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2<sup>nd</sup> Semester

Paper:- Concrete Technology

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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)

## Step To Prevent Flash Setting Of Cement

To prevent flash setting of cement, gypsum is added to cement clinker while grinding.

## Prevention Of False Setting Of Concrete

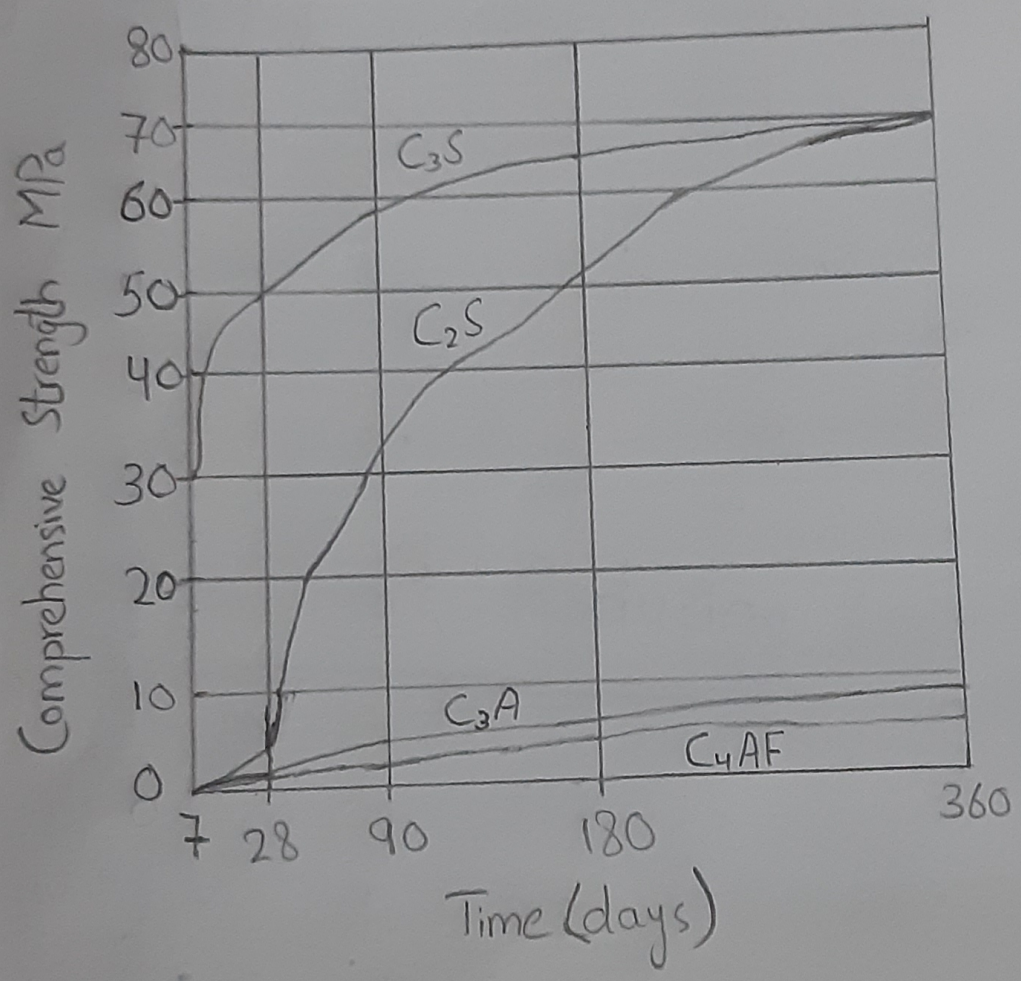
If premature stiffening of cement occurs within a few minutes of adding water to it, then it is called false setting. False setting can be removed by remixing the cement (concrete) paste without adding water.

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

Ans) Strength Development Of Pure Compounds Of Cement



Q.3) Why Type III cement is rapid hardening and Type IV Low heat producing? Draw a graph showing heat of hydration of different types of cement.

