Improvement Test- Solution

BUILDING MATERIALS AND CONSTRUCTION- 18CV34

1. The increase in the volume of a given mass of fine aggregate caused by the presence of water is known as **bulking**. The water forms a film over the fine aggregate particles, exerts force of surface tension and pushes them apart increasing the volume. The extent of bulking depends upon the percentage of moisture present in the sand and its fineness. With ordinary sand bulking varies from 15-30 percent. It increases with moisture content up to a certain point (4-6%), reaches maximum, the film of water on the sand surface breaks, and then it starts decreasing.

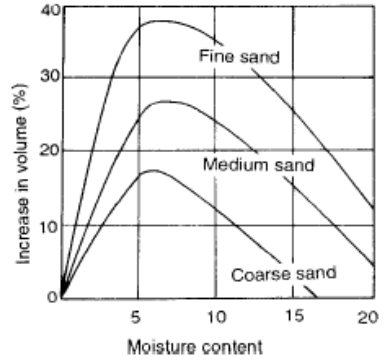


Fig. 6.2 Effect of Moisture Content on Bulking of Sand

2. Deterioration of stone work- The stones with exposed faces are acted upon by various atmospheric agencies such as rain, heat, etc. and chemicals deteriorate the stones with time. Following are the causes of decay of stones:

1.Rain water - Rain water acts both physically and chemically on stones. The physical action is due to the alternate wetting and drying causes disintegration and the chemical action due to the rain water descents through atmosphere absorbs CO_2, H_2S and other gases present in the atmosphere and affect the stones.

2.Wind – It carries fine particles of dust , when it blows at high speed particles will strike against the stone surface and thus stone will decayed. The wind allows rain water to enter pores of stones with force. Such water on freezing, expands and splits the stones.

3.Vegetable growth – The creepers and certain trees develop on the stone surfaces with their roots penetrating in stones joints. Such roots attract moisture and keep the surface damp. At the same time, they may try to expand also, resulting in stone decay.

4.Alternate wetness and drying – Stones are made wet by various agencies such as rain, frost, dew etc. It is found that stones subjected to such alternate wetness and drying wear out quickly.

5.Living organisms – Some living organisms like worms and bacteria act upon stones and deteriorate them.

6.Nature of mortar – The nature of mortar used as a binding material may react chemically with any one of the constituents of stones and thus lead to disintegration of stones.

Preservation of stones

Preservation of stone is essential to prevent its decay. Different types of stones require different treatments.

Preservatives, which are commonly adopted to preserve the stones, are

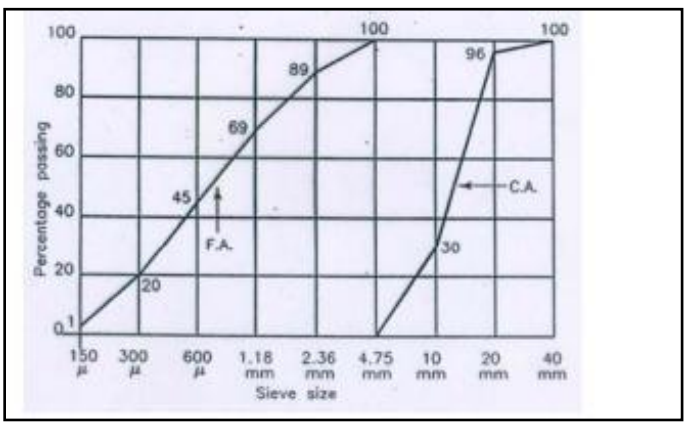
- Coal tar – If it is applied on stone surface , it preserves stone. But colour produces objectionable appearance and absorbs heat of sun. Hence it is not adopted generally since it spoils beauty of stones.
- Linseed oil – It is used as raw or boiled linseed oil. Raw linseed oil does not disturb original shade, but requires frequent renewal whereas boiled oil makes stone surface dark.
- Paint – It preserves the stone but changes original colour.
- Paraffin – It may be used alone or along with dissolved neptha and then applied on stone surface.
- Solution of alum and soap- They are mixed in one litre of water in 40:60 proportions.

3.(i) Sieve analysis

Aggregate whose particle size distribution or Fineness Modulus (FM) is required is determined from mechanical sieve analysis. Standard sets of sieves 4.75, 2.36. 1.18 mm, 600µ, 300 µ, 150 µ are taken and suitable quantity of fine aggregate is placed in sieves and vibrated for 10 minutes. Then material retained on each sieve after sieving represents the fraction of aggregates coarser than the sieve in question, but finer than the sieve above. The sum of the cumulative percentage weights of aggregates retained in sieves divided by 100 gives FM.

Objects of finding

- To grade the aggregate for the required strength and workability of concrete mix with minimum cement.
- To get some idea about the mean size of the particles in the aggregates.



Gradation Curve

Higher F.M. aggregate result in harsh concrete mixes and lower F.M. result in uneconomical concrete mixes

Depending the size of sand it may be classified as

Type of sand	**F M**
Coarse Sand	2.9 – 3.2
Medium Sand	2.6 – 2.9
Fine sand	2.2 – 2.6

Very fine sand and coarse sand has been found unsatisfactory for making mortar and concrete.

