

2/12/14

FINISHINGS

FORM WORKS / MOULDS

- used as support during construction at various stages.
- They should fix (easily) in such away to place easily and to use them again and again.
- They should be strong & durable to carry the weight of wet Concrete and they can withstand the vibration during settlement of Concrete.
- They should be leak proof.
- While placing them they should be coated with oil which makes easy while removing them after the settlement of Concrete slab.
- They should be fixed in such away less hammering will be enough during fixing & removing.
- They should be designed in many commercial size.
- They can be designed for stairs, slab, columns and walls, beams.

SCAFFOLDINGS

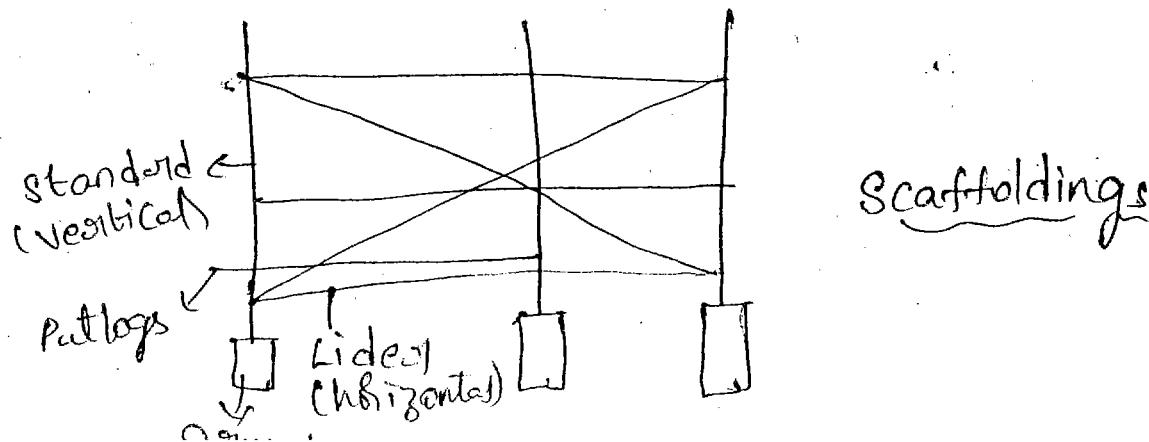
When the height of wall or column of any other structural member of building exceeds about 1.5m. temporary structures are needed to support platform over which workman can sit & carry on the construction. These kind of structures are used to construct

- Very close to walls. In the form of wood, steel frame work which is called as Scaffolding.
- Also useful while repairing and even demolishing of the building.
 - These scaffoldings should be stable & strong enough to support workman and also for construction materials.
 - The height of scaffoldings will be increased along with the ^{height of} construction of wall increases.

Types of Scaffoldings:- Different types. They are as follows.

① single scaffolding:-

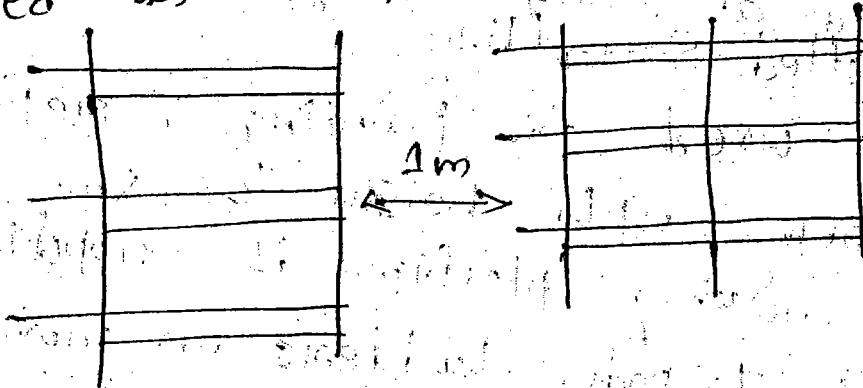
- Consists of single frame of standards, ~~fitzgers~~ putlogs etc.
- ~~standards~~, parallel to the wall at a distance of about 1.20m
- Standards are placed at 2 to 2.5m interval
- Ladders connected the standards and are provided at a vertical interval of 1.2 - 1.5m
- and putlogs are placed with one end on the ladders and other end in the hole lefting the wall.



→ The distance will be b/w Putlog will be 1.2m.

