

Strength Comparison of OPC, PPC and PSC for Continuous and Intermittent Curing

Abhismit Ashok Bhamare¹, Vihar Vijay Waghmare³, Dhanashree Babala Machhi⁴, Mahesh Shambhuling Fulari⁵, Meghna Patankar⁶

^{1,2,3,4,5}UG Students of G.S. Moze College of Engineering, Savitribai Phule Pune University, (India)

⁶Assistant professor of Civil Department, Savitribai Phule Pune University, (India)

ABSTRACT

Compressive strength Comparison between OPC, PPC and PSC for intermittent curing and continuous curing is the main area of interest of this paper. OPC, PPC and PSC concrete cubes are casted as per design mix of characteristics strength M25. These cubes are tested after 7 days and 28 days. In intermittent curing watering is done once in a day while for continuous curing cubes were submerged in water for all time. By observing the result following conclusions were made. i) OPC majorly affected by intermittent curing. ii) PPC and PSC is least affected by intermittent curing as compared to OPC. iii) PSC and PPC gives nearly similar compressive strength after 28 days. Finally we come to know that we can prefer PPC and PSC cement where there is less availability of water or for OPC mix design should be on safer side to overcome the reduced strength in intermittent curing condition. Cubes are exposed to direct sunrays in day time which contributes more reduction in strength.

Keywords compressive strength, continuous, Curing, Intermittent, OPC, PPC, PSC

I. INTRODUCTION

Compressive strength of concrete is highly dependable on the various conditions that occurs while attaining its characteristic strength. These are like quality of water, curing, temperature, and compaction factor etc. but for actual working site condition, the most affecting factor is curing condition. Concrete cubes without curing gives only fifty percent strength than cured continuously [1]. But now a days due to various factors like less availability of water in many countries or in season like summer, construction sites faces the problem of less availability of water. This problem is increasing day by day. So to overcome this problem intermittent curing is useful. But intermittent curing should be trice in day. To cure the concrete cubes thrice in a day require more water as well as workmanship. Many countries facing water scarcity like India, generally watering is done only once in a day. That affect the strength. We can achieve the required strength by preventing the moisture loss by providing protective cover or water holding layer such as jute bag. But it requires more workmanship to tie and remove the cover and also investments. Life of such measures is also less. So most of the construction site don't go for this cover.

All this contributes in strength reduction. It is very important to find out this difference to check whether required strength is achieved or not. Because construction is one time activity and it requires much investment. Human lives are associated with buildings or concrete structure so it's utility, durability, serviceability must ensure and hence compressive strength must check whether it is attaining the required strength or not and how much difference is arise due to intermittent curing in compressive strength

Previously Ordinary Portland cement concrete cubes were tested for intermittent curing from watering once in a day to thrice in a day in comparison with continuous curing[2]. This paper is contributing to checking the effect of intermittent curing on compressive strength of Portland pozzolana cement and Portland slag cement with ordinary Portland cement. PPC and PSC also gaining the popularity in construction industry so it is mandatory to check this effect. Objective of this research paper is to check whether required compressive strength is achieved or not in intermittent curing and extent of difference and Find out the remedial measure keeping economy and ease of working in consideration.

II. EXPERIMENTAL INVESTIGATION

2.1 Materials

2.1.1 Cement

53 grade cement is used for this project work. Birla super cement, Ultratech Cement, and Rajashree Cement is used as OPC, PPC and PSC respectively. Other specifications are mentioned in table no. 1

2.1.2 Water

Clear water available in laboratory with pH ranges from 6.5 to 7.5 is used.

2.1.3 Aggregate

Course aggregate and fine aggregate is used specifications are mentioned in table no. 1

Table No. 1 Material Specification

	OPC	PPC	PSC	C.A.	F.A.
Composi tion		30% fly ash	48% GGB S	20m m 10m m	2mm Crush sand
Specific gravity	3.15	2.65	2.9	2.95	2.8
Bulk density (Kg/m ³)	1440	115 0	1250	1557	1589

2.2 Apparatus

Standard Cube Mould, Standard tamping Rod, Rotating Drum Mixer, Curing Tank, Weigh balance, Universal testing machine, Trowel, lubricating oil, Measuring cylinder.

2.3 Methodology

Various Research paper about proposed project work were studied.

Mix proportion was calculated by IS code method [3] [4] by constant w/c ratio 0.45 for all three type of cement. Three cubes for 7 days & three for 28 day continuous curing and three cubes for 7 days & three for 28 days intermittent curing like that 12 standard size cubes 15 cm × 15cm × 15cm cubes were casted for each type of cement OPC, PPC, PSC. So total 36 cubes were casted.

Mixing was done for 4 minute and mould is filled in three layer each 35 blows by standard temping rod[1].

18 cubes are cured once in a day and remaining 18 cubes completely submerged in water.

Curing is done by the water having constant pH value to avoid effect of different pH value on strength of concrete [5].

Temperature of water and surrounding is kept same $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ to avoid effect of temperature on strength of concrete while casting [6] [7].

Cubes were tested on universal testing machine having capacity 100 tonne on 7th and 28th day

III. RESULT

Table no. 2 Average compressive strength in MPa for 7 days

Type	7 days average strength of three cubes (MPa)		
	Intermittent curing	Continuous curing	difference
OPC	15.45	17.93	2.48
PPC	13.42	14.6	1.18
PSC	13.70	15.25	1.55

Table no. 3 Average compressive strength in MPa for 28 days

28 days average strength of three cubes (MPa)		
Intermittent curing	Continuous curing	Difference
23.31	27.48	4.17
23.59	25.72	2.13
23.63	26.03	2.4

IV. CONCLUSIONS

- OPC majorly affected by intermittent curing and the difference is 2.48 and 4.17 MPa after 7 days and 28 days respectively.
- PPC and PSC is least affected by intermittent curing. Difference is less than 2 MPa after 7 days and less than 2.5 MPa after 28 days.
- PSC and PPC give nearly similar compressive strength after 28 days.
- OPC gives more strength than PPC and PSC after 7 days.
- OPC give slightly more strength than PPC and PSC after 28 days.
- Where there is less availability of water PPC and PSC can prove good alternative to OPC because of less affectability of curing method
- For OPC mix design is made for safer side slightly to overcome the reduced strength in intermittent curing.

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