

AGGREGATES:

Construction aggregate, or simply aggregate, is a broad category of coarse- to medium-grained particulate material used in construction, including sand, gravel, crushed stone, slag, recycled concrete and geosynthetic aggregates.



Aggregates are inert granular materials such as sand, gravel, or crushed stone that, along with water and Portland cement, are an essential ingredient in concrete.

Aggregate, in building and construction, material used for mixing with cement, bitumen, lime, gypsum, or other adhesive to form concrete or mortar. The aggregate gives volume, stability, resistance to wear or erosion, and other desired physical properties to the finished product.

TYPES OF AGGREGATES

On the basis of Source-

▶ Natural Aggregates:

The aggregates are obtained from various three kinds of rocks.

- Aggregates from igneous rocks- Ex. Basalt, Dolerite, Andesite, Granite
- Aggregates from metamorphic rocks. Ex. Schists, Gneisses and Quartzites
- Aggregates from sedimentary rocks. Ex. Limestone, Sandstone

▶ Artificial Aggregates- Broken bricks, Air-cooled slag, Blast furnace slag, Recycled concrete

On the basis of Size-

- Fine Aggregates- Aggregates whose size smaller than 4.75mm
- Coarse Aggregates- Aggregates whose size bigger than 4.75mm

TYPES OF AGGREGATES

On the basis of Shape-

- Flakey- Aggregates that are thin in comparison to length and width
- Elongated- Aggregates that are longer than they are thick or wide
- Angular-The angular aggregates consist well defined edges formed at the intersection of roughly planar surfaces and these are obtained by crushing the rocks.
- Rounded- The rounded aggregates are completely shaped by attrition and available in the form of seashore gravel

On the basis of Texture-

- Smooth- rounded aggregates like Gravels.
- Rough- Possessing well defined edges

On the basis of Weight of aggregates-

- Light weight aggregates- Ex. Shale, Slate, Pumice, Sintered Fly-ash, Broken brick
- Medium weight aggregates- Ex. Sand, Gravel, Crushed stone
- Heavy weight aggregates- Ex. Barite, Limonite, Steel shots, Hematite, Magnetite

PROPERTIES OF AGGREGATES:

- ▶ It Should be hard and tough
- ▶ It should have high Strength
- ▶ It should have high impact value
- ▶ It should have low crushing value
- ▶ It should have high resistance against wear and tear
- ▶ It should have high durability against environmental conditions
- ▶ It should not absorb more water.
- ▶ Aggregate should have high specific gravity which means it has good quality
- ▶ Aggregates should not contain any harmful material in such a quantity so as to affect the strength and durability of the concrete. Such harmful materials are called deleterious materials.

TESTS OF AGGREGATES:

1. Crushing Value Test

▶ This test gives a relative measure of the resistance of an aggregate to crushing under a gradually applied compressive load.

▶ The aggregate crushing value should not be more than 45% for aggregate used for concrete other than for wearing surfaces, and 30% for concrete used for wearing surfaces such as runways, roads and pavements.



TESTS OF AGGREGATES:

2. Impact Value Test

- ▶ This test gives relative measure of the resistance of an aggregate to sudden shock or impact, which may differ from its resistance to gradually applied compressive load.
- ▶ The aggregate impact value should not be more than 45% by weight for aggregates used for concrete other than wearing surfaces and 30% by weight for concrete to be used as wearing surfaces, such as runways, roads and pavements.



TESTS OF AGGREGATES:

3. Flakiness and Elongation Test

The test is not applicable to sizes smaller than 6.3 mm.

▶ Flakiness Test

Flakiness Index is the percentage by weight of particles in it, whose least dimension (i.e. thickness) is less than three-fifths of its mean dimension.

▶ Elongation Test

Elongation Index is the percentage by weight of particles in it, whose largest dimension (i.e. length) is greater than one and four-fifths times its mean dimension.





Elongation Test



Flakiness Test

TESTS OF AGGREGATES:

4. Abrasion Value Test

▶ Los Angles Abrasion Test

- Abrasion Test is the measure of aggregate toughness and abrasion resistance such as crushing, degradation and disintegration.
- 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.
- The percentage of wear should not be more than 16 percent for concrete aggregates.



TESTS OF AGGREGATES:

5. Water Absorption Test

- ▶ This test helps to determine the water absorption of coarse aggregates as per IS: 2386 (Part III) – 1963.
- ▶ Water absorption gives an idea on the internal structure of aggregate. Aggregates having more absorption are more porous in nature and are generally considered unsuitable, unless found to be acceptable based on strength, impact and hardness tests.
- ▶ Water absorption shall not be more than 0.5-1% per unit by weight.