

## DEVAL ATTRITION TEST ON AGGREGATE

**1. Objective:** Attrition test is carried out to test the hardness property of aggregates and to decide whether they are suitable as railway Track Ballast. The principle of Deval Attrition test is to find the percentage wear due to relative rubbing action between the aggregate and steel balls used as abrasive charge with or without the presence of surface water.

### **2. Apparatus Required:**

**1: Balance:** Balance should be able to measure upto 1 g

**2: Sieves:** Sieves required are 50, 40, 25, 20, 12.5, 10 mm (as per Grading requirement) and 1.7 mm

### **3. Deval Attrition Testing Machine:**



The Deval abrasion testing machine shall consist of one or more hollow cast iron cylinders closed at one end and furnished with a tightly fitting iron cover at the other. The inside diameter of the cylinders shall be 20 cm and depth 34 cm. The cylinders shall be mounted on a shaft at an angle of 30 degrees with the axis of rotation of the shaft.

**Fig. 1: Deval Attrition Testing machine**

**3. Reference:** IS 2386(Part 4):1963 Methods of Test for Aggregates for Concrete-Mechanical Properties. Reaffirmed- Dec 2002

### **4. Procedure:**

1. The test sample consists of clean aggregates dried in oven at 105° – 110°C. The sample should conform to any of the gradings shown in Table 1.

Grading	Passing IS Sieve (mm)	Retained on IS sieve (mm)	Percentage of Sample
A	20	12.5	25
	25	20	25
	40	25	25
	50	40	25
B	20	12.5	25
	25	20	25
	40	25	50
C	20	12.5	50
	25	20	50
D	12.5	4.75	50
	20	12.5	50
E	10	4.75	50
	12.5	10	50

**Table 1: Gradation of Aggregate (A to E)**

2. Select the grading to be used in the test such that it conforms to the grading to be used in construction, to the maximum extent possible.
3. The weight of the test sample shall depend upon its average specific gravity and shall be as follows:

Range in Specific Gravity	Weight of sample (g)
Over 2.8	5500
2.4 to 2.8	5000
2.2 to 2.39	4500
Less than 2.2	4000

**Table 2: Weight of Sample to be taken based on Specific Gravity**

4. Rotate the machine at a speed of 30 – 33 revolutions per minute. The number of rotations is 10000. The machine should be balanced and driven such that there is uniform peripheral speed.
5. The machine is stopped after the desired number of revolutions and material is discharged to a tray.
6. The entire stone dust is sieved on 1.70 mm IS sieve.
7. The material coarser than 1.7mm size is weighed correct to one gram.

## **5. Calculation:**

1. Original weight of aggregate sample (W1) =
2. Weight of aggregate sample retained (W2) =
3. Weight passing 1.7mm IS sieve (W1 - W2) =
4. Attrition value =  $(W1-W2)*100/W1 =$