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Membrane Curing Of Concrete

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Abstract — *Curing is the process of controlling the rate and extent of wetness loss from concrete during cement hydration. It may has been placed in position during the manufacture of concrete products. Curing must be undertaken for reasonable period of time if the concrete is to achieve its potential strength and durability. Curing is important if concrete is to perform its in-tended function over the design life of the structure whereas; excessive curing time may lead to the escalation of construction cost of the project and unnecessary delays. Curing by preventing excessive loss of moisture from the concrete: either by leaving formwork in place covering the concrete with impermeable membrane after the formwork has been removed by the application of suitable chemical curing agent (wax) or by combination of such methods Curing by continuously wetting the exposed surface prevents the loss of moisture from it. Ponding or spraying the surface with water these methods are typically employed to this end.*

I. INTRODUCTION

Curing is the process of controlling the rate and extent of wetness loss from concrete during cement hydration. It may has been placed in position during the manufacture of concrete products, thereby providing time for the hydration of the cement to occur. Since the hydration of cement does take time, days, and weeks rather than hours, curing must be undertaken for reasonable period of time if concrete is to achieve its potential strength and durability. Curing may also encompass control of temperature since this affects the rate at which cement hydrates. Curing,it is a process of controlling the rate and extent of moisture loss from concrete during cement hydration. In order to obtain good quality concrete, an appropriate mix [1, 2]. Curing must be undertaken for reasonable period of time if the concrete is to achieve its potential strength and durability. Curing is essential if concrete is to perform its in-tended function over the design life of the structure whereas; excessive curing time may lead to the rapid up construction cost of the project and unnecessary delays. Curing embraces the control of temperature as it affects the hydration rate in cement. If within the curing period, natural temperatures of concrete are in the acceptable range of values,then only moisture content needs to be controlled. If the natural temperature is outside the acceptable range of values, some mean sill be required for controlling the temperature of concrete [3, 4]. The curing of concrete is performed both at normal and elevated temperatures also. Curing can be done in number of ways while the most appropriate means of curing may be dictated by the site conditions or the construction method.

II. LITERATURE REVIEW

Allowing to ACI Committee 308, normally used actual ring methods can be separated into two categories: (1) the “water-adding” procedure, which delivers existing with water or moisture continuously or frequently through water ponding, fogging, scattering, steaming, or casing with soaking material; and (2) the “water-recollecting” technique, which prevents unnecessary infection and water damage from the existing by means of sealing resources, such as plastic sheets, or by presentation of casing-forming curing compounds to the freshly placed concrete. Through the years, concrete curing practice has changed; in many cases it has shifted from “water-adding” to “water-retaining” (Gowripalanet al., 1990). ASTM C 309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.This standard is issued under the fixed designation C 309; the number immediately following the designation indicates the year of original application or, in the case of revision, the year of last revision.This specification covers liquid membrane-forming compounds suitable for application to concrete surfaces to reduce the loss of water during the early-hardening period. White pigmented membrane-forming compounds serve the additional resolution of reducing the temperature rise in concrete open to radiation from the sun. The membrane-forming compounds covered by this specification are suitable for use as curing media for fresh concrete, and may also be used for further curing of concrete after removal of forms or after initial moist curing.

III. METHODS OF CURING CONCRETE

Curing can be described as keeping the concrete moist and warm enough so that the hydration of cement can be continue, It also can be described as the process of maintaining a satisfactory moisture content and favorable temperature in

concrete during period immediately following placement, so the hydration of cement may continue until the desired properties are developed to a sufficient degree to meet the requirement of service.

If curing is neglected in early period of hydration, quality of concrete will experience a sort of irreparable loss. An efficient curing in the early period of hydration can compared to good and healthy feeding given to a new born baby.

Methods of Curing Concrete

Concrete curing methods may be divided broadly into four categories:

1. Water curing
2. Application of heat
3. Miscellaneous
4. Membrane curing

3.1 WATER CURING

This is the best method of curing as it satisfies all the requirements of curing, namely, promotion of hydration, removal of shrinkage and absorption of the heat of hydration. If the membrane method is adopted, it is desirable that a certain extent of water curing is done before the concrete is covered with membranes. Water curing can be done in the following ways:

3.1.1 Immersion

Fig 1: Immersion curing

3.1.2 Ponding

Fig 2: ponding curing

Concrete curing with ponding method

Ponding method is a popular and widely used concrete curing method. Concrete is healed by storing water on the horizontal plane i.e. slab, roof, road etc. After concrete casting, the surface is covered with canvas. After 24 hours, the canvas is removed and water is filled in small rectangular panels. A boundary is given in all the 4 sides so that the water

cannot flow and stored so that the concrete beneath the water is cured appropriately. Ponding curing method is better than the others but it becomes hard to clean after curing is finished.

Advantages

1. Better method compared to others in most conditions.
2. Advantageous for horizontal surface.
3. Helps in cement hydration process.

Disadvantages

1. Ponding method cannot be used in vertical surface.
2. Again, this method requires good amount of water.
3. After concrete curing is finished, it is difficult to clean the surface.

