

Advanced Water Curing For Concrete

¹ Zeeshan Moinoddin Masuldar, ² Rahul D. Pandit, ³ Dr. Abhijeet P. Wadekar,
^{1,2,3} Department of civil Engineering, P.E.S.College of Engineering Aurangabad

Abstract : This experimental research paper proposes to focus on different types of curing technique, these are as Dessert bags water curing in different pattern and normal water spread curing for concrete. Various shaped bags are manufactured in shop by stitching manually. For making these bags different types materials are selected as based on their respective properties. Special designed bags for curing are used for Residential and commercial reinforced concrete structural members e.g. Beam, column, Slab & walls for different grades of concrete. Concrete are cured for 28 days and at last measured compressive strength for all members and all curing types by using non destructive testing methods (NDT). All curing types' results are compared for compressive strength. At last the concrete cured by using Dessert bags models gave more strength as compared to normal water spread curing.

Keywords : Curing, Concrete Structure, Compressive Strength.

Introduction

Concrete is most important construction material for manufacturing different types of RCC structures. For making high rise buildings, bridges, dams or any other big structure basic importance is to maintain grade of concrete precisely. The negligible careless in manufacturing, transporting and placing of concrete can make big damage to structural body. But, Generally concrete achieve its strength after some days curing, that's why proper curing of concrete is very important parameter.

For concrete curing there are various methods are available as like follows

i. Shading of Concrete

This is an process of shading concrete work is to prevent an evaporation of water from the surface which is adopted mainly in case of large concrete surfaces such as road slabs etc. This process is essential in dry weather to protect the concrete from heat to avoid direct sun rays and wind to concrete surfaces. It also protects the surface from rain.

ii. Covering concrete surfaces with hessian or gunny bags

This is a widely used method for concrete curing. Thus exposed surface of concrete is covering with hessian, canvas or empty cement bags. The covering over vertical and sloping surfaces should be cured properly. These are periodically wetted.

iii. Sprinkling of water

Sprinkling continuously on the concrete surface provides an efficient curing. It is mostly used for curing floor slabs, beam, columns, walls etc. The concrete should be allowed to set sufficiently before sprinkling is started i.e. minimum 24 hours from casting period.

iv. Ponding method

This is the best method of water curing. It is suitable for curing horizontal surfaces such as floors, roof slabs, roads. The horizontal top surfaces of wide beams can also be ponded. After placing the concrete, its exposed surface is first covered with moist hessian or canvas. After 24 hours, these covers are removed and small ponds of clay, sand or lean concrete are built across and along the pavements.

v. Membrane curing

It is one of the most important method of curing. It is one of the method of curing is to cover the wetted concrete surface by a layer of water proof material, which is kept in contact with the concrete surface for seven days. This method of curing is termed as membrane curing

vi. Steam curing

Steam curing and hot water curing is sometimes adopted in cold areas. With these methods of curing, the strength development of concrete is very rapid and faster work take place. Generally, these methods are used in pre cast concrete work

REVIEW OF LITERATURE

Mazen J. Al-Kheetan et.al.[1] Concluded that the permeability of concrete is reduced because of crystalline waterproofing material

followed by curing agent. A considerable loss of strength is observed in concrete which is with crystallizing material and cured with water based compound in any of curing condition. It is observed that loss of strength in adverse curing condition is less than that of normal curing condition. Magda I. Mousa et.al.[2] in his paper he concluded that mechanical properties of concrete is improved by using self curing agent in concrete and the bond between cement paste and aggregates is more. the self curing agent for improvement of mechanical properties of concrete is of chemical type (polyethylene-glycol). It observed that the mechanical properties of concrete should increase by increasing cement content and decreasing w/c ratio in concrete. H.T. Tai Nguyen [3] Number of result are obtained in the research in asphalt concrete storage time at a large temperature also plays a very important part in increasing the engineering properties of asphalt concrete. on the mechanical properties of asphalt concrete Ageing has a important effect but the effect is still insignificant. Mohamed G. Mahdy et.al. [4] did his research in concrete mixes for the use of self-curing agent (saturated leca) up to 15% of volume of sand improves the physical properties of concretes under dry-air curing regime which gives better internal curing provides continuation of the hydration process of cement. His results observed a greater improvement took place in the physical properties for self-curing concrete with poly-ethylene glycol as self-curing agent. Nurcan Ozakar et.al. [5] did an experiment and the aim of this study was to evaluate the effect of different veneering materials, light-curing units and curing times on the microhardness of dual-cured resin cement and the result obtained significant differences in microhardness resulting from the different curing units. Ahmed Shaban et al. [6] reseches for recycled concrete aggregate is used in new concrete production is good utilization of concrete waste. He did an experimental study and got result to evaluate the effects of recycled concrete aggregate under different curing conditions (Sprinkling, curing with gunny bags), the best ratio of recycled aggregate to natural aggregates is the mixing ratio of 50%. Katarzyna Łaskawiec et al. [7] did research work to determine appropriateness and way to include durability requirements in designing of curing class and It was concluded that early phase curing is final for the development of durability parameters of concrete.

