

Comparative Study of Compressive Strength of M40 Concrete by Conventional Curing and Compound Curing Method

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Abstract— This paper represents the laboratory investigation of the effect of different method of curing on the properties of concrete (M40) with respect to the age of concrete. For this study, concrete cubes were made and were tested at the age of 7, 14 and 28 days. The comparison between M40 concrete by conventional curing and compound curing was made and found that result of water curing (immersion) method and compound curing method was nearly gives considerable result. From this study, it came to notice that the compound curing method is most economical method of curing.

Keywords: Concrete, Super Plasticizer, Curing Compound AC-CURE-R (M)

I. INTRODUCTION

Curing can be essential to keep the concrete moist and warm enough for the hydration of cement. An efficient curing gives predictable strength gain, improved durability and better serviceability and good appearance of concrete. The concrete should be cured after the chemical reaction has started to allow the concrete to be hardened. Concrete should not be allowed to dry fast in any condition and the curing conditions will likely to be maintained during the first 24 hours or at least until the final setting time of cement has passed.

Concrete can be kept moist by curing method. Some curing methods are air curing, standard water curing, non-standard curing, membrane-curing and self-curing. Self-curing concrete is the method of curing in which concrete can be cured itself by retaining its moisture content. A concrete can be made to self-cure by adding curing admixtures or by application of curing compound.

When the concrete is wet, the external curing compound is applied by brush or by spraying. In case of columns and beams, the application is done after the removal of formwork. On the horizontal surface, the curing compound is applied upon the complete disappearance of all bleeding water. It is suitable for large area concrete surfaces such as airport runways, roads and bridge works. It is also suitable where it is difficult to curing such as tunnel lining work.

To understand the behavior of curing on the compressive strength of concrete by normal curing and external self-curing, this work has been done by applying curing compounds on concrete surface. In this experimental work, the curing is carried out by using spraying method on M40 grade concrete cubes.

II. EXPERIMENTAL PROGRAM

A. Materials

Concrete cubes were casted by using PPC cement, coarse aggregate of size 10mm & 20 mm and fine aggregate. Resin based curing compound [AC-CURE-R (M)] was acquired

from Apple chemical factory, Nagpur. I used mix design of M40 as per IS 10262:2009. Potable water used as per IS 456-2000 specifications.

B. Concrete mix Design

As per IS 10262:2009 (recommended guidelines for concrete mix design) concrete mix design was made for M40 concrete.

C. Preparation of concrete

Mechanical method of mixing was adopted to form concrete of M40 grade. Total 18 number of cubes having dimensions 150mm X 150mm X 150mm each were casted. Out of these, 9 cubes were cured by water curing (immersion) method and other 9 cubes were cured by compound curing method.

III. RESULT AND DISCUSSION

A. The compressive strength of concrete

The average compressive strength at the age of 7, 14 and 28 days are shown in Table 1 and Table 2. It can be seen that at the age of 7, 14 and 28 days, the average compressive strength of concrete cube by water curing method were 26.74 Mpa, 37.33 MPa and 46.04 Mpa respectively. On the other hand, the average compressive strength of concrete cube by compound curing at the age of 7, 14 and 28 days were 24.11 MPa, 37.33 MPa and 44.32 MPa respectively.

Sr.No	Age (Days)	Compressive Strength		
		Load (kN)	Fck (Mpa)	Avg. fck (MPa)
1	7	748	33.24	26.74
		482	21.42	
		575	25.55	
2	14	887	39.42	37.33
		763	33.91	
		871	38.71	
3	28	1037	46.08	46.04
		995	44.22	
		1076	47.82	

Table 1: The compressive strength of cubes at different ages by water curing method

