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Q(1): Which step is taken to prevent flash setting of cement? Also write steps to prevent false setting of concrete.

Ans Flash set: It is the immediate stiffening of cement paste in few minutes after mixing with water. It is accompanied by large amount of heat generation upon reaction of C3A with water. Gypsum is added in cement to prevent flash set. Gypsum slow down the setting of cement so that cement is adequately hardened.

False set: It is rapid development of rigidity of cement paste without generation of much heat. This rigidity can be overcome and plasticity can be regained by further mixing without addition of water. In this way cement paste restores its plasticity and sets in a normal manner without any

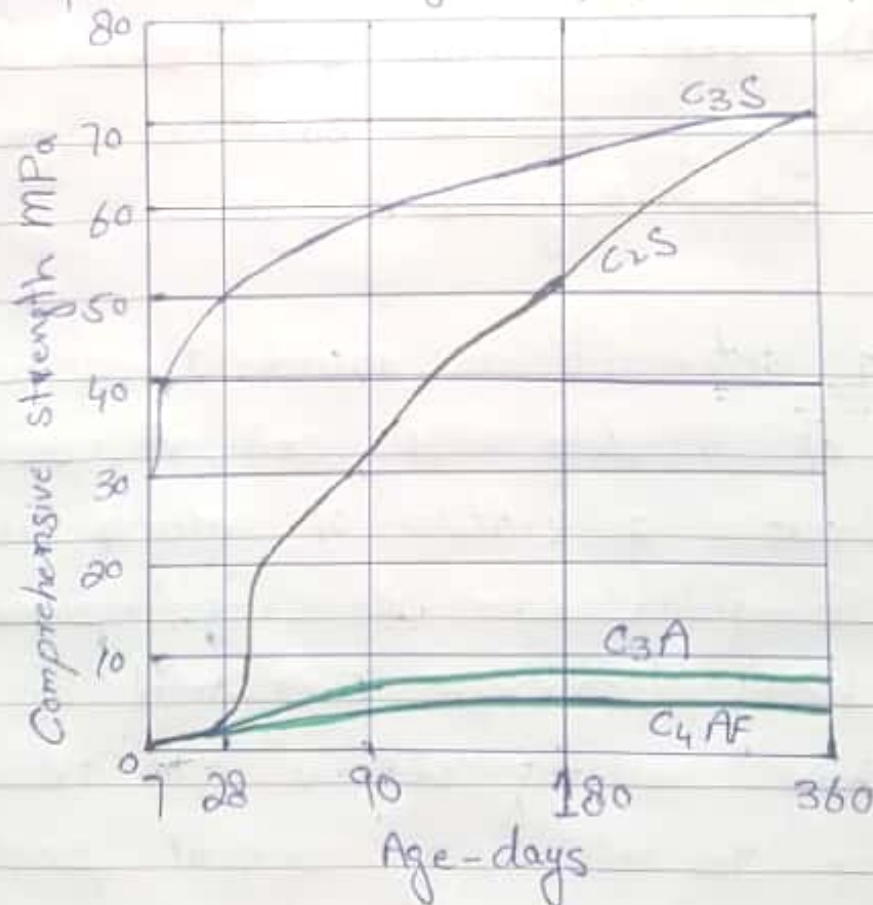
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loss of strength. It may be due to dehydration of gypsum as a result of contacting hot clinker or due to activation of C3S by aeration in high humidity.

Q(2) Draw a graph showing the strength development of pure compounds of cement.

Ans: Development of strength of pure compound.



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Q(3) Why Type III cement is Rapid Hardening and Type IV low heat producing? Draw a graph showing the development of heat of hydration of different cement types.

