

# Concrete Curing Method

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***Abstract- Efficient uninterrupted curing is the key to quality concrete. Proper curing of concrete is crucial to obtain design strength and maximum durability. The curing period depends on the required properties of concrete, the purpose for which it is to be used, and the surrounding atmosphere namely temperature and relative properties humidity. Curing is designed primarily to keep the concrete moist, by preventing the loss of moisture from the concrete during the period in which it is gaining strength. Curing may be applied in a number of ways and the most appropriate means of curing may be dictated by the site or the construction method. The present paper is directed to evaluate effectiveness of different curing methods and study the influence of climate on the strength of concrete. The properties of hardened concrete, especially the durability, are greatly influenced by curing since it has a remarkable Effect on the hydration of the cement.***

## I. INTRODUCTION

Curing is the name given to the procedures used for promoting the hydration of the cement, and consists of a control of temperature and of moisture movement from and into the concrete. Curing allows continuous hydration of cement and consequently continuous gain in the strength, once curing stops strength gain of the concrete also stops. Proper moisture conditions are critical because the hydration of the cement virtually ceases when the relative humidity within the capillaries drops below 80% with insufficient water, the hydration will not proceed and the resulting concrete may not possess the desirable strength and permeability. The continuous pore structure formed on the near surface may allow the ingress of deleterious agents and would cause various durability problems.

Concrete is the key material used in various types of construction. The quality of concrete is defined by its strength and durability. The compressive strength of concrete is one of the most important and useful properties that quantify the quality of concrete. For concrete, to gain the required strength, hydration of

cement in the mix must be complete. Proper hydration of cement ensures good quality concrete with sufficient strength. For proper hydration to occur, fresh concrete must be placed in a favorable environment.

## II. LITRATURE REVIEW

In literature review we have studied that concrete curing is also done by not only the conventional water curing but also various methods. The article we have studied that due to lack of water for curing and we know that curing is most important part of the concrete because whenever curing is done then the strength of concrete and also life the concrete is done properly. But now a days due to lack of water the different methods are used for curing of concrete and also in this report we have to studied the “Concrete curing by Different Methods”.

## III. CURING CONCRETE

Curing is defined as “maintenance of a satisfactory moisture content and temperature in the concrete for a period of time immediately following placing and finishing so that the desired properties may develop.” Since the strength and durability properties of concrete are set by the chemical reactions of the various components during the hydration process, there are three key factors to proper curing.

- Moisture – Having sufficient moisture to ensure the hydration process continues
- Temperature – Maintaining a sufficient temperature ( $\geq 10^{\circ}\text{C}$ ) to ensure that the chemical reaction continues
- Time – Maintaining both the moisture and temperature requirements for a minimum period of time (3 – 7days – See CSA A23.1 – Table 20) to ensure that the durability properties fully develop. Curing needs to be initiated as soon as the finishing operations are complete and the surface will not be damaged

### 3.1 General Notes Regarding Concrete Curing

- Alternating cycles of wetting and drying during the curing process is extremely harmful to the concrete surface and may result in surface crazing and cracking. This should be avoided at all costs.
- A 28 day air drying period is recommended immediately following the 28 day curing period to provide the necessary freeze/thaw resistance for the concrete. Curing methods that result in fully saturated concrete, which will be exposed to freeze/thaw cycles once the curing period is over, may result in premature deterioration of the concrete (even if the concrete is properly air entrained).
- Concrete with low W/CM ratios ( $\leq 0.40$ ) may not have sufficient free moisture in the mix to allow for the use of “moisture loss prevention” curing methods. This situation should be reviewed prior to the start of the project.