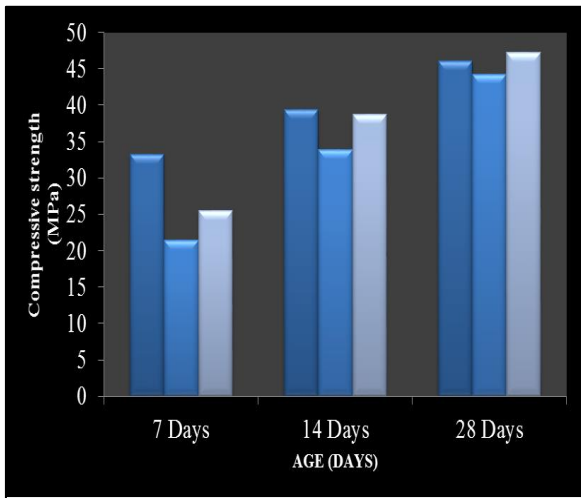


Fig. 1: Compressive Strength at different ages of concrete by water curing method.

Sr.No	Age (Days)	Compressive Strength		
		Load (kN)	Fck (Mpa)	Avg. fck (MPa)
1	7	577	25.64	24.11
		534	23.73	
		517	22.97	
2	14	762	33.86	33.12
		757	33.64	
		717	31.86	
3	28	967	42.97	44.32
		1036	46.04	
		989	43.95	

Table 2: The compressive strength of cubes at different ages by compound curing method

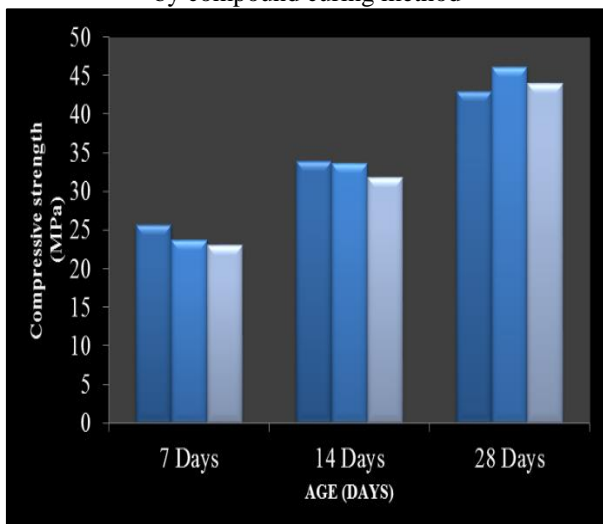


Fig. 2: Compressive Strength at different ages of concrete by compound curing method.

Self-curing (compound curing) method of curing produced the lowest compressive strength at all ages. It caused a reduction in compressive strength of 2.63N/mm², 4.21N/mm² and 1.72N/mm² at 7, 14 and 28 days

respectively, as compared to water curing. The early drying of concrete stopped the cement hydration before the pores were blocked by adequate calcium silicate hydrate.

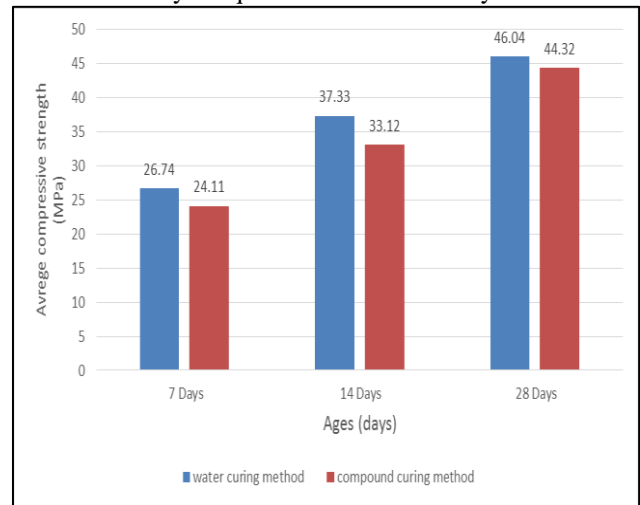


Fig. 3

IV. CONCLUSION

From the above experimental work following are the conclusions made.

