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A Comparative Study on the Behaviour of Various Methods of Curing Concrete

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Abstract: ***The properties of cement-based products, especially their durability, are predominantly influenced by curing, since it has a remarkable effect on the hydration of the cement. Proper curing of cement-based products is crucial to obtaining design strength and maximum durability. The curing period depends on the type of cement works, the purpose for which it is to be used and the surrounding atmosphere, namely temperature and relative humidity. Curing is designed primarily to maintain the moisture, by avoiding the loss of moisture from the period in which it is gaining strength. Curing may be applied in a number of different processes and the mass appropriate means of curing may be directed by the site or the construction method. In this critique, a paper struggle has been made to understand the working and efficiency of curing system which are generally adopted in the construction industry and compared with the standard water curing method.***
Keywords: **Curing period, hydration of cement, curing methods, durability, compressive strength.**

I. INTRODUCTION

Cement is the basic material used in various types of construction work. The quality of concrete and mortar is defined by its strength and durability. Curing is one of the major parts of achieving the strength and durability of concrete and any other cement-based work. A manner temperature should be maintained in and out of the concrete and mortar to eschew thermal cracking. Laboratory tests show that concrete in a dry environment can lose as much as 50 percentage of its potential strength compared to similar concrete that is moistly cured. Curing of the concrete is also dominated by the moist-curing interval. Curing has a secure influence on the properties of hardened concrete: proper curing will increase endurance, might, volume stability, abrasion resistance and resistance to frosty and fusing.

A. Concrete Mix

Concrete mix ratios are the proportions of concrete ingredients such as cement, sand, aggregates and water. These percentages are decided based on type of construction and mixed designs. However, building codes provide a nominal and standard concrete mix percentage for various construction works based on experience and testing. These types of concrete mix percentage are discussed in this article

B. Nominal Concrete Mix Ratios

In the no more the specifications for concrete predetermined the proportions of cement, fine and coarse aggregates. These mixes of fixed cement-aggregate percentage which ensures adequate strength are termed nominal mixes. Pretended mixes offer simplicity and, under normal circumstances, have a margin of strength above that specified. However, due to the variability of mixed ingredients, the titular concrete for a given workability varies widely in brawn. Pretended mix percentages for concrete are 1:2:4 for M15, 1:1.5:3 for M20 etc.

The mix design was done aiming at M20 grade concrete as per ACI regulations. After a number of trails, the final mixed proportion is determined to be 1:1.5:3. The standard of raw materials per cubic meter of concrete is as depicted in table 2.

TABLE I
PHYSICAL PROPERTIES OF OPC 53 GRADE CEMENT

Properties	Test results	IS: 12269-1987
Standard consistency	31.5%	

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Initial setting time	42 min	30 min
Final setting time	360 min	600 min
Specific gravity	3.15	
Fineness	2.5 %	10%
Compressive strength		
3 days	8 mpa	7 mpa
7 days	14 mpa	12 mpa
28 days	21 mpa	19 mpa

TABLE II
QUANTITIES OF RAW MATERIALS 1 M^3 CONCRETE

Mix	Cement (kg)	Fine aggregate (kg)	Coarse aggregate (kg)	Water (kg)
M20	403	600	1208	235

II. CURING METHODS

A. *Conventional Curing*

Water curing is carried out by supplying water to the surface of concrete in a way that assures that it is kept continuously moist. The water that is used for this purpose should not be more than about 50C cooler than the concrete surface. Spraying cosy concrete with cold water may give rise to “thermal shock” that may cause or contribute to cracking. Alternate wetting and drying of the concrete must also be avoided as this causes volume changes that may also contribute to surface crazing and cracking.

B. *Immersion Curing*

Immersion is a curing method where flat concrete surfaces such as slabs and pavements are cured by ponding water around the perimeter of the surface with the help of sand dikes. It is an efficient method as it maintains a uniform temperature in the concrete and also prevents the loss of moisture from the concrete. This method is used in laboratory experiments where the specimens are dipped in water after 24 hours of casting. The specimens are then tested for strength after 7 and 28days. Considering that pounding requires considerable supervision and labour, this method is generally used for small construction activities only.

C. *Wet Gunny Bags Curing*

This is a broadly used technique of curing, restrictively for structural concrete. Thus, the exposed surface of concrete is prevented from scorching out by covering it with hessian, canvas or blank cement bags. The covering over perpendicular and slopping surfaces should be secured properly. These are periodically wetted. The interruptions of wetting will count upon the rate of evaporation of water. It should be ensured that the exterior of concrete is not allowed to dry even for a short occasion during the curing interval. Exceptional arrangements for keeping the surface wet must be made at nights and holidays.

