## TESTS ON AGGREGATES

Abrasion test

- The principle of Los Angeles abrasion test is to find the percentage wear due to relative rubbing action between the aggregate and steel balls used as abrasive charge.
- Los Angeles machine consists of circular drum of internal diameter 700 mm and length 520 mm mounted on horizontal axis enabling it to be rotated.
- An abrasive charge consisting of cast iron spherical balls of 48 mm diameters and weight 340-445 g is placed in the cylinder along with the aggregates.
- The number of the abrasive spheres varies according to the grading of the sample.
- The quantity of aggregates to be used depends upon the gradation and usually ranges from 5-10 kg.
- The cylinder is then locked and rotated at the speed of 30-33 rpm for a total of 500 -1000 revolutions depending upon the gradation of aggregates.
- After specified revolutions, the material is sieved through 1.7 mm sieve and passed fraction is expressed as percentage total weight of the sample.
- This value is called Los Angeles abrasion value. A maximum value of 40 percent is allowed for WBM base course in Indian conditions. For bituminous concrete, a maximum value of 35 is specified.
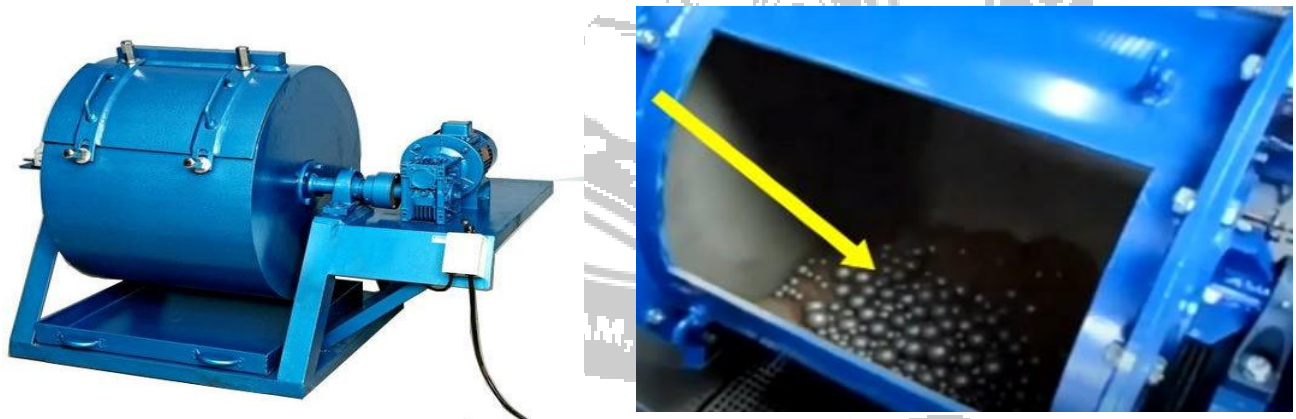
Impact Test

- The aggregate impact test is carried out to evaluate the resistance to impact of aggregates.
- Aggregates passing12.5 mm sieve and retained on 10 mm sieve is filled in a cylindrical steel cup of internal dia 10.2 mm and depth5 cm which is attached to a metal base of impact testing machine.
- The material is filled in 3 layers where each layer is tamped for 25 number of blows. Metal hammer of weight 13.5 to 14 Kg is arranged to drop with a Free fall of 38.0 cm by vertical guides and the test specimen is subjected to 15 number of blows.
- The crushed aggregate is allowed to pass through 2.36 mm IS sieve.

