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Study of Self Curing Concrete

Leena A. Warkade[1], Dhanraj B. Khond[2], Bhagwat V. Chaware [3], Vaibhav V. Rathod[4]
Ayush G. Malpani[5]
[5] *Asst. Prof., Civil engg. Dept., Pankaj Laddhad Institute of Technology and Management Studies, Buldana.*
[1,2,3,4] *Students of civil engg. Department, Pankaj Laddhad Institute of Technology and Management Studies, Buldana.*
Email: linawarkade@gmail.com[1] , dhanrajkhond123@gmail.com[2] , bhagwatchaware1619@gmail.com[3] , vaibhavrathod1995@gmail.com[4], ayushmalpani39@gmail.com

Abstract- Concrete is very important and most popular due to its good compressive strength and durability. It is necessary to gain strength in structures. Conventional concrete is the mixture of cement, fine aggregate, coarse aggregate and water, needs curing to achieve strength. So it is required to cure for a minimum period of 28 days for good hydration and to achieve target strength. Lack of proper curing can badly affect the strength and durability. Self-curing concrete (internal concrete) is a type of modern concrete, which cure itself by retaining water (moisture content) in it. The present paper involves the use of shrinkage reducing admixtures like POLYETHYLENE GLYCOL (PEG 400) as internal curing compound .This curing admixture used in concrete which help in self curing and help in better hydration and good compressive strength. They trap the moisture within the structure and prevent it from evaporation which normally occurs due to the hydration process. In this study the percentage of PEG by weight of cement from 0% to 2% as the dosage of internal curing compound was fixed. It is found through this experiment study that PEG 400 help in self curing by giving strength with the conventional curing method and also improved workability.

Index Terms- Self Curing Concrete, Internal Curing, Polyethylene Glycol

1. INTRODUCTION

Proper curing of concrete structures is important to meet performance and durability requirements. In conventional curing this is achieved by external curing applied after mixing, placing and finishing. Self-curing or internal curing is a technique that can be used to provide additional moisture in concrete for more effective hydration of cement and reduced self-desiccation.

The concept of self-curing agents is to reduce the water evaporation from concrete, and hence increase the water retention capacity of the concrete compared to conventional concrete. It was found that water soluble polymers can be used as self-curing agents in concrete.

2. METHODS OF SELF CURING

There are two major methods available for internal curing of concrete.
The first method uses saturated porous lightweight aggregate (LWA) in order to supply an internal source of water, which can replace the water consumed by chemical shrinkage during cement hydration. The second method uses poly-ethylene glycol (PEG) which reduces the evaporation of water from the surface of concrete and also helps in water retention.

1.1. *Scope of research*

To study the strength properties of concrete made with curing compound i.e. polyethylene glycol as self curing agent with that of concrete made from conventional curing.

1.2. *Objective of study*

- To study the effect of different curing compound (PEG400) on the strength properties of concrete
- Concrete mixes are prepared based on different % of (PEG400)
- Conventional curing method (ponding)

1.3. *Potential material in self curing*

The following materials can provide internal water retention:

- Lightweight Aggregate (natural and synthetic, expanded shale)
- Super-absorbent Polymers (SAP) (60-300 nm size)
- SRA (Shrinkage Reducing Admixture) (propylene glycol type i.e. polyethylene-glycol)

3. METHODOLOGY

1.4. *Materials*

3.1.1 Cement
Ordinary Portland Cement was used for the concrete mixture. It is a binder material, a substance which generally hardens independently and is used to bind the combination of cement and aggregate to form a strong building material. There are variable grades of cement available in our market, for this study of grade 53 is used i.e. OPC 53.
3.1.2 Fine Aggregate
Fine aggregate used was obtained from a nearby river source. Fine aggregate used in concrete have the function of a filler material which fills the voids in concrete generated by coarse aggregate. The filler material used in Natural River sand which is passing in 2.36mm sieve.
3.1.3 Coarse Aggregate
Crushed granite was used as coarse aggregate.20 mm size of coarse aggregate used for concrete mixture.
3.1.4 Water
Water is used for making and curing concrete should be free from injurious substances such as oil, acid, alkali, salt, organic materials or other elements deleterious to concrete. Portable water is suitable for making concrete.
3.1.5 Polyethylene Glycol
Polyethylene glycol is a condensation polymer of ethylene oxide and water with the general formula $H(OCH_2CH_2)_nOH$, where n is the average number of repeating oxyethylene groups typically from 4 to about 180. The abbreviation (PEG) is termed in combination with a numeric suffix which indicates the average molecular weight. One common feature of PEG appears to be the water-soluble nature. The PEG-400 use in the investigation have Molecular Weight 400, Appearance Clear liquid, pH 5-7, Specific Gravity 1.126