D. *Plastic Sheet Curing*

Plastic sheets such as polyethylene film are used to cure concrete. Polyethylene films are lightweight, impervious and hence prevent moisture movement from the concrete and can be applied to simple as well as on complex shapes. The major disadvantage of this type of curing is that it causes patchy discoloration, especially if the concrete contains calcium chloride. Staining is more pronounced when the film grows wrinkles, and it is tough and time-consuming on a large project to place the sheets without wrinkles. Polyethylene film should confirm ASTM C171.Compressive strength, ultrasonic pulse velocity and dynamic modulus of elasticity and lower surface absorption.

This is because enveloped curing moisture movement from the concrete surface was hindered due to the impervious seam of the film and as a result, a good amount of moisture was available to be used throughout the hydration process.

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E. Self-Curing

Self-curing concrete is a class of concrete that utilizes a water-filled curing agent to retain water and mitigate water loss. It can be used in situations where water is not easily accessible, and can have several benefits, including: reduced water wastage, improved durability, reduced resistance, and reinforcement protection. Self-curing concrete is formed by adding a water-filled curing agent to the concrete mixture, which then slowly releases water during the hydration process. Some materials that can be used as curing agents include: Superabsorbent polymers (SAP), Polyethylene glycol (PEG), Lightweight expanded clay aggregates (LECA), Pumice stone (PU), and Natural Fibres. Self-curing concrete can help mitigate shrinkage-induced cracks and enhance the longevity of cement-based materials. It can also enhance the interfacial transition region (ITZ) between the curing agent and the cement paste matrix, and reduce permeability.

F. Sprinkling Curing

Sprinkler curing is a common method for curing concrete that involves spraying water onto the concrete surface with a sprinkler or hose. The water is applied at regular intervals, usually two to three times a day, to keep the concrete surface moist.

III. DATA ANALYSIS

Concrete was put together in a pan mixer and cube moulds were crammed using a vibrating table. The curing was done withall the methods cited in research methodology. Depicts the curing techniques used. The compressive strength was determined on the compression testing machine at the end of 3 days, 7 days and 28 days of curing. The entire emitting and examining procedure for the jute bag curing and air curing was done twice, once in a month. Day to day Metrological data was collected for the whole month. The compressive strength of the 0.15mX0.15mX0.15m concrete cubes remains conferred via Tables 3.

TABLE III
COMPRESSIVE STRENGTH OF CONCRETE FOR DIFFERENT CURING METHODS.

Sl.no	Methods of curing	Compressive strength (MPa)		
		3 days	7 days	28 days
1	Conventional curing	7	13	18
2	Immersion curing	9	14	20
3	Wet gunny bag curing	8	14	19
4	Plastic sheet curing	7	11	16
5	Self-curing	7	12.5	17
6	Sprinkling curing	8	13	19

IV. RESULT

The test results are listed in table 3. Immersion curing or ponding was the most effective method of curing. It had the highest level in compressive strength and cube densities. An increase in both compressive strength and cube densities is a function of the curing method.

