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"Comparison of Strength Characteristics of Self Cured Concrete"

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Abstract: ***Concrete is most widely used construction material due to its good compressive strength. Prevention of loss of moisture not only results in reduction of strength but also but also results in plastic shrinkage by using self curing agents we can solve this problem. Curing of concrete improves the durability and performance of concrete. Keeping importance to this an attempt has made to develop self curing concrete by using polyethylene glycol i.e. PEG400 as self curing agent. Compressive strength of concrete containing PEG400 is investigated and compared with conventionally cured concrete.***

This study investigates the role of PEG400 as a self-curing agent. The parameters include grade of concrete, type and dosage of PEG400 and the effect of these curing compound on mainly compressive strength of concrete after 7 & 28 days also to analyze their effect on workability. In the present study the percentage of PEG400 by weight of cement from 0% to 2% as the dosage of internal curing compound. The test results were studied for two mixes that is for M20 & M30 mixes. Concrete mixes prepared using internal curing compound PEG400 are at par with specified target strength values calculated during design mix for both M20 and M30 grade of concrete. The results shows that PEG400 could help in self-curing by giving strength on par with that of the conventional curing method. It was found that PEG 400 help in self curing by giving strength without compromising workability.

Keywords: *Self curing concrete, Self curing agents, Conventional curing, Polyethylene Glycol, Water retention.*

1. INTRODUCTION

As water becoming a scare material day-by-day, there is an urgent need to do research work pertaining to saving of water in making concrete and in constructions. Curing of is maintain satisfactory moisture content during its early stages in order to develop the desire properties. However, good curing is not always practical in many cases. Curing of concrete plays a major role in developing the concrete microstructure and pore structure and hence improves its durability and performance. Keeping importance to this, an attempt has been made to develop self-curing concrete by using water-soluble Polyethylene Glycol . The aim of this investigation is to study the strength and durability properties of concrete using water soluble Polyethylene Glycol as self-curing agent. The function of self-curing agent is to reduce the water evaporation from concrete, and hence they increase the water retention capacity of concrete compared to the conventionally cured concrete. In this study compressive strength of concrete containing self- curing agent is investigated and compared with those of conventionally cured concrete. It is found through this experimental study that concrete cast with Polyethylene Glycol as self-curing agent is better than that obtained by immersion curing.

2. EXPERIMENTAL STUDY

2.1 Materials:-

A. Cement

OPC (53 grade) conforming to IS:12269-1987

B. Fine aggregate conforming to IS: 383-1970

C. Coarse Aggregate conforming to IS: 383-1970

D. Water

- Potable water was used in the experimental work for both mixing and curing purposes.

E. Polyethylene Glycol-400(PEG-400) (Used as an internal curing compound):-

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 polyethylene groups typically from 4 to about 180. One common feature of PEG appears to be the water-soluble nature. Polyethylene glycol is non-toxic, odorless, neutral, lubricating, non-volatile and non-irritating and is used in a variety of pharmaceuticals. Thus, it is a shrinkage reducing admixture.

3. SCOPE AND OBJECTIVES

- The scope of the paper is to study the effect of polyethylene glycol (PEG 400) on strength characteristics of self-curing concrete.
- The objective is study the mechanical characteristics of concrete such as compressive strength and workability by varying the percentage of PEG from 0% to 2% weight of cement for M20 and M30 grades of concrete.

4. METHODOLOGY:

The systematic approach to study the gaps identified in the literature survey will be followed. Step by step methodology of the proposed work is as follows.

- Two grades of concrete has been selected for the research work **M20 and M30**.
- Testing of ingredients of concrete mix are carried out.

WORKABILTY TEST:-

RESULTS & DISCUSSION:

Slump and compaction factor test:

The results of the slump & compaction factor test were represented in Table 1. As the %of PEG400 is increased the slump and compaction factor is found to increase. But, the rate of increase of slump &compaction factor for M30 concrete is less than that of M20 concrete.

TABLE 1: Result of Workability for different % of PEG-400

SNO	PEG 400(%)	SLUMP (mm)		COMPACTION FACTOR	
		M20	M30	M20	M30
1	0	80	38	0.88	0.84
2	0.50	92	55	0.90	0.86
3	1.00	112	80	0.91	0.87
4	1.50	140	110	0.94	0.90
5	2.00	175	140	0.96	0.93

COMPRESSIVE STRENGTH:

Test result for various mixes:
Average Compressive strength for 7 and 28 days obtained by taking average of 3 specimens for each day are compiled below.

Table 2. Comparative Strength test results of various mixes for M20 Grade of Concrete

MIX	AVERAGE COMPRESSIVE STRENGTH (N/mm²)	
	7 days	28 days
CONVENTIONAL CURING	15.26	26.76
PEG 400 0.5%	17.6	27.82
1%	17.49	28.85
1.5%	16.3	26.45
2%	14.49	25.53

Concrete made from curing compounds doesn't fall short of the minimum strength requirement i.e. 20 MPa. The strength achieved from curing compounds is much above 20MPa.

Table3. Comparative Strength test results of various mixes for M30 grade of concrete

MIX	AVERAGE COMPRESSIVE STRENGTH (N/mm²)	
	7 days	28 days
CONVENTIONAL CURING	22.29	39.54
PEG 400 0.5%	24.75	34.49
1%	26.45	36.92
1.5%	28.72	38.65
2%	26.21	36.78

Concrete made from curing compounds doesn't fall short of the minimum strength requirement i.e.30MPa.The strength achieved from curing compounds is muchabove30MPa.

5.CONCLUSION :

The following conclusion could be drawn from above experimental investigation:-

1. The optimum dosage of PEG400 for maximum compressive strength was found to be 1% for M20 and 1.5% for M30 grades of concrete.
2. As percentage of PEG400 increased slump increased forM20 and M30grades of concrete.
3. From the workability test results , it was found that the self-curing agent improved workability.
4. Self- cured concrete is found to have less water absorption values compared with concrete cured by other methods.
5. Self-curing concrete is the answer to many problems faced due to lack of proper curing.

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