2. MODEL DETAILS

Various models are prepared for curing of beams, column, Rcc wall.

- 1) Required cloth for making desert water bags. 2) flexible pipe. 3) Pvc pipe.
- 4) Pvc T-section, Elbow section. 5) Sponj.



2. Model Making

Building Element	Size
1) RCC Wall of ht. 1.5m	1.8 m X 1.5 m
2) Beam of size 230 X 450	1.2 m X 1.5m
3) Column of size 230 X 450	1.8 m X 1.5m

2.1 Steps For Making Models:

- 1)A required size of model are made using the cloth number of water bags are prepared. Precaution must be taken while stitching that stitching is done properly. The cloth are devided into number of water bags.
- 2) PVC T-section and Elbow section are laid on the model. By taking proper distances between two water bags flexible pipe is cut and attached to the t-section and elbow section.

3. Results:

- 1) The analysis should be taken by comparing the two column which one is cured by normal curing method and another is cured by advanced curing method.
- 2) Rebond Hammer test was performed on both the column and strength should be checked at different points.

3) Strength obtained for 7 days and 28 days of M25 grade on column which is cured by normal curing method and another which is cured by advance curing method is in given table.

Rebond Hammer Test for 7 days

Model	Rebond Hammer test	Normal Curing Method.	Advance Curing Method
Model 1	1	15.15	17.45
	2	16.10	16.30
	3	14.20	19.10
	4	15.75	18.60
	5	13.80	17.60
	6	15.50	18.25
	7	14.25	18.90

Rebond Hammer test for 28 days

Model	Rebond Hammer test	Normal Curing Method.	Advance Curing Method
Model 1	1	17.20	22.80
	2	20.60	23.30
	3	18.80	23.90
	4	18.90	21.80
	5	19.30	22.40
	6	19.80	23.30
	7	20.20	22.70

4. Conclusions

The purpose of the study is to check the strength development in any building element by applying normal curing method like sprinkling of water, covering with gunny bags, etc. and advanced curing method for concrete. The results obtained from the analysis proves Advanced curing of concrete as an excellent method of curing in construction industry. The model prepared and applied on column is shows that strength obtained is much more than column cured by normal curing methods. The most important result is that continuous curing occurred. It is proved by using rebond hammer test the strength of building element which is cured by advanced curing method is more than cured by normal curing method.

5. References :

- 1) S. Klinge , A. Bartels a, P. Steinmann b, “Modeling of curing processes based on a multi-field potential. Single- and multi scale aspects”, International Journal of Solids and Structures Vol. 49, May 2012, pp. 2320–2333.
- 2) Manish A. Kewalramani, “Environmentally Sustainable Concrete Curing with Coloured Polythene Sheets” ICCEN Stockholm, Sweden. December 2013, Vol. 9, pp.241-246.
- 3) Abdullah M. Zeyad. “Effect of curing methods in hot weather on the properties of high strength concretes” Journal of King Saud University – Engineering Sciences, April 2017, pp. 357-368.
- 4) Ulku Sultan Yilmaz. “Microbial carbonate precipitation in construction materials: A review”, Ecological Engineering, August 2014, Vol. 36(2), pp. 118–136.
- 5) Silvia Weber AHans W. ReinhardtA. “importance of curing in construction”. International Conf., Cape Town, 24–26 November, London. Vol.71 Pp. 777–781.
- 6) Yash Nahata, by Elsevier B.V. “Selection n peer review under responsibility of asia pacific, Biological n Environmental Engineering Society”. Vol. 9 Sep 2014 pp. 222 – 229.