PROPERTIES OF AGGREGATES

The desirable properties of aggregates are: Strength the aggregates used in top layers are subjected to

- Stress action due to traffic wheel load,
- Wear and tear,
- Crushing.

For a high-quality pavement, the aggregates should posses' high resistance to crushing, and to withstand the stresses due to traffic wheel load.

Hardness: The aggregates used in the surface course are subjected to constant rubbing or abrasion due to moving traffic. The aggregates should be hard enough to resist the abrasive action caused by the movements of traffic. The abrasive action is severe when steel tyred vehicles move over the aggregates exposed at the top surface.

Toughness: Resistance of the aggregates to impact is termed as toughness. Aggregates used in the pavement should be able to resist the effect caused by the jumping of the steel tyred wheels from one particle to another at different levels cause severe impact on the aggregates.

Shape of aggregates: Aggregates which happen to fall in a particular size range may have rounded cubical, angular, flaky or elongated particles. It is evident that the flaky and elongated particles will have less strength and durability when compared with cubical, angular or rounded particles of the same aggregate. Hence too flaky and too much elongated aggregates should be avoided as far as possible.

Adhesion with bitumen: The aggregates used in bituminous pavements should have less affinity with water when compared with bituminous material otherwise the bituminous coating on the aggregate will be stripped off in presence of water.

Durability: The property of aggregates to withstand adverse action of weather is called soundness. The aggregates are subjected to the physical and chemical action of rain and bottom water, impurities there-in and that of atmosphere, hence it is desirable that the road aggregates used in the construction should be sound enough to withstand the

weathering action. Specifications for aggregates used in bituminous mixes usually require the aggregates to be clean, tough and durable in nature and free from excess amount of flat or elongated pieces, dust, clay balls and other objectionable material. Similarly aggregates used in Portland cement concrete mixes must be clean and free from deleterious substances.

CRUSHING VALUE TEST: These measures the resistance the test sample offers to crush under a gradually applied crushing load Apparatus required. The apparatus for the standard aggregate crushing test as per IS 2386 – 1963 (part IV) consists of the following.

- The test mould of 15.2 cm diameter opens ended steel cylinder with square base plate plunger having a piston of diameter 15 cm, with a hole provided across the stem of the plunger so that a rod could be inserted for lifting or placing the plunger in the cylinder.
- A straight metal tamping rod of circular cross section 16 cm in diameter and 45 to 60 cm long, rounded at one end.
- A balance of capacity 5kg readable and accurate up to 1 gm.
- IS sieves of sizes 12.5mm, 10mm and 2.36 mm
- A compression testing machine capable of applying load up to 40 tons at a uniform rate of 4 tons per minute.
- A cylindrical measure having internal diameter of 11.5 cm and height 18 cm.

FIG. 10 AGGREGATE CRUSHING VALUE TEST APPARATUS JAR

Procedure:

The material is sieved through 12.5mm and 10mm IS sieves. The aggregates passing through 12.5mm sieves and retained on 10mm sieve comprises the test material.

- About 3.25kg of this material is taken.
- The aggregates are poured to fill about just one third depth of measuring cylinder.
- The material is compacted by giving 25 gentle blows with the rounded end of the taming rod.
- Two more layers are added in similar manner, so that cylinder is full.
- The excess material is removed with a straight edge. The quantity contained in the measuring cylinder is that amount of aggregates with will be used to prepare the test specimen.
- The weight of the aggregates is taken after emptying the cylinder to an accuracy of 1gm.
- The whole of this weighed quantity is transferred to the test mould by filling in the three layers in the same manner as for cylindrical measure. The total depth of the sample is then about 10 cms and the surface a little below the top of mould.
- The surface is levelled and the plunger is placed over it so that it rests horizontally on the surface of the aggregates.

- This assembly is placed on the pedestal of compression testing machine and apply load up to 40 tones.
- The load is applied at a uniform rate of 4 tons per minute until the total applied load is 40 tones.
- The load is released. The aggregates are taken out of cylinder and sieve them through 2.36mm IS sieve. This fraction passing through is weighed it to an accuracy of 0.1 gm. This fraction is a measure of loss of material due to crushing.
- The observations are noted down and the aggregates crushing value is computed. The mean of two observations, rounded to nearest whole number is reported as the Aggregate crushing Value.

TABLE 9 AGGREGATE CRUSHING VALUE TEST

Observations	Sample I	Sample II
Total weight of dry sample taken (W_1 gm)		
Weight of portion passing 2.36mm Sieve (W_2 gm)		
Aggregate Crushing Value (%) =(W_2/W_1)X 100		