Very fine sand	Poor mortar – uneconomical
Coarse sand	Harsh concrete mix
Well graded	Particles of all different sizes and produces concrete with minimum mix

Specific gravity

The specific gravity of most of the fine aggregates lies between 2.62-2.67.The specific gravity and porosity of aggregates greatly influence the strength and absorption of concrete. Specific gravity of aggregates generally is indicative of its quality. A low specific gravity may indicate high porosity and therefore poor durability and low strength. The concrete density will greatly depend on specific gravity.

Determination of specific gravity- A sample about 1000 g for 10 mm to 4.75 mm or 500 g if finer than 4.75mm is placed in the tray. The saturated and surface dry sample is weighted (weight M_1).The aggregate is then placed in the pycnometer which is filled with distilled water. The pycnometer is dried on the outside and weighed (weight M_2).Then water added to the contents of pycnometer (weight M_3). The pycnometer is refilled with distilled water to same level as before, dried on the outside and weighed (weight M_4).

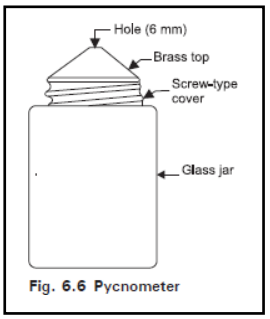


Fig. 6.6 Pycnometer

4. **Plastering**

It is process of covering rough surfaces of walls, columns , ceiling and other building components with thin coat of plastic mortars to form a smooth durable surface .

Objects

- Give decorative effect
- Protect surface against vermin
- Conceal inferior materials
- Protect external surface against penetration of rain water and other atmospheric agencies.

Requirements of good plaster

- Hard and durable
- Good workability
- Cheap
- Possible to apply it during all weather conditions
- Should adhere to the background and should remain during all variations in seasons and other atmospheric conditions.
- Should effectively check penetration of moisture.

5. **Defects in Plastering**

a. **Blistering of plastered surface:** This is the formation of small patches of plaster which swells out beyond the plastered surface, arising out of late slaking of lime particles in the plaster. It may also arise due to presence of un slaked particles in slaked lime.

b. **Cracking:** It consists of formation of cracks and fissures on the plastering surface due to following reasons like :

   i. Defective preparation of back ground

   ii. Structural irregularities in buildings

   iii. Discontinuity of plastered surface

   iv. Movements in the back ground due to the thermal expansion or rapid drying or shaking

   v. Movement in the plaster surface itself either due to expansion or shrinkage or due to creep

   vi. Excessive shrinkage caused by application of thick coat

   vii. Faulty workmanship

c. **Crazing:** It's the formation of a series of hair cracks on plastered surface due to the same reason as for cracking

d. **Flaking:** Due to poor bond between successive coats very loose mass of plastered surface is formed which is called as flaking.

e. **Peeling:** It's the complete dislocation of plastered surface resulting from formation of patches. Formation of imperfect bond is also another reason of this type of defects.

f. **Pooping:** It's the formation of conical hole on the plastered surface due to the presence of some expandable materials.

g. **Rust stains:** These are sometimes formed when plaster is applied on metal laths due to rusting action.

h. **Efflorescence:** This is another defect by which the whitish crystalline material which appears on the plastered surface due to presence of salts present in the plastering material or building material. It gives the bad appearance and even affects adhesion during painting. It can be removed to some extent by washing the surface continuously and by dry brushing.

i. **Uneven Surface:** This is obtained purely due to poor workman ship.

6. Autoclaved aerated concrete (AAC) is a lightweight, precast, foam concrete building material suitable for producing concrete masonry unit (CMU) like blocks. Composed of quartz sand, calcined gypsum, lime, cement, water and aluminum powder, AAC products are cured under heat and pressure in an autoclave. Invented in the mid-1920s, AAC simultaneously provides structure, insulation, and fire- and mold-resistance. Forms include blocks, wall panels, floor and roof panels, cladding (façade) panels and lintels.

AAC products may be used for both interior and exterior construction, and may be painted or coated with a stucco or plaster compound to guard against the elements, or covered with siding materials such as veneer brick or vinyl siding. In addition to their quick and easy installation, ACC materials can be routed, sanded, or cut to size on site using standard power tools with carbon steel cutters

AAC is a highly thermally insulating concrete-based material used for both interior and exterior construction. Besides AAC's insulating capability, one of its advantages is quick and easy installation, because the material can be routed, sanded, or cut to size on site using standard power tools with carbon steel cutters.

AAC is well suited for high-rise buildings and those with high temperature variations. Due to its lower density, high-rise buildings constructed using AAC require less steel and concrete for structural members. The mortar needed for laying of AAC blocks is reduced due to the lower number of joints. Similarly, the material required for rendering is also lower due to the dimensional accuracy of AAC. The increased thermal efficiency of AAC makes it

suitable for use in areas with extreme temperatures, as it eliminates the need for separate materials for construction and insulation, leading to faster construction and cost savings.

Even though regular cement mortar can be used, most of the buildings erected with AAC materials use thin bed mortar in thicknesses around ⅛ inch, depending on the national building codes. AAC materials can be coated with a stucco or plaster compound to guard against the elements, or covered with siding materials such as brick or vinyl.