3.1.3 Spraying or Fogging

Fig3: Spraying or fogging curing

Sprinkler concrete curing

This concrete curing method requires huge amount of water. In this method, water is applied to the concrete after an interval of time. The water should be continuously applied so that the concrete does not dry out.

Advantages

1. Concrete never dries as water is applied frequently.
2. This method can be used in any surface i.e. horizontal, vertical.

Disadvantages

1. This method requires huge amount of water, so it is a bit costly.
2. Ponding method

3.1.4 Wet Covering

Fig 4: Wet curing

The precast concrete items are normally submerged in curing tanks for a certain duration. Pavement slabs, roof slab etc. are covered under water by making small ponds. Vertical retaining wall or plastered surfaces or concrete columns etc. are cured by spraying water. In some cases, wet coverings such as wet gunny bags, hessian cloth, jute matting, straw etc., are wrapped to vertical surface for keeping the concrete wet. For horizontal surfaces saw dust, earth or sand are used as wet covering to keep the concrete in wet condition for a longer time so that the concrete is not unduly dried to prevent hydration.

3.2 APPLICATION OF HEAT

The development of strength of concrete is a function of not only time but also that of temperature. When concrete is subjected to higher temperature it quickens the hydration process resulting in faster development of strength. Concrete cannot be subjected to dry heat to accelerate the hydration process as the presence of moisture is also an essential essential. Therefore, subjecting the concrete to higher temperature and maintaining the required wetness can be achieved by subjecting the concrete to steam curing.

Steam curing at high pressure

Steam is applied in small precast members and the concrete takes less time to cure properly. In this concrete curing method, the curing process is aggregated above 22°temperature. You can check this article for preferred concrete curing temperature under different condition.

Advantages

1. Concrete curing time is less than the others
2. Steam curing is better in cold weather.
3. In small precast members, this method is advantageous.

Disadvantages

1. Steam curing method cannot be applied in large surface.
2. It is costly as curing is done in temperature above 22°C.

3.3 MISCELLANEOUS METHODS OF CURING

Calcium chloride is used either as a surface coating or as an admixture. It has been used adequately as a curing medium. Both these methods are based on the fact that calcium chloride being a salt shows similarity for moisture. The salt not only absorbs dampness from atmosphere but also retains it at the surface. This moisture held at the surface prevents the mixing water from evaporation and thereby keeps the concrete wet for a long time to stimulate hydration. Formwork prevents escaping of moisture from the concrete, mainly, in the case of beams and columns. Keeping the form work essential and sealing the joint with wax or any other sealing compound prevents the evaporation of moisture from the concrete

3.4. MEMBRANE CURING

Sometimes, concrete works are carried out in places where there is acute scarcity of water. The excessive application of water for water curing is not possible for reasons of economy. Curing does not mean only application of water; it means also formation of conditions for advancement of continuous and progressive hydration. It is also pointed out that the quantity of water, normally mixed for making concrete is more than sufficient to hydrate the cement, provided this water is not allowed to out from the body of concrete. For this reason, concrete could be covered with membrane which will effectively seal off the evaporation of water from concrete.

Large numbers of sealing compounds have been developed in recent years. The idea is to obtain a endless seal over the concrete surface by means of a strong impervious film to prevent moisture in concrete from escaping by evaporation. Some of the materials, which can be used for this purpose, are bituminous compounds, polyethylene or polyester film, waterproof paper, rubber compounds etc. When waterproofing paper or polyethylene film are used as membrane, care must be taken to see that these are not perforated anywhere and also see whether adequate lapping is given at the junction and this lap is effectively sealed.

IV. CONCLUSIONS

- To conserve water in summer seasons or in the regions of water scarcity,curing techniques can be adopt so as to reduce the water consumption as much as possible.
- The membrane produced, unlike other curing technics, not only it provides the hydration but also provides protection to the surface exposure of concrete thus it gives dual function and very helpful in humid regions and can be chosen over other techniques.
- Further research can be made to make it possible to use such compound for membrane curing which can be obtained easily and in a cost efficient way along with affecting less to the actual strength of the concrete, thus eliminating its only drawback of being expensive than other methods.
- Using Membrane curing and Self-Curing methods one can achieve 90% of productivity as compared to Conventional Curing method specially in columns and inaccessible areas. Membrane curing compounds are most practical and widely used method, it the is most suitable in water scarce area.
- The average efficiency of curing compound increases with curing age initially by reducing at later age.

V. REFERENCES

[1] C.C.Rhodes,J.R.Evans,"An appraisal of the membrane method of curing concrete pavements", engineering experiments station bulletin 108.

[2] ASTM Designation: C 309 – 03 "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete".

[3] Investigation into Improved Pavement Curing Materials and Technique : Part 1 (Phases I and II) Iowa DOT Project TR-451 CTRE Project 00-77.

[4] Dr.K.V.Krishna Reddy,"A Comparative Study on Methods of curing Concrete-Influence of Humidity", international journal of engineering research and applications (IJERA) ISSN: 2248-9622 Vol 3,Issue3,May June 2013 ,pp 1161-1165