② Double Scaffolding:-

- In stone masonry it is very difficult to provide holes in the wall to support putlogs. In that case a more strong scaffolding is used which consists of 2 rows of scaffolding. Each row from a separate vertical framework. The 1st row is placed at 20-30 cm away from the wall while the other frame work is placed at the distance b/w 2 rows frame works is at 1m. Putlogs are supported on both the frames. Rakers & Cross braces are provided to make the scaffolding more strong & stable. Also called as independent scaffolding.



③ Cantilever & needle scaffolding:-

- used under the following circumstances:-
→ when the ground is weak to support standards.
→ when the construction of upper part of wall to be carried out.
→ It is reqd. to keep the ground near the wall free for traffic etc.
→ These may be single type or double type.

- In the previous model standards are supported on a series of needles ~~set~~ through the openings/holes in the wall.
- In 2nd model the needles are projecting beams are situated into the floors through the openings.

④ Suspended Scaffolding:-

- slight weight scaffolding used for such as pointing, painting ~~from roof with support of rope & suspended from roof with support of rope &~~
- working platform is provided by means of suspended from roof with support of rope & chair. The height of platform can be raised or lowered at any designed levels.

⑤ Stretchered Scaffolding:-

- It is used for painting & repairworks inside the rooms upto height of 5m.

→ The working platform is supported on the top of tripods, ladders on movable wheels

⑥ Steel Scaffolding:-

- It is practically similar to timber scaffolding except that timber members are replaced by steel tubes and rope lashing are

by steel couples & fittings.

- These scaffoldings can be erected & dismantled easily.

→ It has greater strength, durability & high on fire resistance.

→ the cost of insurance is more.
→ But it is constis extensively used in these days both for brick & stone walls.

⑤ Patented scaffoldings:-

→ Made up of steel & are available in the market & are equipped with special frames etc.
→ working platform is supported on blankets which can be adjusted on suitable heights.

Summary:-

Damp proofing and water proofing materials, and uses — plastering, Pointing, white washing and distempering —
Paints: Constituents of paint — Types of Paints —
Painting of new / old wood — Varnish
Form works and scaffoldings.

AGGREGATES

Classification of aggregates based on size-

These are classified in 2 diff categories.

- They are ① Coarse aggregate | ④ Graded aggregate
 ② Fine aggregate |
 ③ All-in aggregate

① Coarse aggregate :-

When the size of aggregate is above 4.75 mm & are called coarse aggregate.

Aggregates:- These are the materials derived from Sedimentary, igneous, metamorphic rocks which will be used as fillers with binding material during the production of masonry & concrete.]

Cont:- else the materials which are retained on

4.75 mm sieve is called Coarse aggregate.

→ The max size used in concrete is 80mm

→ Size of aggregates depends on thickness

of section, spacing of reinforcement,

cleaning, mixing, handling & placing methods.

→ Generally Coarse aggregates are derived

from the given beds, pits etc.

→ Due to this washing & cleaning is required

before they are used. & for economy the

size should be as large as possible

but not more than $\frac{1}{4}$ " of min thickness of members.

Structure

→ In reinforced sections, the max size is at least 5mm less than the clear spacing b/w the reinforcement & also at least 5mm less than the clear cover.

→ Aggregate mde than 20mm size is portable for reinforcement Cement Concrete structural members.

② Fine aggregate:-

→ when the size of aggregate is less than 4.75mm else the material which passed through 4.75mm sieve called as fine aggregate.

→ Generally they are derived from river beds or natural sand, crushed stone sand - obtained by crushing stones and crushed gravel sand.

→ The smallest fine particle size is 0.06 mm

→ Depending upon the particle size they are divided as fine, medium, coarse sands.

→ On the basis of particle size distribution fine aggregates are divided into 4 grading zones being progressively finer from 1 grading zone 1 to 4 grading zone 4.

③ All In aggregates:-

All naturally available aggregates which are in the fractions of fine & coarse sizes, are known as All In aggregates.

→ The deficiency of any particular fraction can be corrected while preparing mix will be fulfilled by these aggregates.

→ But they are not recommandable to quality concrete.

④ Graded aggregates:-

→ In a mixture of various sizes of aggregates the aggregate which passes through a particular size sieve are known as graded aggregates.

Classification based on shape:- ⑤ Cubical:- workability & stability of concrete increases.

