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Concrete technology Assignment.

Q1: Which step is taken to prevent flash setting of cement? Also write steps to prevent false setting of concrete.

a) Ans: * Flash setting :-

setting ^{stiffening} of cement rapidly when mixed with water this takes place within minutes.

* Prevention:-

Gypsum is added to cement to prevent the flash setting of cement.

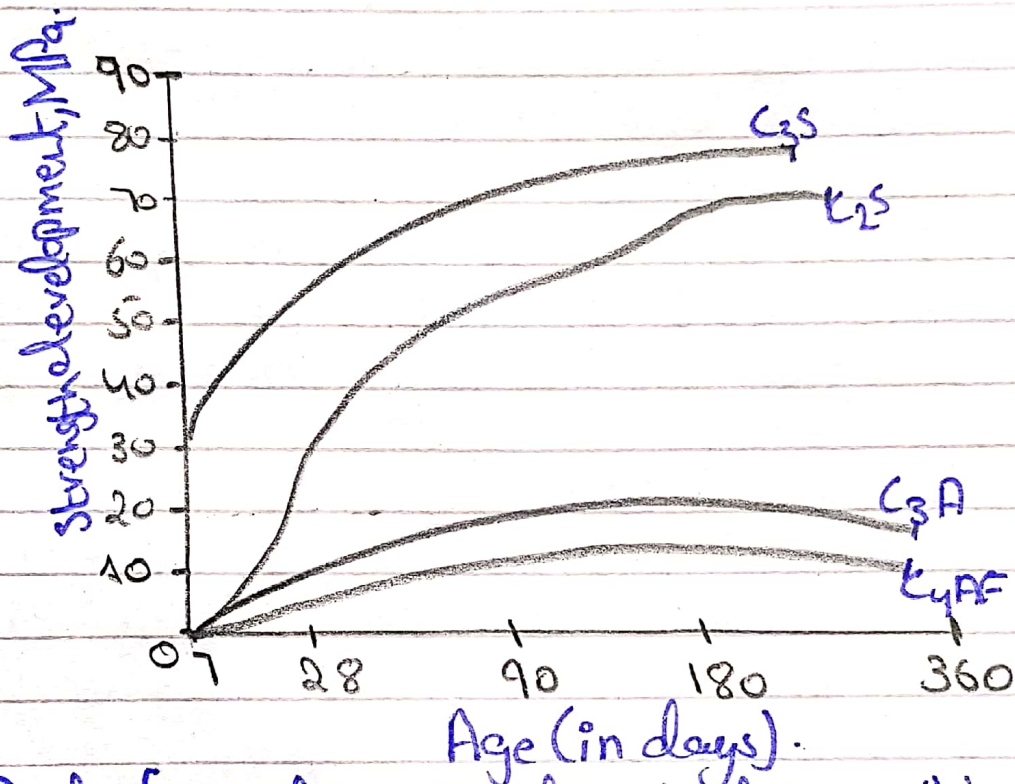
b) Ans: * False setting:-

False setting of concrete is the abnormal setting of the paste rapidly without generation of the heat compared with that of flash setting.

* Prevention:-

False setting can be prevented by continuous and further mixing without any additions of water or so, as by doing so the plasticity and setting is restored to normal without any loss in strength.

Q2. Draw a graph showing the strength development of pure compounds of cement.
 * Strength development of pure compounds of cement:-



Ref. { Tricalcium silicate, dicalcium silicate, tricalcium aluminate, and tetra calcium aluminoferrite. }

From the graph above we have

Tricalcium aluminate → Initial/flesh setting.

Tricalcium silicate → Initial one-two week (long)

Dicalcium silicate → long duration.

Tetra calcium aluminoferrite → rapid (fluxing agent)

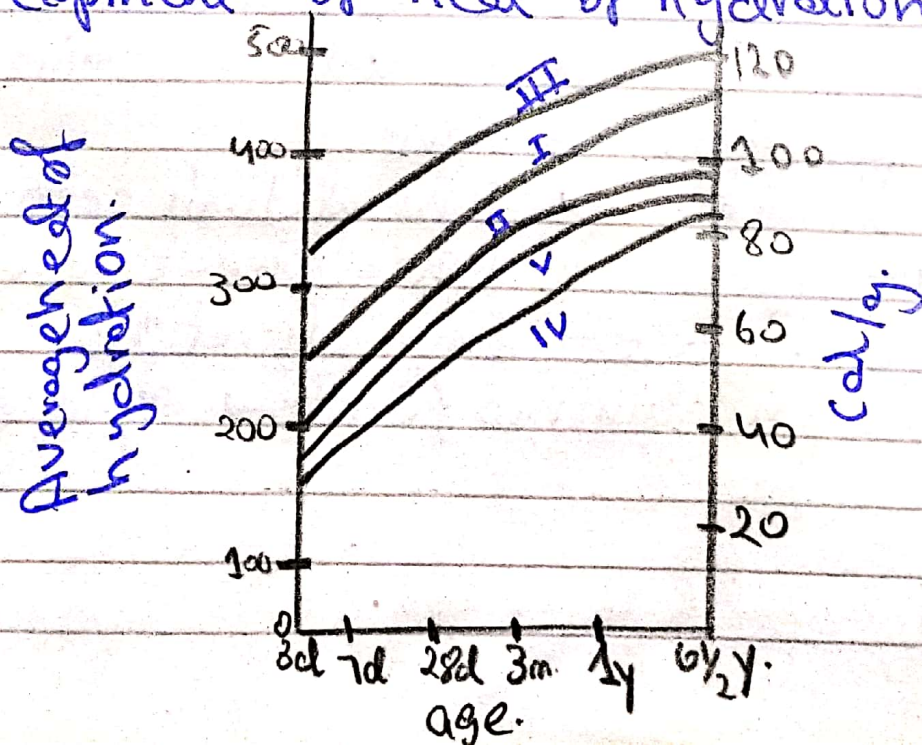
Q3. Why Type III cement is rapid hardening and Type IV low heat producing? Draw a graph showing development of heat hydration of different cement types.