- 1) Curing compound will effectively prevent evaporation of water from concrete and will not allow ingress of water to replenish that is lost by self-desiccation.
- 2) At most of the construction sites, wet curing is often applied but in practice curing compound may lead to better results.
- 3) This method reduces the moisture movement from concrete specimens leading to enhanced degree of cement hydration.
- 4) As compound curing method produces almost equal compressive strength with respect to water curing (immersion) method, this method is convenient where there is scarcity of potable water.
- 5) Curing compound method is the most effective method of curing and produces the optimum level of compressive strength.
- 6) The curing compound may be effective in summer days as it gives cooled temperature into the surface of concrete.

REFERENCES

- [1] Comparative Study On Compressive Strength Of Self Cured SCC And Normally Cured SCC Ms. Akanksha A. Patil, Prof. M. R. Vyawahare(Department Of Civil Engineering, Babasaheb Naik College Of Engineering Pusad, Amaravati University) (Associate Professor Of Civil Engineering Department Babasaheb Naik College Of Engineering Pusad, Amaravati University)
- [2] An Appraisal of the Membrane Method of Curing Concrete Pavements By C. C. RHODES Chemical Research Engineer Michigan State Highway Department and J. R. EVANS Engineering Experiment Station MICHIGAN
- [3] A Study On The Influence Of Curing On The Strength Of A Standard Grade Concrete Mix Udc

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- [4] Comparative study on Durability of Self cured SCC and Normally cured SCC Ms. Akanksha Anantrao Patil*, Prof. M. R. Vyawahare***Student M.E. IInd year (Structure), Department of Civil Engineering, Babasaheb Naik College Of Engineering Pusad, Sant Gadage Baba Amaravati University, Amaravati, Maharashtra, India** Associate Professor of civil Engineering Department Babasaheb Naik College Of Engineering Pusad, Sant Gadage Baba Amaravati University, Amaravati, Maharashtra, India
- [5] C. Selvamony, M. S. Ravikumar, S. U. Kannan and S. Basil Gnanappa, "INVESTIGATIONS ON SELF-COMPACTED SELF-CURING CONCRETE USING LIMESTONE POWDER AND CLINKERS", ARPN Journal of Engineering and Applied Sciences, VOL. 5, NO. 3, March 2010 ISSN 1819-6608.
- [6] M. Manoj Kumar and D. Maruthachalam, "Experimental Investigation on Self-curing Concrete", International Journal of Advanced Scientific and Technical Research Issue 3 volume 2, March-April 2013 ISSN 2249-9954.
- [7] M. S. Ravi Kumar, Selvamony C., S. U. Kannan and S. Basil Gnanappa, "BEHAVIOUR OF SELF COMPACTED SELF CURING KILN ASH CONCRETE WITH VARIOUS ADMIXTURES", ARPN Journal of Engineering and Applied Sciences, VOL. 4, NO. 8, OCTOBER 2009 ISSN 1819-6608.
- [8] Prof. Nanak J Pamnani, Dr. A.K. Verma, Dr. D.R. Bhatt, "Comparison of Compressive Strength of Medium Strength Self Compacted Concrete by Different Curing Techniques", International Journal of Engineering Trends and Technology (IJETT) - Volume4Issue5- May 2013.
- [9] Nan Su, Kung-Chung Hsu, His-Wan Chai, "A simple mix design method for self-compacting concrete
- [10] N.Gowripalan, R Marks and R Sun., Early age properties of self-cured concrete, Proceedings of Concrete Institute of Australia, Perth 2001, and pp 655-662.
- [11] Nirav R Kholia, Prof. Binita A Vyas, Prof. T. G. Tank "effect on concrete by different curing method and efficiency of curing [8] Roberto Troli, Antonio Borsoi, Silvia Collepari, Glenda Fazio, Mario Collepari, Saveria Monosi, "SELF-COMPACTING / CURING / COMPRESSING CONCRETE", 6th International Congress, Global Construction, Ultimate Concrete Opportunities, Dundee,U.K. – 5-7 July 2005.
- [12] IS 456: 2000 (code of practice for plain and reinforced concrete)
- [13] IS 10262:1982 (recommended guidelines for concrete mix design)
- [14] IS 10262:2009 (recommended guidelines for concrete mix design)
- [15] IS 4031:1988
- [16] Shetty M.S. "A text book of concrete technology"