Ans) Rapid Hardening Cement (Type III)

This type of cement develops strength more rapidly and is so called high early strength cement. The rapid hardening of this cement is due to a higher  $C_3S$  content even sometimes upto 70% and also because of fine grinding of the cement clinkers.

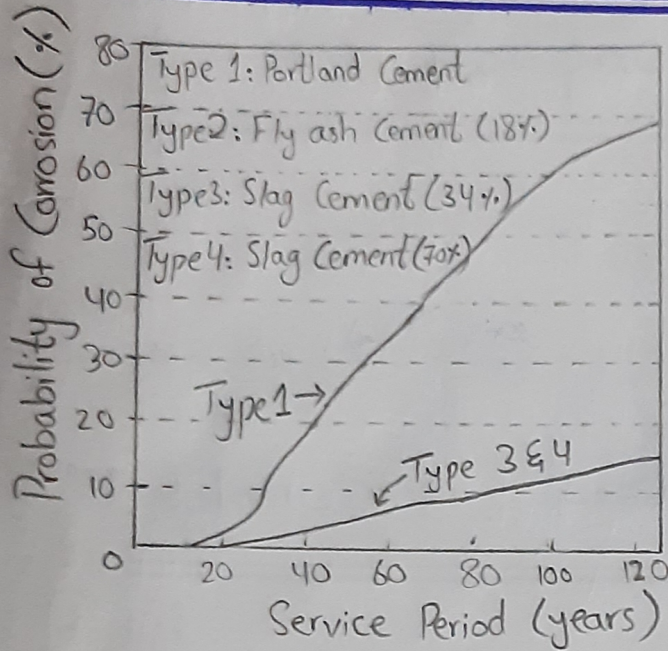
Low Heat Producing Cement (Type IV)

This type of cement contains less amount of  $C_3S$  and  $C_3A$  which results in slow development of strength and producing less heat, which makes this cement of low heat.

Portland blast furnace cement ~~Type~~ and Portland Pozzolana cement can be specified to be of low heat variety.

# Graph of Heat of Hydration of

## Different Cement Types:-



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) Effect of Compaction on Entrapped Air of Concrete

Compaction expels entrapped air from freshly placed concrete and packs the aggregate particles together so as to increase the density of concrete.

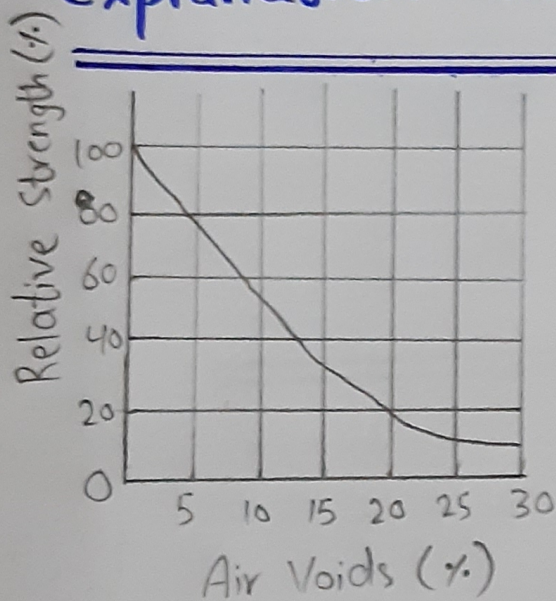
It also increases the strength of concrete.  
It also improves durability of concrete.

## Effect on Strength of Concrete

### If Not Compacted Sufficiently

In case a concrete is not compacted sufficiently, it will have entrapped air (voids) which will greatly reduce its strength.

### Explanation With Graph



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

Ans)

### Percentage of Gypsum:-

It is very important to add 3% - 5% gypsum exactly to cement, because it acts as a set retarder. It prevents the portland cement from "flash set."

