ID :- 16703
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SECTION :- B (2nd Semester)
SUBJECT :- CONCRETE TECHNOLOGY
CLASS :- CIVIL ENGINEERING

Q. NO :- 01

(a) RETEMPERING OF CONCRETE :-

⇒ :- The process of remixing of water to concrete, in addition to required quantity of water is known as retempering of concrete. Sometimes, extra cement is also added while retempering.

⇒ :- Retempering is done owing to loss of workability undue stiffness of concrete at actual side in case of long tunnels, road construction etc where batching plant is few kilometers away.

(b) MIXING TIME :-

⇒ Mixers generally run at speed of 15-20 revolutions per minute.

⇒ Normally 25-30 revolutions are required for a well designed mixer to mix ingredients properly.

⇒ Mixing time is usually 1.5 to 2.5 minute and depends upon volumetric capacity of mixer.

⇒ Batching plant takes 12 minutes to load a transit mixer of 6m capacity.

Q:2 part (a)

⇒ According to ASTM :⇒

If we not cure any concrete it strength loss upto 60%

* Given:-

Expected loss = ?

Concrete Strength = 3000 Psi

Curing is not perform at all.

* Solution:-

$$\Rightarrow \frac{60}{100} \times 3000$$

Answer: 1800 psi loss in concrete occured due to no curing.

Q:2 part (b):

Membeane curing is 80% efficient as compared to water curing.

Q: 2 part (c)

⇒ RETROGRESSION OF STRENGTH:-

Retrogression of strength is defined as a change in the hydration products that are formed when cement is exposed to high temperatures (> 110°C / 230°F). It can be described as a decline of cement strength at elevated temperatures where decreased strength is observed with increasing time.

Q: 4

⇒ CREEP:-

Creep can be defined as the elastic and long-term deformation of concrete under a continuous load. Generally, a long term pressure changes the shape of concrete structure and the deformation occures along the direction of the applied load. When the continuous load is removed, the strain is decreased steain is equal to the elastic strain at

the given age.

⇒ FACTOR AFFECTING CREEP OF CONCRETE:

The factor that affect creep of concrete are similar to the factors affecting shrinkage which are as following:

(1) Water-Cement Ratio:

The rate of creep is increased with increasing water cement ratio.

(2) Humidity:

It is influenced by humidity and drying condition of the atmosphere

(3) Age of Concrete:

The rate of creep rapidly decreases with time. The time taken by a concrete structure to attained creep is 5 years

(4) Aggregate:

Aggregate with moisture movement and low elastic modulus cause a large amount of creep. The rate of creep generally decreases with the increase of the size of aggregates.

(5) Admixtures:

Some admixtures (mainly accelerators) are also responsible for causing creep in concrete.

DIFFERENCE BETWEEN CREEP AND STRAIN RELAXATION:

⊛ CREEP:

CREEP can be defined as the elastic and long-term deformation of concrete under a continuous load. Generally a long term pressure changes the shape of concrete structure and the deformation occurs along the direction of the applied load. When the continuous load is removed the strain is decreased immediately. The amount of the decreased strain is equal to the elastic strain at the given age.

⊛ STRAIN RELAXATIONS:

Stress relaxation is the observed decrease in stress in response to strain generated in the structure. This is primarily due to keeping the structure in a strained condition for some finite interval of time and causing some amount of plastic strain

Q: 3 part (c)

(*) BONDING BETWEEN STEEL AND CONCRETE:-

In a reinforced concrete structure the bond strength between concrete and steel is as important as the compressive strength of concrete. According to Neville

(1) "Bonding between concrete and steel is important both in terms of structural behaviour as in relation to cracking caused by shrinkage and thermal effects at early ages." ~~According~~ According to Araujo et al:

"it is usual the separation of bond strength in three parts, as adhesion, friction and mechanical interaction. This classification is based on stress vs displacement curves. Adhesion is the chemical union, friction arises when there is movement between the materials and the mechanical grip relates to mechanical gearing.

Q: 3 (b)

DIFFERENCE BETWEEN ATTRITION AND EROSION OF CONCRETE

① EROSION OF CONCRETE:

Erosion is the deterioration of concrete surface as a result of particles in moving water scrubbing the surface.

② ATTRITION TEST:

An attrition test is a test carried out a measure the resistance of a granular material to wear. An example of a material subjected to an attrition test are stones used in road construction, indicating the resistance of the material to being broken down under road traffic.