Classified as follows:-
① Angular:- they possess well defined edges found at the intersection of roughly planed places.

Ex:- All types of crushed stocks.

② Flaky:- Not suggestable for construction.

→ Usually angular of which the thickness is very small compared to width & length.

Ex:- Laminated stock.

③ Elongated:- Not suggestable for construction.

→ usually angular & length is very large as compared to other 2 dimensions.

Ex:- Laminated stocks.

④ Irregular:-

They are naturally irregular shaped by attrision & having rounded edges.

Ex:- Pit sand & gravel.

③ rounded - they are fully water worn & shaped by attrition.

Ex:- River & seashore gravel.

Classification based on unit weight:- Based on unit weight aggregates.

① Normal weight aggregates - Traditional concrete

② Heavy weight aggregates

③ Light weight aggregates

④ weight & Specific gravity.

① Normal weight aggregates:- Artificial. Natural

→ Specific gravity $\rightarrow 2.5 - 2.7$

→ Unit weight (KN/m^3) $\rightarrow 23 - 26$.

→ Bulk density (kg/m^3) $\rightarrow 1520 - 1680$.

Ex:- Lime, stone, sand stone, granite, gravel, sand.

② Heavy weight aggregate:-

→ Specific gravity $\rightarrow 2.8 - 2.9$

→ Unit weight (KN/m^3) $\rightarrow 25 - 29$

→ Bulk density (kg/m^3) - greater than 2080

Ex:- Barite, magnetite.

- ③ Light weight aggregates:
→ unit weight → 12 kN/m^3 .
→ Bulk density - less than 1120 kg/m^3 .

Ex:- Pumic, Dolomite, Cinder, Clay
Classification based on Surface texture-

① Glossy:-

→ The main characteristic feature is having concoidal (shell) shaped fracture.

Ex:- Black flint, Vitreous slag.

② Honey Combed:-

→ NO preferable.
They have visible pores and cavities.

Ex:- Clinker, Pumic, brick.

③ Crystalline:-

→ easily.
They consists of visible Crystalline Components.

Ex:- Granite.

④ Smooth:-

They are water washed & Smooth. Due to fracture of fine grained or laminated rock.

Ex:- Marble, gravel, slate.

⑤ Kong:- Consists easily visible crystalline Components of medium grained stocks / fine grained stocks. → Good ^{as const.} as the bonding is good.

Ex:- Basalt, limestone.

⑥ Granular:- They exhibits fractures of rounded grains which are more or less equivalent to each other.

Ex:- Sandstone.

Classification based on Geological Origin:- Based on geological origin they are classified as ① Natural aggregates ② Artificial aggregates.

Q12/14 ① Natural aggregates:- Prepare Notes.

② Artificial aggregates:- Broken bricks

Practical shape of aggregates & Texture:-

Glossy, Honey combed, Crystalline, smooth,

Rough.

Bond and strength of aggregates:-

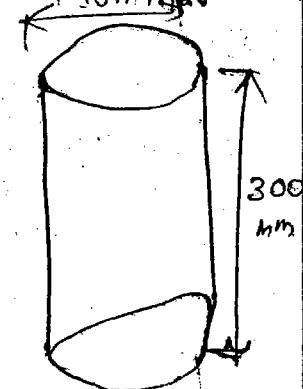
Strength of aggr → said based on strength of stocks & stones.

→ Rocks are collected in this cylinder from Quarry.

→ Tests are done on the UTM. (A) Compressive testing machine.

→ Load Carrying Capacity of stock specimen is obtained from test.

→ Max stress carried by stock, $\sigma = \frac{\text{Load}}{\text{Area}} = \frac{P}{\frac{\pi d^2}{4}}$

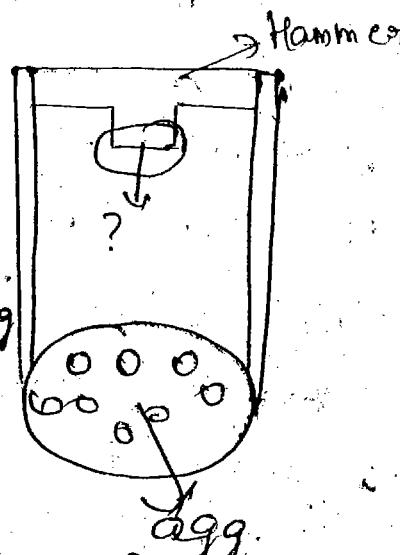


strength of → Compressive Strength
Rock Source → Impact "

Impact → Sudden loads.

