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AN EXPERIMENTAL STUDY ON STRENGTH CHARACTERISTICS OF SELF CURING CONCRETE

Mahesh S M[1], Raghavendra D[2]

[1]*Post Graduate Student, Department of Civil Engineering, East Point College of Engineering and Technology, Bangalore, India*
[2]*Assistant Professor, Department of Civil Engineering, East Point College of Engineering and Technology, Bangalore, India*

ABSTRACT: *Concrete is most generally utilized development materials because of its quality, lastingness and sturdiness. Since the solid is interested in air, the water utilized as a part of cement vanishes and the water accessible in solid won't be adequate for viable hydration. As water is turning into a rare material step by step, there is an earnest need to spare the water in making concrete and in developments. In spite of the fact that water is being utilized as a part of making solid, its utilization is high in the curing procedure. Curing is more fundamental for picking up quality in the meantime and absence of appropriate curing can severely influence the quality and strength of the solid. At the point when concrete is presented to the earth dissipation of water happens and loss of dampness will decrease the underlying water-bond proportion which will bring about the deficient hydration of the concrete and subsequently bringing down the nature of the solid. The capacity of self-curing specialist is to diminish the water dissipation from the solid, and thus they increment the water maintenance limit of cement contrasted with the traditionally cured cement. The point of this examination is to contemplate the quality properties of solid utilizing water solvent Polyethylene Glycol (PEG 400) 0.5% and 1% as self-curing specialist utilizing M40 review concrete. It is found through this examination consider that PEG 400 help in self-curing by giving quality keeping pace with that of the traditional curing strategy and furthermore enhanced workability.*

Key words: Self-compacting concrete, Self-Curing concrete, Self-Curing agent, PEG-400, Water reducing admixtures, mineral admixture.

1.INTRODUCTION

The greater part of the solid that is created and put every year everywhere throughout the world as of now does self-cure to some degree. Some of it is not proposed to have anything done to its outside surface, aside from maybe surface wrapping up. However the solid's capacity to fill its planned need is not altogether decreased. Legitimate curing of solid structures is vital to meet execution and sturdiness necessities.

In ordinary curing this is accomplished by outside curing connected in the wake of blending, putting and wrapping up. Self-curing or inner curing is a method that can be utilized to give extra dampness in cement to more powerful hydration of bond and decreased self-parching. There are cases in which concrete has been enormously helped with advancing toward a self-curing status either coincidentally or purposely through moves made in the choice and utilization of materials. Advantages of inside curing incorporates expanded hydration and quality, which additionally diminishes autogenous shrinkage and breaking which assistant lessens porousness.

The utilization of shrinkage lessening admixtures, for example, polyethylene glycol, poly vinyl liquor and so on., impact the hydration property and quality of cement. Concrete contrasted with the expectedly cured solid, It has been discovered that water dissolvable polymers (Poly Ethylene Glycol) can be utilized as self-curing specialist in the solid. Then again Master Glenium sky 8630 has been essentially produced for applications in superior solid where the most noteworthy toughness and execution is required. The present pattern is joining self-curing specialists in Self Compacting Concrete. In this way, an investigation might be led on self-compacting self-curing concrete.

2. DEGREE AND OBJECTIVE

- The principle extent of this paper is to think about the impacts of poly ethylene glycol (PEG-400) on the strength properties of self-curing concrete
- The goal is to consider the mechanical quality properties, for example, compressive quality, split elasticity and flexural quality by shifting the dose of curing operator from 0.5 to 1% for M40 review of cement.

3. EXPLORATORY INVESTIGATIONS

The quality [flexural, split pliable and compressive] and workability [slump factor] were examined on concrete with self-curing admixtures in specific extents of weight of bond is supplanted by some mineral admixtures. PEG was included terms of 0.5%,1%. Workability of crisp cement was controlled by the droop factor test as indicated by Indian standers. The normal size of 3D shape 150mm ×150mm was utilized to decide the Compressive quality.

Split elasticity was done on the barrel with 150mm width and 300mm tallness. To figure the flexural quality, crystals of 100mm x 100mm x 500mm was threw. These were tried at 7and 28day's period and the designing properties of the Self Curing Concrete were contrasted with those of the reference concrete.

BLENDS

MIX 1: 100% Cement
MIX 2: 70% Cement + 30% Fly slag

4. MATERIALS USED

This examination includes the sorts of materials, for example, takes after.

cement: Cement utilized as a part of the examination was 53 review conventional Portland concrete affirming IS: 12269: 1987.

Fine aggregate: Grading must be uniform all through the work and should go through 4.75 mm sifter estimate which affirms to the code IS: 383 – 1970. Particles littler than 0.125 mm estimate are considered as fines which add to the powder content. Particular gravity of fine aggregate utilized is 2.58and fineness modulus 2.783 is utilized for this investigation.

