SAND

- Sand is used as fine aggregate in the preparation of cement or lime mortars.
- Increases volume of mortar
- It consists of small angular rounded grains of silica(SiO_2) and is formed by the decomposition of sand   stone under the effect of weathering agencies.
- Based on the source of the sand, it can be two types;
  1. Natural
     - Pit sand
     - River sand
     - Sea sand
  2. Artificial

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SAND

Pit sand
- Obtained from pit dug at a depth of 1.5m to 1.2m in soil.
- Particles are sharp, angular, porous
- free from harmful salts.
- Excellent for making mortar and concrete.

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SAND

River sand
- Obtained from river beds and river banks.
- Bright, clear and has sharp and rounded particles.
- Best sand for making cement mortar.
- Has low interlocking value because of rounded corners.
- Suitable for plastering works.
- It is usually available in clean condition; it is widely used for all purposes.

3

SAND

Sea sand
- Sands available in sea shore.
- Brown in colour & consist of round particle.
- It contains objectionable salts.
- Not recommended for construction.
- Salt present in this sand absorb moisture from atmosphere and causes dampness in the structure.

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1

SAND

Artificial sand

- It is essentially manufactured or engineered sand, taking rock of the properly prescribed mineral content, crushing it, sorting the particles to separate out the necessary sizes for its intended use.
- artificial sand is widely used in highway construction, concrete making, and relevant construction fields.
- Due to the gradual shortage of natural sand resources and the booming construction industry, machine-made artificial sands become even more popular in the market.
- Various types of rocks can be processed into sand including granite, natural river pebbles, basalt, limestone and so on.

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SAND

Artificial Sand   Natural Sand

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Qualities of Good Sand

- It should be clean and free from coatings of clay and silt.
- It should be free from hygroscopic salts.
- It should have coarse, angular, hard and sharp grains.
- It should not contain organic matter.
- It should be strong and durable.
- It should be chemically inert.
- It should be well graded. Should contain particles of different sizes in suitable proportions
- Should pass through 2mm IS sieve ad retained on 90 micron IS sieve

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Classification based on size

- Fine sand   – 0.075mm – 0.425mm
- Medium sand   – 0.425mm – 2mm
- Coarse sand   - 2mm – 4.75mm

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Fineness Modulus

- Fineness modulus is determined by **Sieve Analysis**.
- Sum of cumulative percentage of residue retained on each of IS sieve (80mm to 150micron) divided by 100 is known as **fineness modulus**.
- Higher the fineness modulus, coarser will be the particle & vice versa.
- Test is carried out by continuously sieving an aggregate sample through a set of sieves (80mm to 150micron).
- Weight retained in each sieve after sieving is noted.
- Then, find the % of weight retained in each sieve.
- After that, find the cumulative % of weight retained in each sieve.
- Fineness modulus = Sum of cumulative % of weight retained/100

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Sieve Analysis

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Sieve Analysis

Table 4.1 Calculation of fineness modulus

I.S Sieve	Weight retained gm	% of weight retained	Cumulative % of weight retained
80 mm	-		
40 mm	-		
20 mm	-		
10 mm	-		
4.75 mm	30	3.0	3.0
2.36 mm	80	8.0	11.0
1.18 mm	100	10.0	21.0
600 micron	125	12.5	33.5
300 micron	200	20.0	53.5
150 micron	385	38.5	92
PAN	80	8.0	100
TOTAL	1000	100	314

Fineness Modulus = 314/100 = 3.14

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Classification based on fineness modulus

Type of sand	Fineness modulus
Fine	2.2 to 2.6
Medium	2.6 to 2.9
Coarse	2.9 to 3.2

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Field test on sand

- Some qnty of sand is placed in a glass of water, is shaken and allowed to settle. If clay is present, a distinct layer is formed on top of water

- Sodium hydroxide and caustic soda is added to sand and is stirred. Colour change to brown indicates the presence of organic matter

- When sand is rubbed against the fingers, and the fingers are stained, it indicates the presence of earthy matter

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Sieve Analysis

Well Graded aggregate
- Aggregate contain all sizes varying from 80 mm to 150μm.
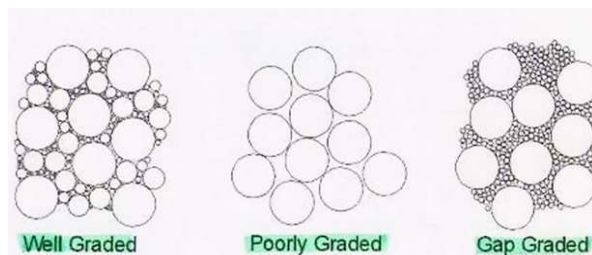
Uniformly graded aggregate
- It contains only aggregates of single size.

Gap Graded aggregate
- Some sizes are missing.

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Sieve Analysis

Well Graded   Poorly Graded   Gap Graded

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