* Reasons-

Type III cement is rapid hardening cement due to the use of clinker and addition of a small percentage of gypsum which causes rapid hardening i.e. the strength development of this type of cement in 7 days is equal to 28 days of that of type I and II. whereas,

Type IV cement is known as low heat producing cement because the maximum percentages of C_3A and C_3S are limited to 7% and 35% due to which hydration develops at a lower rate and hence low heat is produced.

* Development of heat of hydration (Graph):-

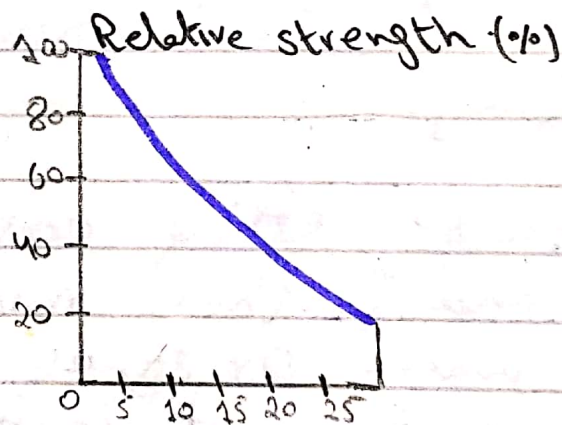


Q. What is the effect of compaction on entrapped air of concrete? What will be the effect on strength if concrete is not compacted sufficiently? Explain with graph.

Ans: Effect of compaction on entrapped air :-

The effect of compaction on the entrapped air of concrete is such that it expels all the entrapped air resulting in a high density of concrete i.e. packed particles of aggregate.

Effect on strength if not compacted sufficiently :-



Air voids (%)

From the graph above it is quite apparent that if compaction is not sufficient the strength is diversely effected hence poor compaction results in poor strength.

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

Ans:- Addition of Gypsum:-

Gypsum is added to cement for controlling the setting time of cement hence preventing phenomena such as false set or flash set.

* Limited Addition:-

The addition of gypsum is limited to 3-5% because if excessive amount or percentage of gypsum is added to cement contrary to increasing the setting time it remains in a free state resulting in expansion, decrease in strength and disruption of set cement paste.

following on

Q6. What is the effect of bond strength of concrete?

i) Shape of aggregate.

→ The rough angular and elongated aggregate have high bond strength whereas rounded aggregates have the opposite.

ii) Size of aggregate.

→ Smaller the size of the aggregates higher will be the bond strength and vice versa.

iii) Texture of aggregate:-

→ Rough surface textures have a high bond strength whereas smooth surface textures have lower bond strength.

iv) Bleeding:-

→ Bleeding has a diverse effect on the bond strength hence decreasing it by being excessive.

Q7. What is the effect of following on workability of concrete?

(i) Porosity and absorption.

→ The Porosity and absorption affects the water/cement ratio of concrete hence has an inverse effect on the workability of concrete.

(ii) Air entraining agent.

→ The air entraining agent has a direct relation with workability hence it increases the workability without altering the cement/water ratio widely.

(iii) Coarse aggregate to fine aggregate ratio.

→ By the mix proportions of concrete we can see that a high ratio which includes more cement has an increased workability. Low ratios provide poor workability.

iv) Grading of aggregate.

→ Proper gradation is required for high workability or else the strength increases but workability decreases.

Q. What is the effect of fineness of cement on the following?

(i) Strength of concrete.

→ The fineness of cement has a direct relation with its strength hence the finer the cement the more its strength.

(ii) Rate of heat evolution during hydration.

→ The rate at which heat evolution takes place during hydration is increased by increasing fineness.

(iii) Total heat of hydration.

→ The total heat of hydration also has a direct relation with fineness hence increasing fineness increases it.

(iv) Workability of concrete.

→ The workability of non-entrained air is significantly increased with the increase in fineness.

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

* Segregation of concrete:-

Segregation occurs due to the absence of a homogeneous mixture which causes differing size and specific gravity ultimately reducing characters such as strength of concrete.

P.T.O.

*Steps to prevent segregation:-

There are various steps taken to prevent segregation some of which are given belows.

- 1- The use of proper equipment such as hoppers, vertical pipes and so on is essential to avoid segregation.
- 2- Concrete should not be poured from higher heights.
- 3- The transportation of concrete should be followed by the shortest route.
- 4- Air tight containers or bags should be used.
- 5- Vibrators should be properly used.
- 6- Concrete should be placed in its final position as soon as possible.