Impact strength of aggregates:-

- Aggregates are placed on the plate weight - 13.5 to 14 kg.
- A hammer of dia 100 is fallen for 380±5 times - som long 2mm Chamfered at lower edge.
- Then the aggregates are powdered



- Then the powder is sieved on IS size sieve.
- If the powder is less than then IS size then it is suitable for construction.

Sieve Analysis:—

Coarse agg.	fine agg.	Coarse	aggregates
Dividing the given sample of aggregates			
based on their size.			

IS Sieve sizes:-

Sieve size:

80 mm

40 mm

20 mm

10 mm

4.75 mm

2.36 mm

mm
0.598 → 600 micron

300 micron

150 micron.

Sieve size	wt retained (kg)	% wt retained	% Passing	Cumulated wt passing retained (kg)	Cumulative % wt retained
80	0	0	100	0	0
40	0	0	100	0	0
20	0.8	10	90	0.5	10
10	3.0	60	40	3.5	70
4.75	1.3	26	74	4.8	96
2.36	0.1	2	98	4.9	98
1.18	0.05	1	99	4.95	99
600				5.00	100
300 M	0.05	1	99	5.00	100
300		0	100	5.00	100
150 M	0	0	100	5.00	100
Pan	0	0	100	5.00	100

F.M = Sum of Cumulate % of wt retained.

$$\begin{aligned}
 &= \frac{6.73}{100} \\
 &= 6.73
 \end{aligned}$$

∴ fine Modulus ; F.M = 6.73

Impact strength of coarse aggregates:-

The apparatus as per IS: 2386

- i) Testing machine 45 to 60 kg. having metal base with lower surface of not less than 30cm in dia. Supported by on a level and plane Concrete floor of minimum 45cm thickness. The machine should also have provisions for fixing its base.
- ii) Cylindrical steel cup of internal diameter 102mm, depth 50mm, thickness 6.3mm.
- Metal hammer weighing 13.5 - 14 kg & lower end being cylindrical in shape 50mm long 100mm in dia. with a 2mm Chamfer at the lower edge and case hard-end. The hammer should slide freely bet vertical guides and be concentric with the cup. Free fall of hammer should be within 380 ± 5 mm.
- A cylindrical metal measure having internal dia 75mm and depth 100mm for measuring aggregate.
- Tamping rod 10mm in dia and 830mm long, rounded at one end.
- A balance of capacity not less than 500g readable and accurate upto 0.1g.

1/12/14 Specific gravity of aggregates:-

For aggregates > 10mm:-

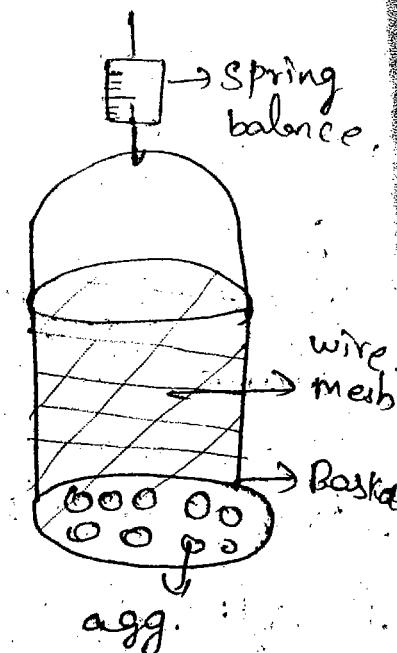
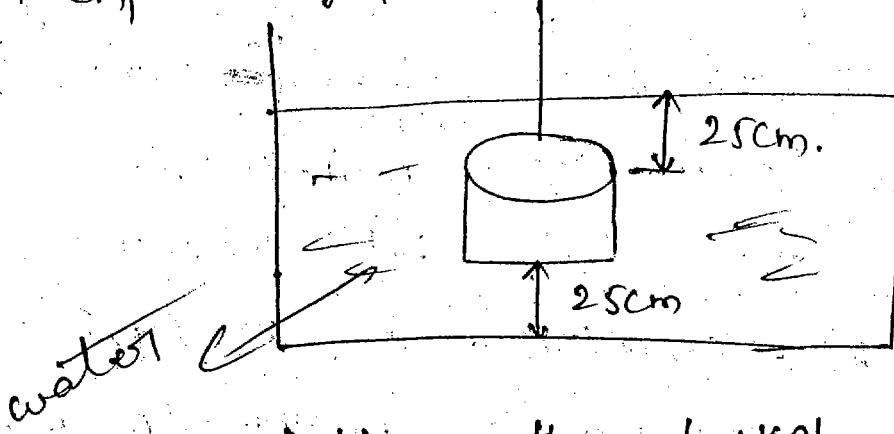
Sample of 2 kg. (air)

