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Section B

Subject Concrete Technology

Department Civil Engineering

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Qno1(a). What is re-tempering of concrete? In which case is re-tempering of concrete done?

Ans(a): Retempering

is defined by as the “Addition of water and

remixing of concrete or mortar which has lost

enough workability to become unplaceable or

unsaleable.

2.The one and only reason for retempering of concrete is to regain the lost workability of fresh concrete to make it usable. The reason behind the workability loss is the delay between mixing of concrete ingredients and placing of concrete on actual site..

(B). What is the normal RPM of the agitator of a transit mixer? What is the minimum limitation of total revolutions of agitator in a transit mixer set by ASTM before concrete placement?

Ans(b):Agitating speed is usually about 2 to 6 revolutions per minute, and mixing speed is generally about 6 to 18 revolutions per minute. Mixing for long periods of time at high speeds, about 1 or more hours, can result in concrete strength loss, temperature rise, excessive loss of entrained air, and accelerated slump los.

ASTM Specifications C 94 power of 3 specify a minimum of 50 and a maximum of 100 revolutions of the drum or blades at mixing speed, with any additional mixing being done at agitating speed. Tests (31) have shown that the thoroughness of mixing resulting from 50 revolutions at 4 rpm is at least as good as that from 50 revolutions at 10 rpm..

Qno2.(a) what will be the expected loss in strength of 3000psi concrete if it curing has not been performed at all?

Ans(a):

Hydration is not an instantaneous process. Water is required for hydration reaction to achieve 100 percent.

If curing is not done, there is water deficiency which causes insufficient hydration. As a result there will be capillary pores which won’t be segmented, causing cracks and shrinkage in the long run.

Thus the concrete if not cured results in poor strength development and lower durability and 3000 psi strength could be decreased upto 50% ...

(B) What is the percentage efficiency of membrane curing as compared to water curing?

Ans(b): Using membrane curing and saturated wet covering, one can achieve 80 to 90% efficiency (in terms of compressive strength) as compared to conventional water immersion method. Saturated wet covering is suitable for pavement structure but not suitable for vertical structures or high rise structures.

(C) What is meant by retrogression of strength in concrete? Which method of curing promotes retrogression in concrete strength?

Ans (c): Strength retrogression 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.

It has been emphasized that a very young concrete should not be subjected suddenly to high temperature. Certain amount of delay period on casting the concrete is desirable. It has been found that if 49°C is reached in a period shorter than 2 to 3 hours or 99°C is reached in less than 6 to 7 hours from the time of mixing, the gain of strength beyond the first few hours is effected adversely. Concrete subjected to steam curing exhibits a slightly higher drying shrinkage and moisture movement. Subjecting the concrete to higher temperature may also slightly effect the aggregate quality in case of some artificial aggregate. Steam curing of concrete made with rapid hardening cement will generate a much higher heat of hydration..

Qno3(a) What do you mean by endurance level? What is the endurance level of concrete and steel?

Ans(a): Endurance limit (Se) is the stress level below which a specimen can withstand cyclic stress indefinitely without exhibiting fatigue failure. ... Endurance limit is also known as fatigue limit.

The endurance limit of concrete (EL2 ) can alsobe defined as the flexural fatigue stress at which the beamcould withstand 2 million cycles of nonreversed fatigue loading, expressed as a percentage of its modulus of rupture.

 For a large number of steels, there is a direct correlation between tensile strength and fatigue strength; higher-tensile-strength steels have higher endurance limits. The endurance limit is normally in the range of 0.35 to 0.60 of the tensile strength..

(B). What is the difference between attrition and erosion of concrete?

Ans(b): Attrition: Attrition test is a test carried out to 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..

Erosion: Erosion is a mechanical damage of concrete which is frequently associated with corrosion. Marine concrete is the ideal example of such damage. With this corrosion effects, erosion is happened when mechanical damage to concrete is occurred by the waves of water with gravel and sand carried by them.

(C) What steps should be taken to improve bond strength of reinforcement in concrete?

Ans (c) The bond between concrete and reinforcement steel bars is affected by the surface condition of the rebar and the formulation of concrete. The surface condition as rust oil polluting are sometimes studied as well as the effects of testing procedures.A very good bond between concrete and steel is often observed in the case of a practical application of alkali-activated concrete. The bond is so tight that it can cause problems during the de-moulding of alkali-activated concrete from steel moulds. This might mean that the bond strength between AAC and steel is much better that that between Portland cemenent..