V. CONCLUSION

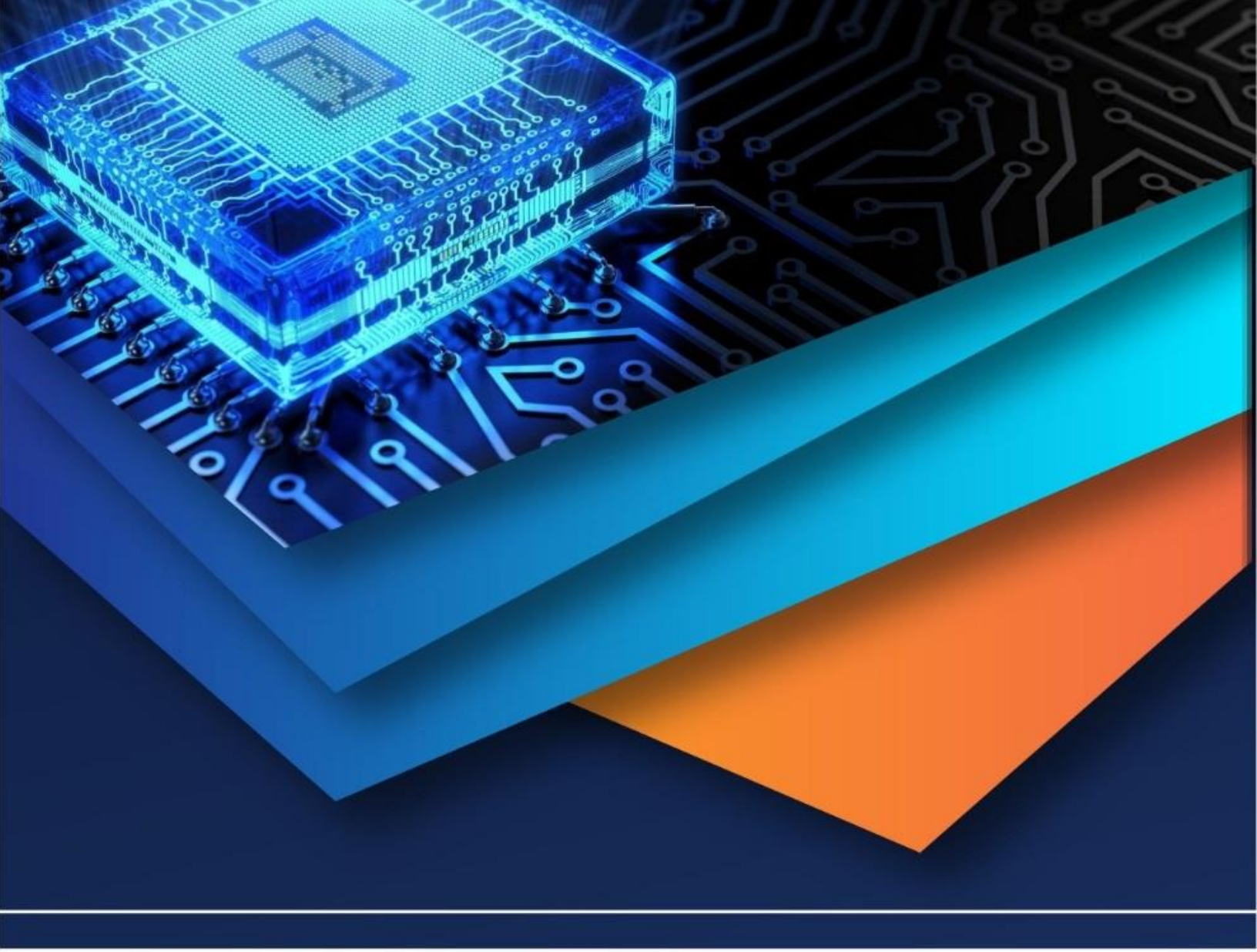
1) Water curing was the most effective method of curing. It produced the highest level of compressive strength. This is due to improved pore structure and lower porosity resulting from a greater degree of cement hydration reaction without any loss of moisture from the concrete specimens.
2) The sprinkling method of curing produces higher compressive strength than plastic sheeting. This is attributed to reduced moisture movement from concrete specimens leading to an enhanced degree of cement of hydration.
3) The plastic sheet method of curing produces the lowest level of compressive strength. This is because the moisture movement from the concrete specimen in higher the plastic sheeting method, which did not provide any protection against early drying out of the concrete.

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4) Usual concrete should be cured by the water curing (immersion) method in order to achieve superior hardened properties. Water curing produces no dropping of moisture, and therefore enhances cement hydration reaction. In the case of water scarcity, sprinkling curing can be adopted instead of wrapped curing.

REFERENCES

[1] American Concrete Institute, Detroit, Mich.,1992,2000
[2] Zain M.F.M (2007) effect of different curing methods on the properties of micro silica concrete. Australian journal of basic and applied science, 1(2):87-95,2007
[3] Dr.K.V. Krishna reddy/ international journal of engineering research and applications. "A comparative study on methods of curing concrete – influence of humidity"
[4] IS 4031:1988 – Methods of physical tests for hydraulic cement.
[5] IS 516: 1959 – Methods of testing the strength of concrete.
[6] IS 383: 1970 – Specifications for coarse and fine aggregates from natural sources for concrete.
[7] M.V. Jagannadha kumar, M. Srikanth, Dr. K. Jagannadha Ra" strength characteristics of self-curing concrete" IJRET- SEP 2012.
[8] Sharifa Al-Fadala, Dana Dashti, Hussain Al-Baghli, Jayasree Chakkamalayath, and Zainab AwadhSustainable "Internal Curing Materials Effect on Concrete Performance"-international concrete abstracts portal.
[9] ACI Committee 308- standard practice for curing concrete ACI 308-92.
[10] "Effect of curing methods on compressive strength of sustainable self-consolidated concrete" Osama Mohamed and Omar Najm – Material science and engineering, volume 471, issue 3.



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