$$\text{Aggregate impact value} = \frac{W_1}{W_2} \times 100$$
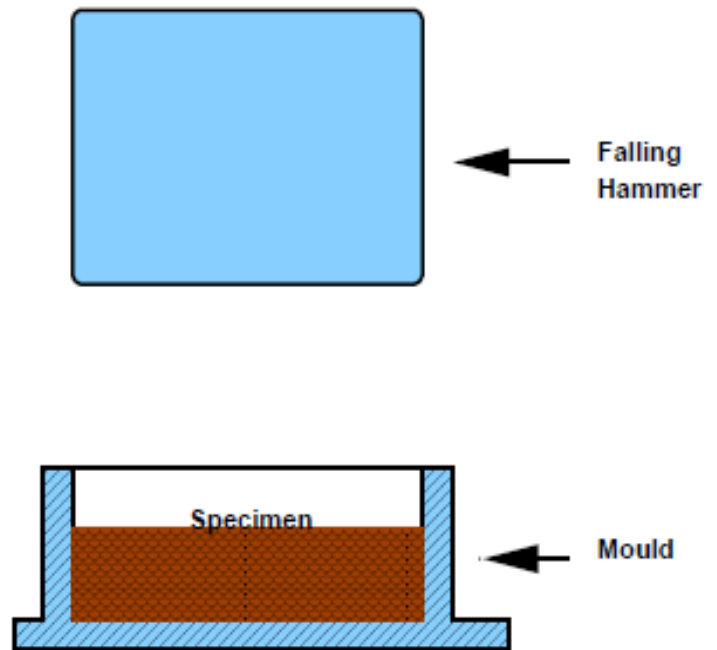
- And the impact value is measured as percentage of aggregates passing sieve (W2) to the total weight of the sample (W1).
- Aggregates to be used for wearing course, the impact value shouldn't exceed 30 percent.
- For bituminous macadam the maximum permissible value is 35 percent. For Water bound macadam base courses the maximum permissible value defined by IRC is 40 percent

SHAPE TEST

- The particle shape of the aggregate mass is determined by the percentage of flaky and elongated particles in it.
- Aggregates which are flaky or elongated are detrimental to higher workability and stability of mixes.
- The flakiness index is defined as the percentage by weight of aggregate particles whose least dimension is less than 0.6 times their mean size.
- For determining the flakiness index of aggregate. It consists of a panel having accurately cut slots of different standard lengths and width.
- Particle is elongated when its length (longest dimension) is more than 1.8 of the midsize of the sieve fraction.
- Aggregate to be classified is separated into seven sieve fractions from 63 to 6.3mm, and each fraction is examined separately.
- Six labeled openings between pairs of metal pins measure particle from each of the six sieve cuts below 50mm.
- The mass of all elongated particles (failing to pass between pins) as percent of the sample is the elongation index. Meets BS 812.
- The elongation index of an aggregate is defined as the percentage by weight of particles whose greatest dimension (length) is 1.8 times their mean dimension. This test is applicable to aggregates larger than 6.3 mm.
- Discard all aggregate retained on the 50.0 mm BS test sieve and all aggregate passing the 6.30 mm BS test sieves

- Select the length gauge appropriate to the size-fraction under test and gauge each particle separately by hand. Elongated particles are those whose greatest dimension prevents them from passing through the gauge

- From the sum of masses of the fractions in the trays(M1), calculate the individual percentages retained on each of the various sieves. Discard any fraction whose mass is 5% or less of mass M1 . Record the mass remaining (M2)
- Gauge each fraction as follows. Select the length gauge appropriate to the size-fraction under test and gauge each particle separately by hand.
- Elongated particles are those whose greatest dimension prevents them from passing through the gauge.
- Combine and weigh all Elongated particles (M3).

$$\text{Elongation index} = \frac{M3}{M2} \; X \; 100$$

Water Absorption Test

- Water absorption is the difference between the apparent and bulk specific gravities or water permeable voids of the aggregates.
- We can measure the volume of such voids by weighing the aggregates dry and in a saturated, surface dry condition, with all permeable voids filled with water.
- The difference of the above two is MW. MW is the weight of dry aggregates minus weight of aggregates saturated surface dry condition.

$$\text{water absorption} = \frac{M_W}{M_D} \times 100$$

- Water absorption values ranges from 0.1 to about 2.0 percent for aggregates normally used in road surfacing.