C for 24 hours. It is then removed from the oven, cooled in an airtight container and weighed W4 g. At least two tests should be carried out, but not concurrently.

**Calculations:**

Weight of saturated aggregate suspended in water with the basket = W1 g  
 Weight of basket suspended in water = W2 g  
 Weight of saturated aggregate in water = (W1-W2) = Ws g.  
 Weight of saturated surface dry aggregate in air = W4 g  
 Weight of water equal to the volume of the aggregate = (W3-Ws) g

$$\begin{aligned} \text{(i) Specific gravity} &= \frac{\text{Dry weight of aggregate}}{\text{Weight of equal volume of water}} \\ &= \frac{W4}{W3 - Ws} = \frac{W4}{W3 - (W1 - W2)} \end{aligned}$$

$$\begin{aligned} \text{(ii) Apparent Sp.gr.} &= \frac{\text{Dry weight of aggregate}}{\text{(Weight of equal volume of water excluding air voids in aggregates)}} \\ &= \frac{W4}{W4 - Ws} = \frac{W4}{W4 - (W1 - W2)} \end{aligned}$$

$$\begin{aligned} \text{(iii) Water absorption} &= \text{percent by weight of water absorbed in terms oven dried weight} \\ &\text{of aggregates.} \\ &= \frac{(W3 - W4) 100}{W4} \end{aligned}$$

**Limits:** The specific gravity of aggregates ranges from 2.5 to 3.0  
 The water absorption of aggregates ranges from 0.1 to 2.0 %.

**TEST : SPECIFIC GRAVITY OF COARSE AGGREGATES  
( IS : 2386 - PART 3 )**

Lab Ref.No : \_\_\_\_\_

Type of Material : \_\_\_\_\_

Date of Sample : \_\_\_\_\_

Source Km. : \_\_\_\_\_

Date of Tested : \_\_\_\_\_

S.NO	DESCRIPTION	TEST NUMBER			MEAN VALUE
		1	2	3	
1	Weight of Saturated Aggregate and Basket in Water. W1 ( gms )				
2	Weight of Basket in Water. W2 ( gms )				
3	Weight of Saturated Surface Dry Aggregates in Air. W3 ( gms )				
4	Weight of Oven Dried Aggregates in Air.W4 ( gms )				
5	Specific Gravity = $W4 / [W3 - ( W1 - W2 )]$				
6	Apparent Specific Gravity = $W4 / [W4 - (W1 - W2)]$				
7	Water Absorption = $( W3 - W4 ) X 100 / W4$				

Remarks : \_\_\_\_\_

Tested by : \_\_\_\_\_  
for Contractor

Checked by : \_\_\_\_\_  
for Contractor

\_\_\_\_\_ for Engineer