Adding additional amount of gypsum will cause "false set". The gypsum acts as a binder, causing the sensation of setting.

Q.6) What is the effect of following on the bond strength of concrete? (Use not more than 2 lines to answer each part).

- i) Shape of aggregate
- ii) Size of aggregate
- iii) Texture of aggregate
- iv) Bleeding

Ans)

### Effect of Shape of Aggregate On Bond Strength of Concrete

Angular Aggregates:- Increased flakiness or elongation, reduces workability, which results into stronger bond.

## Round Smooth Aggregates:-

Require less water for lubrication and gives greater workability which results into weaker bond.

## Effect of Size of Aggregate

### On The Bond Strength of Concrete

The smaller the size of aggregates the less will be the workability and higher will be the bond strength and vice versa.

## Effect of Texture of Aggregates

### On The Bond Strength of Concrete

Porous aggregates need more water as <sup>compared to</sup> non absorbent aggregates for achieving same workability and bond strength. Hence porous aggregates should be avoided.

## Effect of Bleeding On The Bond Strength of Concrete

Bleeding has a bad effect on the bond strength of concrete because it decreases the bond strength.



Q.7) What is the effect of following " " on workability of concrete?

- (i) Porosity & Absorption
- (ii) Air entraining agent
- (iii) Coarse Aggregate to fine aggregate ratio
- (iv) Grading of aggregate.

A Ans)

## Effect of Porosity & Absorption On Workability of Concrete

If there is more porosity the concrete will be more workable and vice versa.

Absorption will effect the workability in the following way. Since concrete contains aggregates which disturbs the water to cement ratio because aggregate itself also absorb water. If the aggregates absorbs water and equivalent water for this absorption is not added as per the required water to cement ratio, the workability will reduce.

The case will be opposite if aggregates contain excess water.

## Effect of Air Entraining Agent On Workability of Concrete

Air entraining agents form small bubbles of air in the concrete. These bubbles reduce the friction that occurs during the concrete pumping stage. As a result workability improves.

## Effect of Coarse Aggregate To Fine Aggregate On Workability

Fine Aggregates require more water for a larger surface, hence aggregate with finer particles need more water to make it workable. On the other hand, coarse aggregates have less surface area, demand less water for wetting surface and making workable. Gravel and crushed stones are generally preferred.

# Effect of Grading of Aggregates

## On Workability of Concrete.

Grading of aggregates have the maximum effect on the workability of concrete. Well graded aggregates have all sizes in required proportions. This helps in reducing the voids in a given volume of aggregates. Which helps in improving the workability.

Q.8) What is the effect of fineness of cement on the following? (Use not more than two sentences to answer each part)

- (i) Strength of concrete      (ii) Rate of heat evolution during hydration.  
(iii) Total heat of hydration      (iv) Workability of concrete

Ans) Effect of Fineness of Cement on Strength of Concrete

Strength of concrete increases with an increase in cement fineness.

## Effect of Fineness of Cement on Rate of Heat Evolution During Hydration

Increase of cement fineness increases the rate of heat generation.

## Effect of Fineness of Cement on Total Heat of Hydration

Increase of cement fineness has no effect on total heat of hydration at 7 days.

## Effect of Fineness of Cement on Workability of Concrete

By increasing the fineness of cement the workability of concrete also increases.

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Q.9) What steps can be taken ~~to~~ during transportation and placement of concrete to prevent segregation of concrete?

Ans) Steps Taken To Prevent Segregation of Concrete During Transportation & Placement

Wherever depth of concrete is more than 1.5 meters it should be placed through temporary inclined chutes. The angle of incline should be 1:3 - 1:2, so that the concrete from top of chutes travels smoothly towards the bottom. Use of little bit of water from top helps in lubricating the path of flow for concrete.

The delivery end of chute should be as close as possible to point of deposit.

Choose the shortest route for transportation of concrete mix.