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- ① Which step is taken to prevent flash setting of cement? Also write steps to prevent false setting of concrete.

Flash Setting :-

The reaction of water with pure tricalcium aluminate tends to get rapidly decreases initial setting time of cement.

The phenomena or the process is called Flash setting of cement.

PREVENTION OF FLASH SETTING :-

To prevent flash setting we added calcium sulphate source such as Gypsum are added to cement at a time of grinding when C_3A are in the form of clinker.

Gypsum having property to prevent rapid setting and make gel with tricalcium aluminate.

False Setting ② :-

stiffening of the abnormal premature minutes of cement with few mixing of water.

At high temperature in grinding mill gypsum is added with clinker due to which its loss its own workability and itself setting rapidly.

Causes :

Dehydration of Gypsum while Grinding and mixed with clinker at hot temp.

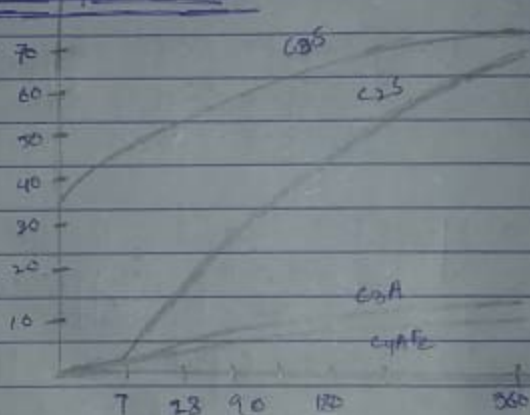
Semihydrates and Anhydrites are form of Gypsum which react with water and again precipitated in the form of Gypsum.

Excess amount of Alkali Carbonates react with $CaSO_4$ liberated by hydrolysis of CaS to form $CaCO_3$. This precipitation and induced a rigid of the past.

PREVENT THE FALSE SETTING OF CONCRETE :-

To remove the above components which are already discussed we'd easily or approx. level of false setting of concrete could be counter. Proper amount or ratio required will avoid false setting time.

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

* Rate of strength

C₃S hydrates and hardens rapidly. Hence it's generates more heat as compare to the other components.

C₃S are the only component that provide high early strength to mixture.

(4)

C_2S Hydrates and Harden slowly and provide much of ultimate strength.

C_2S provide more resistance to chemical attack on the mixture.

The higher percentage of C_2S result with early gain in strength at higher heat of hydration. While the high percentage of C_3S result slow hardening, less heat of hydration and show greater resistance to chemical attack.

* C_3A & C_4AF fast reacting with water and may lead to immediate stiffening of the paste. And this process also known as Flash setting.

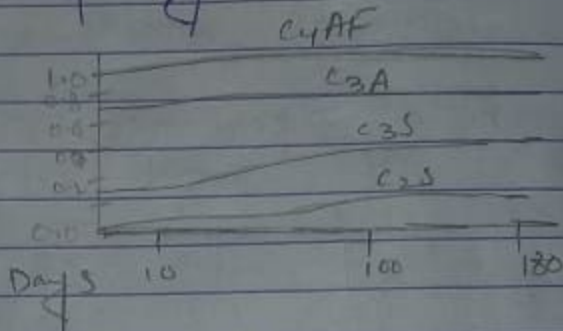
C_3A provide low resistance against sulphate attack. Its contribution of development of strength is perhaps less significant.

While C_4AF hydrate rapidly settle but contribute little to concrete strength.

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In majority of Portland cement contain C_4AF .

* Rate of Hydration



(2) 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 type.

RAPID HARDENING :-

Rapid hardening cement contain high strength in early days it is used where framework are acquire to remove quickly such as construction under the water.

* Similar like ordinary portland cement.

* This cement has increased lime content and contain higher C_3S content with

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 Finer grading which gives greater strength development than "open" at early stage.