1.5. *Advantages of self curing*

- It is the alternate of construction in desert regions where major scarcity of water is there.
- Eliminates largely autogenously shrinkage.
- Increases the strength of concrete in some extent.
- Self-Curing (Internal Curing) is a method to provide the water to hydrate all the cement, accomplishing what the mixing water alone cannot do.
- Maintains the strengths of mortar/concrete at the early age (12 to 72 hrs.) above the level where internally & externally induced strains can cause cracking.

1.6. *Experimental Work*

We have study to the strength of self curing concrete by adding the poly ethylene glycol PEG400 at 0.5%,1%,1.5% and 2% by weight of cement to the concrete of each .This paper was aimed to study compressive strength .

3.3.1 Test for compressive strength of concrete

Out of many test conducted, this is the outmost important which gives an idea about all the characteristics of concrete. For this test 150mm x 150mm x 150mm size specimens were used. The concrete cubes were tested on compression testing machine of capacity 2000 KN. The load was applied to opposite sides of specimen. The load at which concrete cubes was fail, consider as ultimate load and noted. The compressive strength was obtained by compressive strength =P/A.
Where,
P = Cube compressive load causing failure in Newton
A = Cross sectional area of cube in mm
The average of no of specimen strength is calculated and it was taken as compressive strength of one set.

Table No 3.1 Compressive Strength Test Result For Cube

Sr. no	PEG	Comp. strength	
		M20	M40
1	0%	26.60	46.65
2	0.5%	27.61	47.23
3	1%	28.49	45.93
4	1.5%	26.74	44.62
5	2%	25.03	42.44

4. CONCLUSION

1. By applying the self–curing admixture compressive strength of self curing concrete is increases.

2. The percentage of PEG400 for maximum strengths (compressive, tensile and modulus of rupture) was found to be 1% for M20 and 0.5% for M40 grades of concrete.

3. Strength of self curing concrete is on equalizing with conventional concrete.

4. Self curing concrete is solved to many problems faced due to lack of proper curing.

5. Self curing can be applied to simple as well as complex shapes.

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REFFERENCES

[1] Bentz, D.P., "Influence of Curing Conditions on Water Loss and Hydration in Cement Pastes with and without Fly Ash Substitution," NISTIR 6886, U.S. Dept. Commerce, July 2002.

[2] Wei-chen Jau (June 24, 2010), "Method for Self Curing Concrete," United States Patent Application Publications.

[3] Magda I. Mousa, Mohamed G. Mahdy, Ahmed H. Abdel-Reheem, Akram Z. Yehia, "Physical properties of self-curing concrete (SCUC)," HBRC Journal.

[4] Hoff, G.C., "Internal Curing of Concrete Using Lightweight Aggregates," Theodore Bremner Symposium, Sixth CANMET/ACI, International Conference on Durability, Thessaloniki, Greece, June 1-7 (2003).

[5] Kewalramani, M.A.; Gupta, R, "Experimental study of concrete strength through an eco-friendly curing technique," Advances in concrete technology and concrete structures for the future. Dec 18-19, 2003. Annamalainagar

[6] M.V.Jagannadha Kumar strength, characteristics of self curing concrete IJRET , Vol: 1, Issue: 1,pp 51-57,2012.

[7] Nirav R Kholia, Prof. Binita A Vyas, Effect on concrete by different curing method and efficiency of curing compounds International Journal of Advanced Engineering Technology , pp:57-60,2013.