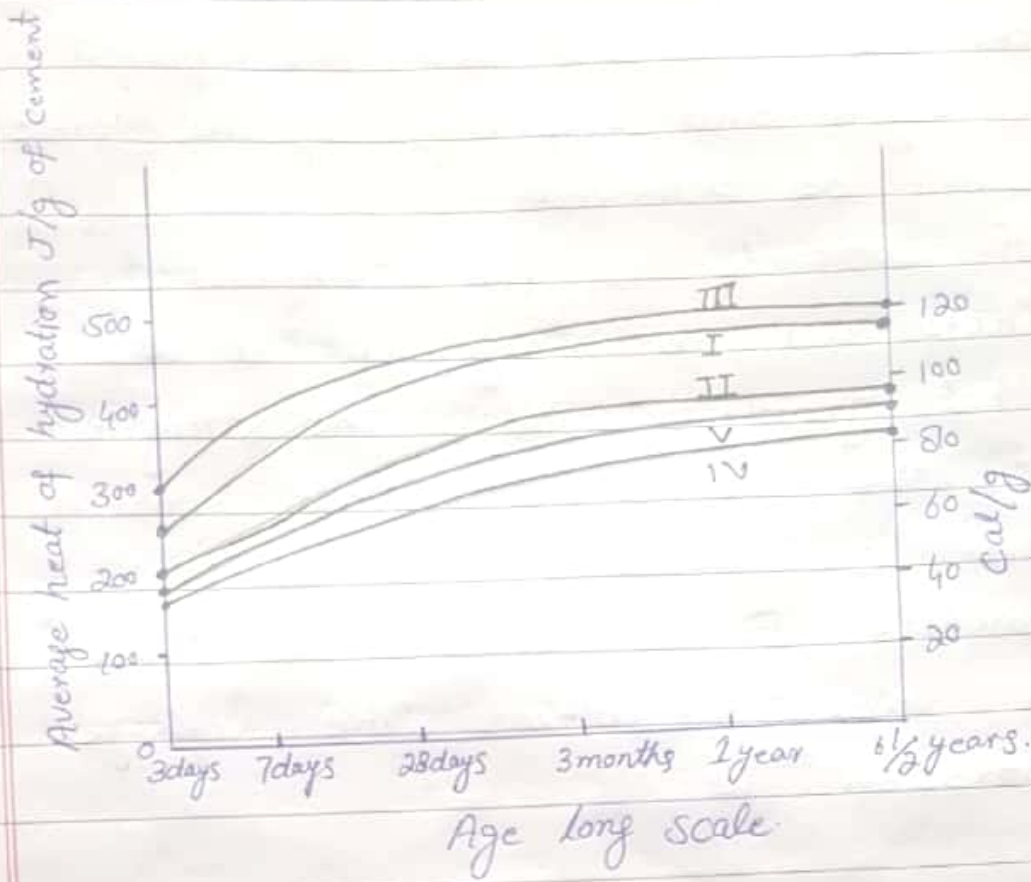
Type III cement: The rapid strength of this types of cement is achieved due to increase of  $C_3S$  compound and due to finer grinding of ~~per~~ the cement clinker. Rate of heat evolution is higher than in ordinary portland cement due to increase in  $C_3S$  and  $C_3A$  and due to its higher fineness.

Type IV cement:

Its composition contains less  $C_3S$  and  $C_3A$  percentage, and higher percentage of  $C_2S$  in ordinary portland cement. And its fineness is not less than  $3200 \text{ cm}^2/\text{g}$ . So its produce low heat.

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Q(4) What is the effect of compaction on entrapped air of concrete? What will be the effect on strength if concrete is not compacted sufficiently? Explain with graph.

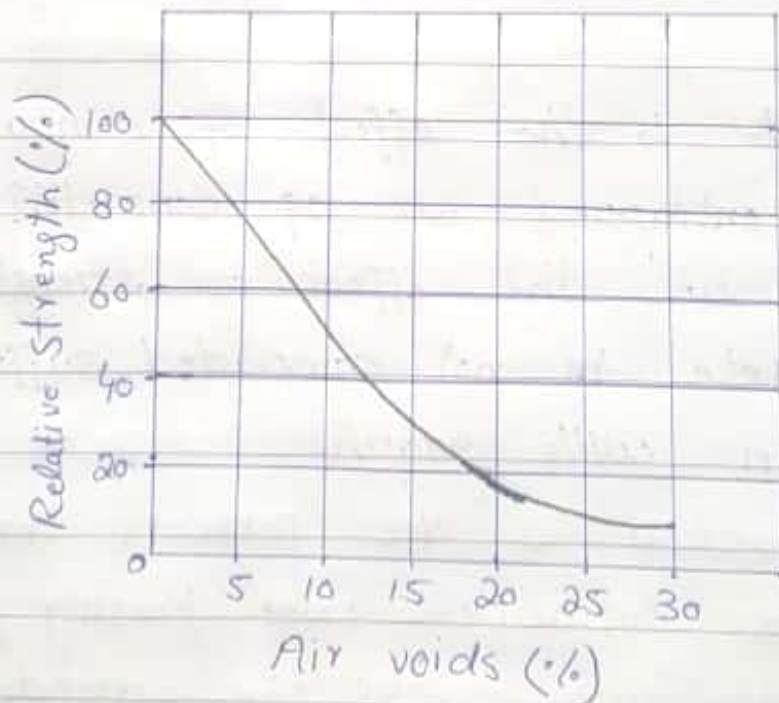
Ans Compaction is the process that expels entrapped from freshly placed concrete and packs the aggregate particle together so as to increase the density of the concrete. Due to compaction the entrapped