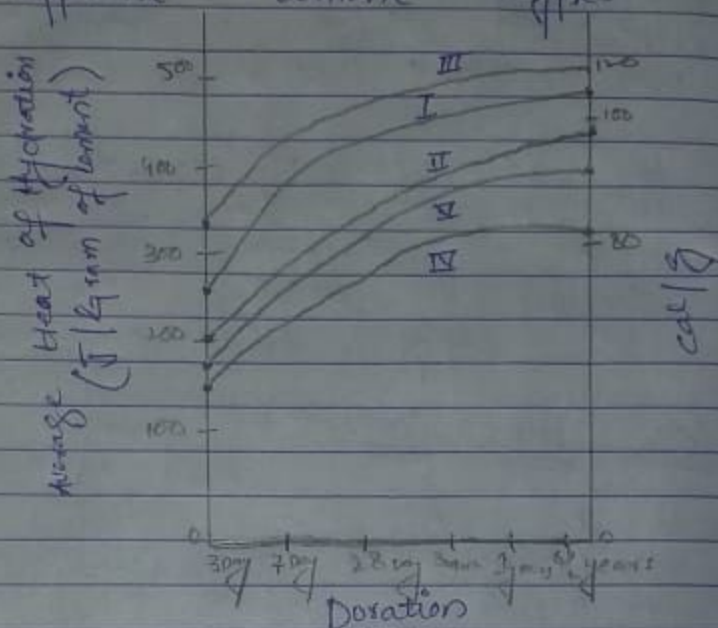
The advantage of rapid hardening is to remove earlier to increase rate of construction and decrease cost of construction by saving framework cost.

Low Heat Content :-

Low heat content is prepared by maintaining the percentage of trisulphate aluminate below from 6% by increasing the proportion of C₂S. This makes the concrete to produce low heat of hydration and thus is used in mass concrete construction like gravity dams, as the low heat of hydration prevent the cracking of concrete due to heat.

This cement has increase power sulphate and is less reactive and initial setting time is greater than ordinary Portland cement.

"Development of Heat of Hydration different cement types"



Q) What is effect of compaction on entrapped air of concrete? What will be the effect on strength if concrete isn't compact sufficiently? Explain with Graph.

EFFECT OF COMPACTION?

The entrapped air in concrete can reduce the strength, durability and impermeability of concrete to a great extent.

* Effect of compaction also effect the density

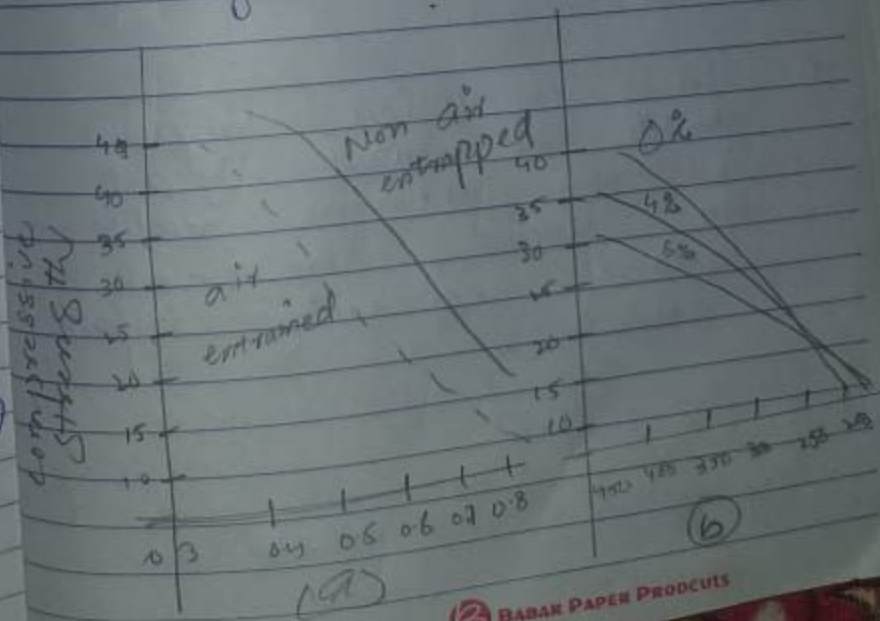
(3)

Each one percent less compaction reduces the strength of concrete about 5% on an average.

