Midterm Paper (Summer)

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Section # B

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Subject # concrete technology

Q No 1

Discuss in brief various types of admixtures used in concrete?

Ans:; Accelerating admixture

Accelerating is added to concrete to reduce setting time of the concrete and to accelerating early strength. The amount of reduction in setting time varies depending on the amount of accelerator used.

Calcium chloride is a low cost accelerator, but specification often calls for a non-choride accelerator to prevent corrosion of reinforcing steel.

Retarding admixtures

Are often used in hot weather conditions to delay setting time. Many retarders also act a water reducer.

Fly Ash --- Aby product of coal burning plants. Fly ash can replace 15% - 30% of the cement in the mix. cement and fly ash together in the same mix make up the total cementious materials

* Fly ash improves workabillity
* Fly ash easier to finish
* Fly ash reduce the heat generated by the concrete.
* Fly ash costs 1/4 to 1/2 the amount of the cement it replaces.

Air Entraining Admixtures

Must be used whenever concrete is exposed to freezing and thawing. Air entraining agents entrains microscopic air bubbles in the concrete. When the hardened concrete freezes, the frozen water inside the concrete expands into these air bubbles instead of damaging the concrete. For example Vinsol resin and Dadex.

- Air entrainment improves concrete workabili
- Air entrainment improves durability.
- Air entrainment produces a more workable mix.

Water reducing admixtures - reduces the amount of water needed in the concrete mix. The water cement radio will be lower and the strength will be greater Most low range water reduces reduce the water needed in the mix by

5% - 10% High range water reducers reduce the mix water needed by 12% to 30% but are very expensive and rarely used in ~~the~~ residential work.

Chemical Admixture

Chemical admixtures are normally used to reduce the limitations of cement hydration, with example being: water reducer, superplasticizer retarder, accelerator, shrinkage preventer segregation reducer, and heat evolution reducer.

Q No 02

Define workability of concrete and factors affecting on workability ?

Ans Workability of concrete

Workability of concrete is the property of freshly mixed concrete which determines the ease and homogeneity with which it can be mixed, placed, consolidated and finished" as defined by ACI standard 116R-90 (ACI 1990b)

ASTM defines it as "that property determining the effort required to manipulate a freshly mixed quantity of concrete with minimum loss of homogeneity".

Factors Affecting Workability of concrete

1» Water content of the concrete Mix.

Water content will have influence on the workability in given volume of concrete. The higher the water content per cubic meter of concrete, the higher will be the fluidity of concrete, which affect the workability. Water requirement is mainly associated with absorption by aggregates surface & filling up the voids between aggregate.

However; Adding Extra water to the concrete Mix can be Disadvantage as Given below.

* The strength of the concrete may get reduced
* More quantity of water comes out from the suface of concrete resulting into bleeding.
* Cement slury also escapes through the joints of formwork resulting into the loss of cement from concrete.

2. The Size of Aggregates :

Workability is mainly governed by the maximum size of aggregate. water and paste require will be not less if a chosen size of aggregate for concrete is bigger. consequently, for a given quantity of water content & paste. bigger size aggregate will give higher workability. on the site, the maximum size of aggregate to be used will depend upon the many factors such as the handing mixing and placing equipment, the thickness of section and quantity of reinforcement.

3. The shape of Aggregate.

The shape of Aggregate Seriously Influences the workability of concrete.

* Angular, Flaky & elongated aggregate reduce the workability of concrete.

* Rounded or subrounded aggregate increase the workability due to the reduction of surface area for a given volume or weight. Therefore, an excess paste is available to given better lubricating effect.

* Rounded shape aggregate has less frictional resistance and gives a high workability as compared to angular, flaky or elongated aggregate.

4 Surface Texture of Aggregate.

The roughly textured aggregate have more surface area than smoothly rounded aggregates of the same volume. Smooth rounded or glassy aggregate will give better workability than roughly textured aggregate. A reduction of inter particle frictional resistance offered by smoth aggregates also contributes to higher workabily.

5 The Porosity of Aggregate.

Porous and non-satured aggregate will require more water than non-absorbent aggergate. For the same degree of workability. latter will require less water Overall, this factor is only of secondary importance.

6 Grading of Aggregate.

Grading of Aggregate has the greatest influence on workabily. The better the grading of aggregate. the less is the amount of void in concrete so well-graded aggregates should be used when total voids are less in concrete, the exess paste is available to give better lubricating effect.

With excess amount of concrete paste Present in the mixture, it becomes cohesive & fathy that Prevent segregation

of particles & least amount of compacting efforts is required to compact the concrete.

For a given workability, there is one value of coarse aggregate / Fine aggregate ratio, which needs the lower water content.

7. Uses of concrete admixtures.

This is on of the commonly used methods to enhance the workability of concrete. Concrete admixtures such as plasticizer and superplasticizers greatly improve the workabity. Air entraining agents are also used to increas the workability. Air entraining agents creats a large number of very tiny air bubbles. These bubbles gets distributed throughout the mass of concrete and act as rollers and increase the workabilitfy. Mineral admixture like Pozzolanic meterial are also used to improve the warkability of concrete.

8 Ambient Temperature..

In hot weather, if temperature increase, the evaporation rate of mixing water also increasing and hence fluid visocity increase, too. This phenomenon affects the flowability of concrete and due to fast hydration of concrete, it will gain strength earlier which decrease the workability of fresh concrete.

Q No 3

What are the properties of fresh concrete ? Explain in brief. ?

Ans:- Properties of fresh concrete:

Concrete remains in its fresh state from the time it is mixed untill it sets. During this time the concrete is handled, transported, placed and compacted. Properties of concrete in its fresh state are very important because the influence the quality of the hardened concrete.

The fresh concrete has the following Procedure.

- Consistency
- Workability
- Settlement & Bleeding
- Plastic Shrinkage
- loss of consistency.

1 Consistency :-

Consistency of a concrete mix is a measure of the stiffness or sloppiness or fluidity of the mix. For effective handling placing and compacting of concrete consistency must be the same for each batch, it is therefore necessary to measure consistency of concrete at regular intervels. slump test is commonly used to measure consistency of concrete.

2 Workability :-

The workability of a concrete mix is the relative ease with which concrete can be planced, compacted and finished without separation or segregation of the individual materials.

Workability is not the same thing as consistency. Mixes with the same

consistency can have different workabilities. if they are made with different size of stone - the smaller the stone the more workable the concrete.

it is not possible to measure workability but the slump test, together with an assessement of properties like stone content, cohesiveness and plasticity, gives a useful indication.

3 Settlement and Bleeding

Cement and aggregate particles have densities about three time that of water. In fresh concrete they consequently tend to settle and displace mixing water which migrates upwards and may collect on the top surface of the concrete. This upward movement of mixing water is known

as bleeding water that separates from rest of the concrete is called bleed water.

4 Plastic shrinkage

If water is removed from the compacted concrete before it sets, the volume of the concrete is reduced by the amount of water removed. This volume reduction is called plastic shrinkage.

Water may be removed from the plastic concrete by evaporation or by being absorbed by dry surface such as soil or old concrete or by the dry wooden from work.

Slump loss

From the time of mixing. fresh concrete gradually loss consistency. This gives rise to the problems only if the concrete becomes too stiff to handle, place and compact Property.

Slump loss in concrete is caused due to the following reasons.

* Hydration of cement (generating more heat)
* loss of water by evaporation
* Absorption of water by dry aggregate
* Absorption of water by surface in contact with the concrete.