$A = \text{wt of aggregates only in water}$
in gm.

$$A = A_1 - A_2$$

$A_1 \rightarrow$ wt of agg + basket in water

$A_2 \rightarrow$ wt of agg basket alone dipped in water.
Sample surface is dried by lifting basket for some time
Then 1 Dipping & 1 Palling for 1 sec.



$B = \text{wt of agg in}$
surface dry.
(saturated
condition)

After dipping the basket along with agg

left for $\frac{24}{\text{some}}$ hrs. 110°C for 1 day.

$C = \text{wt of oven dried agg.}$

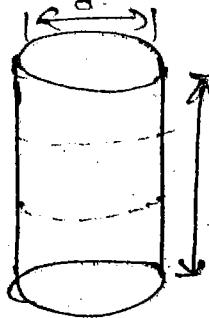
$$\text{Specific gravity} = \frac{\text{wt of agg}}{\text{wt of water}} = \frac{C}{B-A}$$

$$\text{Apparent S.G} = \frac{C}{C-A}$$

$$\% \text{ Moisture Content} = \frac{B-C}{C} \times 100$$

C → wt of dry agg.

Bulk density of coarse aggregate :- (kg/m³)



$$V = \frac{\pi}{4} d^2 \times l$$

$$\begin{aligned} 1 l &= 100 \text{ cm}^3 \\ &= 100 (10^{-2} \text{ m})^3 \\ &= 10^{-3} \text{ m}^3 \end{aligned}$$

d → inner diameter

In a layer, agg. are adjusted by tempering
and by 25 blows.

→ Again the agg. are adjusted likewise in 2nd...
layers.

A = wt of agg + cylinder.

B = wt of cylinder only.

$$\text{Bulk density, } \gamma = \frac{\text{wt of agg.}}{\text{Volume of cylinder}} = \frac{A - B}{V} \text{ kg/m}^3$$

Percentage of Voids:-

$$\% \text{ of Voids} = \left(\frac{G_s - \gamma}{G_s} \right) \times 100$$

G_s → Specific gravity.

γ → Bulk density.

Influence on fresh concrete:- water demand increases in proportion to amount of micro-silicon added to the mixture. The increase in water demand of concrete containing micro silica will be about 1% for every 1% of cement substituted.

Influence of hardened Concrete:-

The concrete containing microsilica produces outstanding characteristics with respect to strength.

Air Entrainers:- These are also one type of admixtures which enhance the properties of concrete like workability, durability.

Aggregates:-

Classification of aggregates:-

Based on shape:-

SNO	Classification	Description	Example
1	Rounded	Fully water born and completely shaped by attrition (rubbing few some particles)	Seashore or river gravel
2	Irregular	Naturally irregular shaped by attrition and having rounds at edges	Pit sand, ordinary gravells.
3	Angular	They form during the intersection of roughly planar faces.	Crushed rocks of all types.

4	Flaky	usually angular of which the thickness is very small compare to width and length	Laminated rocks.
5	Alongated	They are also angular and length is very small when compare with other 2D	Laminated rocks.

Based on Surface Texture:-

S.NO	Surface texture	Characteristics	Examples
1	Glossy	Concoidal surface / fracture	Black flint
2	Smooth	Smooth due to fracture of laminated & fine grade glock	Gravel, slate
3	Granular	Exhibits more/less rounded granule shape / grains	Sandstone
4	Rough	Rough fracture of fine/medium grade glocks having easily visible crystalline properties	Limestone

5 Crystalline Having easily visible crystal film Granite

6 Honey Combed Having visible pores and cavities Pumic stones

Based on unit weight:-

<u>S.No</u>	<u>Aggregate</u>	<u>Specific gravity</u>	<u>unit wt (kN/m³)</u>	<u>Bulk density (kg/m³)</u>
1	Normal wt	2.5 - 2.7	23 - 26	1520 - 1680
Eg:-	Lime stone, Sand, Gravel, granite			
2	Honey wt	2.8 - 2.9	25 - 29	72080
Eg:-	Magnetite			
3	Light wt	-	-	12
Eg:-	Pumic, Dolomite			

Based on Geological origin:-

1. Artificial

2. Natural.

Natural:- Which comes from beds of rivers, pits, seashores.