Q: 3 part (a)

Endurance Level:

Endurance (also related to sufferance, resilience, construction, fortitude and hardiness) is the ability of an organism to exert itself and remain active for a long period of time

as well as its ability to resist withstand, recover from and have immunity to trauma wounds or fatigue

⊛ ENDURANCE LEVEL OF CONCRETE AND STEEL:

Ramakrishnan et al (1989) defined the ~~ed~~ endurance level or limit of concrete as the stress level below which it can ~~be~~ withstand the threshold fatigue life of 2 million loading cycles. They observed that the sample which did not fail with in 2 million cycles, even sustained 4 million load cycle.

And Now

~~For~~ 0.35 to 0.60

For a large number of steels there is a direct correlation b/w tensile strength and fatigue strength highes-tensile-strength steels have highes endurance limits. The endurance limit is normally in the range of 0.35 to 0.60 of tensile strength.

Q.5

(*) DRYING SHRINKAGE:-

Drying shrinkage results from the loss of capillary water from the hardened cement mixture leading to contraction and crack formation with in concrete. According to the previous studies the addition of plant fibres such as sisal to cement mortar increases its drying shrinkage.

(*) PLASTIC SHRINKAGE:-

Plastic shrinkage is caused by the loss of water by evaporation from the surface of newly laid concrete or by suction of dry concrete underneath. At the surface, plastic shrinkage occurs when the rate of evaporation exceeds the rate of bleeding

* Not all drying shrinkage however is reversible. Initial drying when water is easily removed from large and medium capillaries and concrete is moving from it

P.T.O.

its plastic state to its hardened state is considered irreversible shrinkage and can account for up to 4% mass in the first 12 hours of drying.

Q 6 Part (b)

Sol:

Step #01

Slump = 50mm

Step #02 Max size of Aggregate = 25mm

Step #03

quantity of water = 180 kg/m³

Step #04

Average strength of concrete.

28 days of strength of concrete = x + y + 1.5

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= 0 + 3 + 1.5

= 18 MPa

we can use the 2nd ~~equation~~ $f_m = 18 + 3.5$ MPa

~~OR~~

~~$f_m = 1.1 \times 18 + 5$~~

~~= 24.8 MPa~~

P.T.O.

$$f_m = 18 + 8.5$$

$$\boxed{f_m = 26.5 \text{ MPa}}$$

OR

$$f_m = 1.1 \times 18 + 5$$

$$f_m \boxed{= 24.8 \text{ MPa}}$$

Probability of Air content = 1.5%.

Now step # 05

water content ratio = ?

From table 19.1

$$\boxed{w/c = 0.41}$$

Cement quantity $= w/w/c = \frac{180}{0.41}$

$= 439 \text{ kg/m}^3$

Step # 6

Quantity of course aggregate we can find from table 19.9.

C.A = 0.69

weight of C.A = 0.69×1600

$= 1104 \text{ kg/m}^3$

Step #07

Quantity of F.A By Volume method.

~~weight of C.A = 2.65 {~~

weight of C.A =

$$2.65 \left(1000 - \left(\frac{439}{3.15} + \frac{180}{1} + \frac{1104}{2.7} + 15\right)\right)$$

$$C.A = 2.65 \left(1000 - 139.3 - 180 - 408 - 15\right)$$

$$C.A = 2.65 \left(257.7\right)$$

$$\boxed{C.A = 682.9 \text{ Kg/m}^3}$$

Step #08

For 1% Absorbad $C.A = \frac{1}{100} \times 1104$

$C.A = 11.04 \text{ Kg}$

Step #09

For 2% moisture present in F.A that will

P.T.O.

added after mix $\frac{2}{100} \times 682.9 \text{ kg/m}^3$

$= 13.65 \text{ kg}$

(1) Net weight of water $= 185 + 13.65 - 11.04$

$= 187.61 \text{ kg}$

(2) Net quantity of C.A $= 1104 - 11.04$

$= 1092.95 \text{ kg}$

(3) Net quantity of F.A $= 682.9 + 13.65$

$= 696.56 \text{ kg}$

Final quantities

Cement $= 439 \text{ kg/m}^3$

C.A $= 1092.95 \text{ kg}$

F.A $= 696.56 \text{ kg/m}^3$

water $= 187.61 \text{ kg/m}^3$

Q NO#06 Part (a)

The concrete structure built in main conditions are always exposed to seawater either directly or indirectly the coastal and offshore structure are always in contact with seawater and there number of physical and chemical deterioration processes takes place so, concrete structure effected by seawater requires special attention.

The constituents of seawater ~~react~~ reacts chemically with constituents of concrete which result in several ways, the magnesium sulphate present in seawater react with calcium ~~sulphate~~ hydroxide of cement and forms calcium sulphate as well as magnesium hydroxide precipitation.

We can increase resistance of concrete by using those cement in which sulphate are present. if we can use sulphate attack cement in our concrete than we can increase resistance of concrete to seawater.