Qno4: What is creep? What are the factors affecting creep? What difference between creep and strain relaxation?

Ans: Concrete creep is defined as: deformation of structure under sustained load. Basically, long term pressure or stress on concrete can make it change shape.

Factors Affecting Creep

Aggregate

Mix Proportions

Age of concrete.

wo terms are sometimes used interchangeably, although they are really different. Creep is an increase in plastic strain under constant stress. Stress relaxation is a decrease in stress under constant strain. ... Creep is an increased tendency toward more strain and plastic deformation with no change in stress.

Creep is an increase in plastic strain under constant stress. Stress relaxation is a decrease in stress under constant strain. ... Creep is an increased tendency toward more strain and plastic deformation with no change in stress.

Creep and shrinkage of concrete are two physical properties of concrete. The creep of concrete, which originates from the calcium silicate hydrates (C-S-H) in the hardened Portland cement paste (which is the binder of mineral aggregates), is fundamentally different from the creep of metals and polymers. Unlike the creep of metals, it occurs at all stress levels and, within the service stress range, is linearly dependent on the stress if the pore water content is constant. Unlike the creep of polymers and metals, it exhibits multi-months aging, caused by chemical hardening due to hydration which stiffens the microstructure, and multi-year aging, caused by long-term relaxation of self-equilibrated micro-stresses in the nano-porous microstructure of the C-S-H. If concrete is fully dried, it does not creep, but it is next to impossible to dry concrete fully without severe cracking.

Qno5: What is the difference between drying shrinkage and plastic shrinkage? Is drying and plastic shrinkage reversible?

Ans: If the volume reduction occurs before the concrete hardens, it is called plastic shrinkage. The volume reduction that occurs primarily due to moisture loss after the concrete has hardened is known as drying shrinkage.

Some contractors find that plastic shrinkage cracks can be prevented in hot dry climates by spraying an evaporation retardant on the surface behind the screeding operation and following floating or troweling, as needed, until curing is started. Start curing the concrete as soon as possible.

Qno6(a) What are risks to concrete structure exposed to sea water? How do you increase resistance of concrete to sea water?

Ans(a): It increases the risk of corrosion of the embedded reinforcing steel, if the structure is to be exposed to air in service. The most damaging effect of seawater on concrete structures arises from the action of chlorides on the steel reinforcement and the build up of salts.

To improve durability of concrete structure which are exposed to marine conditions,

Cement with low C3A content should be preferable to make concrete.

Prepare rich concrete with low water cement ratio which makes the concrete impervious. Then the pores in concrete are very small and they cannot hold seawater results in the prevention of expansion by freezing of water and crystallization of salt in the pores.

The concrete is of low water cement ratio. To make it workable for construction, Water reducing admixtures can be added to the concrete which is recommended by ACI 318 and ACI 357.

The admixtures should not contain chloride in any form otherwise corrosion of reinforcement takes place.

Adequate cover should be provided for reinforcement in concrete structure to enhance durability.Good compaction and well-made construction joints in the structure helps the concrete structure to withstand against expansion caused by seawater.

Use of pozzolanic material in the preparation of concrete is good against salt water.

For better durability, High pressure steam cured concrete elements can be used for construction of structure in marine conditions.

Both ACI 318 and ACI 357 recommended that suitable air entraining agents can be used to prevent the effect of seawater on concrete.

Aggregates used for making concrete should be thoroughly washed with fresh water to reduce the chloride ion concentration in it..

Qno6(b) Concrete is required for the internal columns of a building. The specified 28 days strength is (x+y+15) MPa (where x and y are the last two digits of your Roll no. ) The following equations may be used to find average compressive strength

 Fm= fmin+7 for fmin < 21 MPa

. The slump required is 50mm and a maximum size of 25mm is required. The fine aggregate has a Fineness modulus of 2.60. Preliminary tests indicate that FA and CA have a specific gravity of 2.65 and 2.7, with 1 percent absorption in C.A and 2% free moisture in F.A. The Bulk density of C.A is 1600 kg/m³. Find the required quantities of ingredients.

Ans(b): 