Artificial:- Which are extracted from quarries, Comes from broken bricks.

Based on Size:-

B.M.C Notice

Bond strength:- The thermal coefficient of cement, paste and agg are diff & they are highly influence the process of hydration.

Bulk density:- Influences based on packing, It depends on size, shape, bulking moisture content. If it is more, less the voids.

Porosity:- Less than 20%. If it is more the workability will be affected & concrete becomes permeable and ultimate affects the aggregate, cement and paste.

Resistance to freezing, abraction.

The pores on agg absorb more moisture resulting loss of workability.

Specific gravity-

It should be 2.6 - 2.7

The porosity & specific gravity influences the strength & absorption of concrete
→ specific gravity indicates quality of cement.

→ + low specific gravity may indicates high porosity, low strength, durability. The concrete density greatly depends on specific gravity.

Moisture Content:- The moisture content in agg influences properties like strength, water-absorption etc and it can be removed by adopting.

→ Drying by using ovens, oven pans, chemical strong sol like methylated dihydrite.

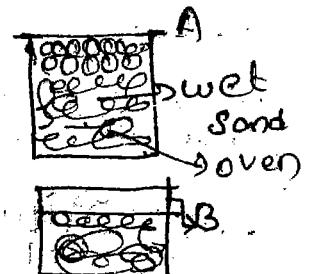
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Bulking of Sand:-

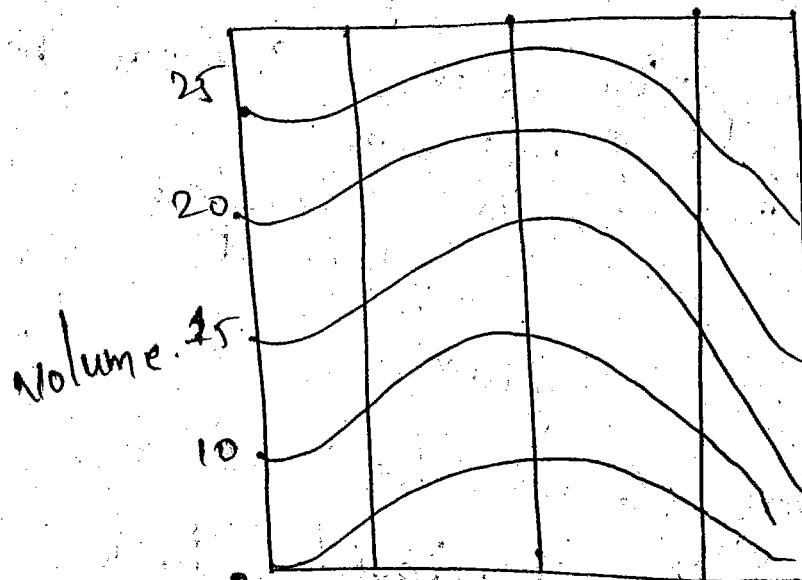
Bulk \rightarrow increasing its volume.

\rightarrow on adding water to sand, the sand absorbs the water and changes its volume. as the sand particles absorb water.

$$\text{Bulking on Sand} = \frac{A - B}{B} \times 100$$



Bulking of Sand is represented by graph given below.



Mix ratio.

1:2:4

Sand.

$B = 10\% \text{ then}$

$$B = \frac{10}{100} \times 2$$

Procedure:-

Sedimentary Substances of aggregate:-

Organic substances / matter

→ while the sand is dredging from rivers, dried rivers, certain amount of organic matter comes with the sand.

→ If we are dredging from bottom of flowing river, then organic matter flows through the river becomes washed out.

It is durable / portable.
The organic matter % is estimated as:-

→ The sand will be mixed with 3% of sodium hydroxide.

→ After 24 hrs then colour of sand is compared with standard dark colour. The

→ Then the % of organic matter in the sand is estimated.

Soundness of aggregates:-

↓
The efficiency characteristics.

