EXPERIMENTAL ANALYSIS OF SELF CURING CONCRETE BY USING POLYETHYLENE GLYCOL

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Abstract – *Concrete is mostly used construction material due to its good compressive strength and durability. Depending upon the nature of the work cement, fine aggregate, coarse aggregate and water are mixed in specific proportions to produce plain concrete. Plain concrete needs congenial atmosphere by providing moisture for a minimum period of 28 days for a good hydration and to attain desire strength. The properties of hardened concrete, especially the durability are greatly influenced by curing since it has a remarkable effect on the hydration of the cement. Any laxity in curing will badly affect the strength and durability of concrete. Self-curing concrete is one of the special concrete in mitigating insufficient curing due to human negligence, paucity of water areas, inaccessibility of structure in difficult terrains and in areas where the presence of fluorides in water will badly affect the characteristics of concrete. The present study involves the addition of polyethylene glycol (PEG-400, with weight of cement in different ratios) in concrete and compared with that of conventional cured concrete.*

Key words: Self curing Concrete, Polyethylene glycol, Compressive strength.

1.INTRODUCTION

Curing is the name given to the producers used for promoting the hydration of the cement, and consists of a control of temperature and of moisture movement from and into the concrete. Laborartory tests shows that concrete in dry environment can lose as much as 50 per cent of its potential strength compared to similar concrete that is moist cured. 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 It was found that water soluble alcohols can be used as self curing agents in concrete.

The use of self-curing admixtures is very important from the point of view that water resources are every day (i.e. each $1m^3$ of concrete requires about $3m^3$ of water for construction most of which is for curing).

2. MATERIALS FOR SELF CURING CONCRETE

2.1 Polyethylene glycol

Polyethylene glycol is a condensation polymer of ethylene oxide and water. The abbreviation (PEG) is termed in combination with a numeric suffix which indicates the average molecular weights. One common feature of PEG appears to be the water-soluble nature. Polythethylene glycol is non-toxic, odorless, neutral, lubricating, non-volatile and non-irritating and is used in a variety of pharmaceuticals

Table 1: Property of Polyethylene glycol

properties	Odor	Density	Appearance	Vapour pressure
PEG-400	Mild odor	1.2	White liquid	Very low

2.2 Cement

Ordinary Portland cement 53 grade conforming to IS 269:1976 is used. The specific gravity of cement is 3.15. the test on various properties of cement such as consistency, initial setting time and final setting time were tested as per IS code.

Initial setting time of cement = 120min
Final setting time of cement = 750min

2.3 Fine aggregate

River sand is used as fine aggregate
Specific gravity of fine aggregate is = 2.6

2.4 Coarse aggregate

20mm Coarse aggregate is used for concrete
The specific gravity of Coarse aggregate is 2.68

3.DETAILS FOR EXPERIMENTAL WORKS

3.1 Slump test

Slump test for various percentages of PEG. Mixed proportion with M25 grade concrete are conducted.

Table - 2: slump values at different mix proportions

Sl.No	% of PEG	Slump (mm)
1	0	21
2	1	18

3	1.5	17
4	2	12

3.2 Compression strength of SCC

Compressive strength is a concrete, it is the ratio of load at failure to the cross sectional area. The size of the cube is 150x150x150mm. The compressive strength is determined by the formula,

Compressive strength = P/A
P = Breaking load in Newton
A= Area of mould in mm^2

Table 3: Compressive strength values

Sample	Days	Load in kN	Compressive strength in N/mm^2
Conventional Concrete (M_{25})	7	310	13.7
	14	340	15.1
	28	552	24.53
MIX 1-1% of PEG with M_{25}	7	325	14.4
	14	430	14.7
	28	542	24.08
MIX 2-1.5% of PEG with M_{25}	7	330	14.6
	14	450	15.6
	28	558	24.8
MIX 3-2% of PEG with M_{25}	7	350	15.5
	14	460	22.4
	28	561	24.9

3.3 Split tensile strength of SCC

Splitting tensile strength test on concrete cylinder is a method to determine the tensile strength of concrete.
Size of cylinder is 150 dia, height 300mm
Split tensile strength = $2P/\pi DH$

P = Breaking load in N
D = Diameter of cylinder in mm
H = Height of cylinder in mm

Table 4: Split tensile strength values

Sample	Days	Load in kN	Compressive strength in N/mm^2
Conventional concrete (M_{25})	7	110	1.55
	14	157	2.22
	28	225	3.18
MIX 1-1% of PEG with M_{25}	7	93	1.31
	14	105	1.48
	28	195	2.75
MIX 2-1.5% of PEG with M_{25}	7	103	1.45
	14	139	1.96
	28	220	3.11
MIX 3-2% of PEG with M_{25}	7	109	1.54
	14	145	2.05
	28	215	3.04

4. RESULT AND CONCLUTIONS

From the results, we conclude that,

1. M_{25} grade concrete with 2% of PEG, gives compressive & Split tensile strength as same as ordinary concrete.
2. The optimum dosage of PEG for maximum strength was found to be 2% for M_{25} grade.
3. It was found that as the percentage of polyethylene glycol increases, the workability of self curing concrete.

5. REFERENCES

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