## IV. CURING METHODS AND MATERIALS

Concrete can be kept moist (and in some cases at a favorable temperature) by three curing methods:

- Methods that maintain the presence of mixing water in the concrete during the early hardening period. These include ponding or immersion, spraying or fogging, and saturated wet coverings. These methods afford some cooling through evaporation, which is beneficial in hot weather.
- Methods that reduce the loss of mixing water from the surface of the concrete. This can be done by covering the concrete with impervious paper or plastic sheets, or by applying membrane-forming curing compounds.
- Methods that accelerate strength gain by supplying heat and additional moisture to the concrete. This is usually accomplished with live steam, heating coils, or electrically heated forms or pads. The method or combination of methods chosen depends on factors such as availability of curing materials, size, shape, and age of concrete, production facilities (in place or in a plant), aesthetic appearance, and economics. As a result, curing often involves a series of procedures used at a particular time as the concrete ages. For example, fog spraying or plastic covered wet burlap can

precede application of a curing compound. The timing of each procedure depends on the degree of hardening of the concrete needed to prevent the particular procedure from damaging the concrete surface (ACI 308 1997).



Fig.1 Fogging minimizes moisture loss during and after

### 4.1 Ponding And Immersion

On flat surfaces, such as pavements and floors, concrete can be cured by ponding. Earth or sand dikes around the perimeter of the concrete surface can retain a pond of water. Ponding is an ideal method for preventing loss of moisture from the concrete; it is also effective for maintaining a uniform temperature in the concrete. The curing water should not be more than about 11°C (20°F) cooler than the concrete to prevent thermal stresses that could result in cracking. Since ponding requires considerable labour and supervision, the method is generally used only for small jobs. The most thorough method of curing with water consists of total immersion of the finished concrete element. This method is commonly used in the laboratory for curing concrete test specimens. Where appearance of the concrete is important, the water used for curing by ponding or immersion must be free of substances that will stain or discolor the concrete. The material used for dikes may also discolor the Concrete.

Ponding or immersion is a curing method wherein the flat concrete surfaces such as slabs and Pavements are cured by ponding of water around the perimeter of the surface with the help of sand dikes. It is an effective method as it maintains a uniform temperature in the concrete and also prevents the loss of the

moisture from the concrete. This method issued in laboratory experiments wherein the Specimens are dipped in water after 24 hours of casting. The specimens are than tested for the Strength after 7 and 28 days. Since ponding require considerable supervision and labour, this method is generally used for small construction activity only.



Fig. 2 Ponding method of curing

#### V. CONCLUSION

- Conventional water curing is the most efficient method of curing as compared to all these method.
- Curing of concrete is mostly governed by two parameters Temperature and Period.
- Water curing is most practical and widely used curing method. In this review paper effort has been made to understand the working and efficiency of curing methods which are generally adopted in the construction industry and compared with the conventional water curing method.
- The new methods of curing are not economical but where wants to achieve greater strength then these methods are adopted.
- These methods are uneconomical that's why it is adopted when big project are build and strength will as compared to normal projects.

#### VI. SCOPE OF THESE TECHNIQUES OF CONCRETE CURING

As we know that conventional curing is done by the water only the method is only used is conventional water curing by ponding method but now a days the rainfall intensity goes decreasing that's why the that techniques are used for concrete curing. Whenever the water is not available so easily and we want the more

strength as early as possible then these techniques are more suitable than the water curing method

#### REFERENCES

- [1] Fauzi, M., 1995. The Study on the Physical Properties of Surface Layer Concrete under the Influence of Medium Temperature Environments. Ph.D. Thesis, Kyushu University, Japan.
- [2] Neville, A.M., 1996. Properties of Concrete, Fourth and Final Edition. John Wiley and Sons, Inc., New York, USA.
- [3] Bentz, D. P., Snyder, K. A. and Stutzman, P. E., 1997, "Hydration of Cement: The Effects of Curing Conditions", Proceedings of the 10th International Congress on the Chemistry of Cement, Gothenburg, Sweden, June 2-6, 1997, Vol.2.
- [4] Wang, J., Dhir, R. K. and Levitt, M., 1994, "Membrane Curing of Concrete: Moisture Loss", Cement and Concrete Research, 1994, Vol. 24, No. 8, pp. 1463-1474.
- [5] Chapter 12 "Curing Concrete", University of Memphis
- [6] Md. Safuddin, S.N. Raman and M.F.M. Zain, 2007, "Effect of Different Curing Methods on the Properties of Micro silica Concrete", Australian Journal of Basic and Applied Sciences, 1(2): 87-95, ISSN 1991-8178.