To find out the soundness of agg

which is influenced by alternative heat and
rain & winter. So the agg are tested
for their soundness.

Procedure: The aggregates are taken in a
beaker and continuous heating and cooling
of aggregates is done ^{by adding sodium sulphate & magnesium sulphate} for number of
times. The aggregates may be effected by
these conditions. On continuous increase in
temperature and decrease in temperature
then those chemicals form bonds in the
poles. Then the weight of the aggregate
decreases. As the weight decreases
the strength of aggregates also decreases.
These chemicals form salty bonds in the
poles of aggregates. These salty bonds do not
allow the water into the poles. Thus
the stability decreases. The wt. of aggregates
after bonds forming is found. If it is less
than 10-12% of the total wt then they are
unfit for construction.

Alkali aggregate reactions:- 4 steps

① Reactivity of alkali agent:-
Already agg contains Alkali concentration.
This can be identified by using Petro-
graphic test.

~~All the~~
② High Concentration of Alkali in cement:-
This also influences the reactivity of

aggregate reaction in Cement

→ The permissible level of alkali in cement is 0.6% and is observed by many field & laboratory tests.

③ Moisture Content of Mix / cement:-

Because of H_2O the agg. alkali rapidly increases which leads to deleterious consequences (change in strength, durability, -) of mix.

④ Temperature:-

The rate of alkali-agg. reaction is highly influenced bw 10-138°C. If temp. $< 10^\circ C$ and $> 138^\circ C$ then thickness increases and decreases.

Mechanism of alkali-aggregate Reaction:-

Alkali - 0.6% ^{more than} then mix with agg initially Caustic sol will form. That sol is attacked by H_2O which leads to react with 'Si' of cement & forms alkali-Si Gel.

If $H_2O \uparrow$ then alkali-Si gel expands in volume at thin Concrete walls

like Pavements, they exhibits cracks when still it reaches its volume. Its influence the strength, workability. At one particular instant the dissolved Calcium CO_2 Converts Calcium Carbonates into Calcium hydroxide and then spoils entire concrete mix characteristics.

Controlling Measures:-

- ① ^{Low} Reactivity of aggregates.
- ② Low Concentration of alkali in cement.
- ③ Proper proportions of admixtures in concrete mix.
- ④ Control moisture concentration.
- ⑤ Control temperature.

Sieve Analysis:-

To find out the size of the aggregate from mass of aggregates.

Procedure:-

→ This is a Practise / Procedure used to asses the particle size distribution of a granular material. This is done by sieving the aggregates as per IS 2386 (Part -1)-1963 In this we use diff. sieves as standardized by the IS Code and then pass aggregates through them and collect diff. particles left over diff. sieves.

Apparatus:-

① Is sieve sizes ← A set of - 80mm, 63mm, 50mm, 40mm, 31.5mm, 25mm, 20mm, 16mm, 12.5mm, 10mm, 6.3mm, 4.75mm, 3.35mm, 2.36mm, 1.18mm, 600μm, 300μm, 150μm, 75μm

② Balance & scale with an accuracy to measure 0.1% of wt. of test sample.

Procedure to determine Particle size distribution of aggregates:-

① The test sample is dried to a constant wt at a temp. of $110 \pm 5^\circ\text{C}$ and weighed.

② The sample is sieved by using a set of sieves.

③ On completion of sieving the material on each sieve is weighed.

④ Cumulative wt passing on each sieve is calculated as % of total sample wt.

⑤ Fineness modulus is obtained by adding retained on sieve and dividing the sum by 100.

The struts connected to the tie beam & principle rafters in inclined direction to prevent the sagging of principle rafters.

Ridge beam is provided at the apex of post to provide end support to the common rafters.

The stoners are supported at bed blocks of concrete pillars & wall plates at supporting walls so that load will be distributed to greater span.

The principle rafter is joined to the tie beam by a single abundance by a bridle joint. The joint is further strengthened by steel/iron strap around the joint.

The head of each strut is fixed to the principle rafter by as ~~old~~ tenon joints and lique mortise joints.

The king post is provided with splade shoulders & feet and it is tenoned into the upper edge of tie beam for a sufficient stance and it is further strengthened by a mild steel & iron strap.

At its head the king post is joined at the ends of principle rafter with Tenon & mortised joint.

It is connected by a 3 way iron of mild steel