During the process of manufacturing of concrete a considerable amount of air is entrapped forming void in it.

EFFECT OF STRENGTH

If concrete is not fully compacted the strength of concrete loss to the large amount of 10% air void left in concrete can lead to decrease in durability, workability and strength.



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(6)

(9)

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

* REASONS :-

The percentage of Gypsum in cement is limited to 5% because excess of Gypsum is leading unsoundness in cement.

* Excess amount of Gypsum may react with extra sulfate to form Gypsum into Ettringite. Ettringite can expand the volume and add the causes the cracking due to which the durability of construction building become less.

→ In conclusion Gypsum should be used at its own optimum value to avoid chemical attacks especially sulfate attack.

Q1) What is the effect of following on the bond strength of concrete?

1) Shape of Aggregate

Yes shape of aggregate effect the strength of concrete to the maximum strength suggest Angular aggregate in concrete because of the edges to/w the angular aggregate due to their high surfad Area.

ii) Size of Aggregate

This is no variation in bond strength but it can reduce the bond strength when all most maximum aggregate are less than 10 mm used in concrete.

iii) Texture of Aggregate

A smooth texture of aggregate can increase wearability while rough texture of aggregate generate stronger bond

blw the paste & aggregate
create high strength.

(iv) Bleeding :-

Bleeding consider as
as the physical migration /
movement of water comes toward
the top of concrete. It
decrease strength and cause
not strong enough bonds b/w
successive ingredients in mixture.

⑦ What is the effect on workability of Aggregate in concrete :-

(i) Porosity & Absorption :-

Compressive
and tensile strength ratio
decreases when we increase
porosity. If the aggregate
more or less amount of
can damage the workability
of concrete we need
specific ratio of water in concrete.

(ii) Air Introducing Agent :-

Workability
is inversely proportional to
compressive so " Air introducing

(12) agent effect the compressive strength and its workability increases".

(iii) Coarse Aggregate to Fine Aggregate Ratio :-

If the ratio of both aggregate same can increase the workability because it workable very smoothly and easily.

(iv) Grading of Aggregate :-

Grading of Aggregate has the greatest impact on its workability. The better grading of aggregate can avoid approximate level of voids for given workability.

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

(i) Strength of concrete :-

the ratio of hydration varies on the fineness of cement.

more fineness of cement give
vs fast in development of
strength of concrete.

(ii) Ratio of Heat Evolution During Hydration:

The amount of hydration depends
on the fineness of cement because
hydration start from the surface
of cement particle. A high
fineness cement quickly increases
the heat of hydration at
early stage.

(iii) Total Heat of Hydration &

Fineness increases rate
of hydration, high strength
and high heat generation thus
fineness of cement increases the
total heat of hydration.

(iv) Workability of Concrete &

The fineness of cement
induces the drying shrinkage
of concrete. when water
content increases because of
fineness and if excessive
bleeding due to coarseness

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of cement takes place can decrease the workability.

8) What steps can be taken during transportation and placement of concrete to prevent segregation of concrete?

Avoid Segregation During Transportation:

- * It should be mixed properly.
- * If unmonitored, excessive amount of water is added, unskilled labour or labour contractors for increasing workability which means less effort in placing and mixing) leading to higher water-cement ratio in concrete.
- These following problems should be avoided.
- * Admixtures or air entraining agents should be used to avoid segregation.
- * Avoid jolts and jerks during transportation concrete mixers and try to transport Road to site as soon possible before initial setting time comes.

* Avoid Segregation During Placing

- * Make sure that formwork remains sufficiently rigid during placing.
- * Tendency of Segregation also increases when concrete is placed in heavily reinforced concrete member.
- * Height of fall should not be greater than 1.5m if pouring directly.
- * Ensure the chutes are smooth and don't have resistance to flow.
- * Segregation can be detected by advanced method of testing like ultrasonic testing.
- * "Apart from that above follow basic sense there's no full proof algorithm/ steps to avoid segregation. Supervision is necessary & improvisation are need all the time despite of all possible precaution.
Experience teaches everything".