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air is expelled and the required strength and properties of the concrete can be achieved.

If concrete is not compacted, there will be large pocket of air that greatly diminish the strength of the concrete in both tension and compression. Pores remain in concrete. Porous concrete can lead to various problems like leakage, corrosion etc.



Q(5) Why is the percentage of gypsum added to the cement limited only to 5%?

Ans Gypsum is added to control the setting time of cement because when cement is mixed with water it set very fast. If gypsum is added more than 5% a phenomena known as "false set" occurs. The gypsum causes itself act as a binder, causing the sensation of setting. It also is prone to the production of excessive amounts of ettringite, which is significantly expensive and usually considered bad.

Q(6) What is the effect of the following on the bond strength of concrete?

i) Shape of aggregate.

Ans Rough surface aggregate have pore which have ability to form strong bond and create resistance against

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the applied load and to increase the compressive strength of concrete upto 20-30%.

ii) Size of aggregate:

The smaller the size of aggregate the higher is the strength of the concrete and less will be its workability.

iii) Texture of aggregate:

Rougher texture results in a greater adhesion or bond between the particle and the cement matrix compare to smooth texture.

iv) Bleeding

In the process of bleeding the accumulation of water creates a water voids and reduce bond between the aggregates and cement paste.

Q(7) What is the effect of the following on workability of aggregate?

i) Porosity and absorption:

The porosity and absorption of



aggregate is important consideration because some water added is absorbed by aggregates, hence effecting workability.

ii) Air entraining agent:

Air entrainment effect workability of aggregate. It increase the workability of aggregate with out much increase in water-cement ratio.

iii) Coarse aggregate to fine aggregate ratio:

finer particle needs more water to make it workable. Bigger particle demands less water. So bigger particle give higher workability for fixed water content.

iv) Grading of aggregates:

Grading helps in reducing the voids in a given volume of aggregates. The less volume of voids makes the cement paste available for aggregate surface to provide better lubrication to the aggregates.

Q(8) What is the effect of fineness of cement on the following?

i) Strength of concrete:

The fineness of cement affects hydration rate, and in turn the strength. Increasing fineness of cement increase rate of hydration and increase strength of the concrete.

ii) Rate of heat evolution during hydration:

The fineness of cement increase the rate of hydration which also increase the rate of evolution of heat.

iii) Total heat of hydration:

Cement hydration reaction is exothermic reaction. Thus a lot of heat is liberated and this heat that is released is called the heat of hydration. Heat of hydration increase with increase in fineness of cement.

iv) Workability of concrete:

The workability of non air-entrained concrete increase by increasing the cement fineness.

Q(9) Which step can be taken during transportation and placement of concrete to prevent segregation of concrete?

Ans Segregation is the separation of aggregates from the cement matrix. When concrete is poured freely from a height more than 1m, the aggregates will be thrown separately first and the cement matrix will follow them and accumulate at the top.

To avoid segregation:

- \* Check the concrete is not "too wet" or "too dry".
- \* Make sure the concrete is properly mixed. It is important that the concrete is mixed at the correct speed in a transit mixer for at least two minutes immediately prior to discharge.
- \* The concrete should be placed as soon as possible. When transporting the mixer load carefully.

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- \* Choose the shortest route for # transportation of concrete mix.
- \* Use of certain workability agents, pozzolanic material and air entraining agent can be significantly reduce segregation.

If placing concrete straight from a truck, pour vertically and never let the concrete fall more than one-and-a-half meters.