Coarse aggregate: Coarse total was acquired from locally accessible pounded stone total quarry. Most extreme of 12.5mm size total has been utilized all through the test.

fly fiery debris: The consuming of harder, more established anthracite and bituminous coal regularly delivers Class F fly powder. This fly fiery debris is pozzolanic in nature, and contains less than20% lime (CaO). Having pozzolanic properties, the lustrous silica and alumina of Class F fly powder requires an establishing operator, for example, Portland bond, quicklime, or hydrated lime, with the nearness of water keeping in mind the end goal to respond and deliver cementitious mixes.

Polyethylene Glycol: Poly ethylene glycols (PEGs) are group of water-solvent direct polymers shaped by the extra response of ethylene oxide(EO) With mono ethylene glycols (MEG) or diethylene glycol. The summed up equation for polyethylene glycol is: H(OCH2CH2) n OH, n: Average number of rehashing ethylene oxide gatherings. Polyethylene glycol is non-lethal, unscented, unbiased, greasing up, non-unstable and non-disturbing what's more, is utilized as a part of an assortment of pharmaceuticals.
Water : Potable water accessible in research center was utilized for throwing every one of the examples. The nature of water was found to fulfill the necessities of IS: 456-2000

Table 1: MIX PROPOTIONS OF SCC

Water	Cement	Fine Aggregate	Coarse Aggregate
225.688lit	562.98 kg/m3	866.328 kg/m3	681.478 kg/m3
0.4	1	1.53	1.21

6.TEST RESULTS ON FRESH CONCRETE:

Table 3: Workability test results for 0.5% PEG

Mixes	Slump test	v-funnel	L-box	u-box
Mix 1	730	8	0.83	21
Mix 2	700	7	0.87	20

Table 4: Workability test results for 1% PEG

Mixes	Slump test	v-funnel	L-box	u-box
Mix 1	680	7	0.82	22
Mix 2	680	9	0.85	20

7.TEST RESULTSS ON HARDENED CONCRETE:

7.1 COMPRESSION TEST:

For cube compression tests on concrete, cube of size 150mm were employed. The cube specimens were tested on compression testing machine of capacity 4000KN. The load applied was increased continuously at a constant rate until the resistance of the specimen to the increasing load breaks down and no longer can be sustained. The maximum load applied on 7 and 28 days specimen was recorded.
Fc = P/A, (1) where, P is load & A is area.
Figure 1.Comparison of 7 days and 28 days of compressive strength

Table 5: Compressive strength of 0.5% PEG

Age of curing	**Mix1**	**Mix2**
7	34.61	32.07
28	42.03	41.1

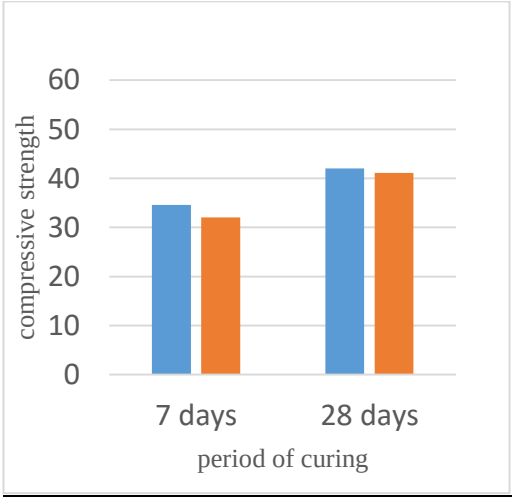

Chart 1:Comparison of 7 days and 28 days of compressive strength

Table 6: Compressive strength of 1% PEG

Age of curing	Mix1	Mix2
7	38.10	28.07
28	47.18	41.9

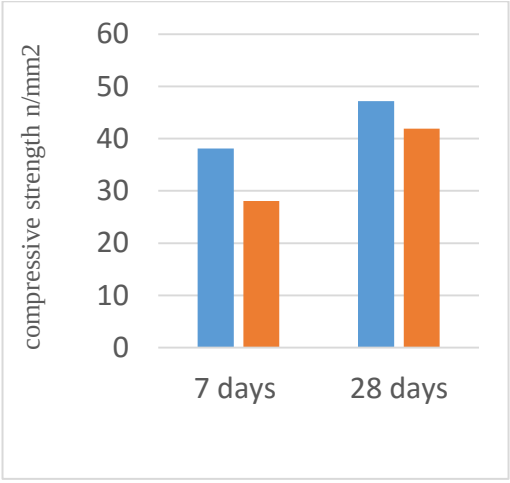

Chart 2: Comparison of (1% PEG) 7 days and 28 days of compressive strength

Figure 1 and 2 indicates the difference in compressive strength of concrete.X-axis indicates the period of curing and Y-axis indicates maximum compressive load (N/mm2). As it can be seen that 28 day curing period 1% of curing agent provides maximum strength comparing to 28 days curing period of 0.5% PEG, therefore as the dosage of curing agent and curing period increases strength also increases.

And it also indicates that mix 2 gives little bit higher strength than mix 2 at 28 days of curing. Complete use of cement content in concrete mix results more expensive, therefore (70%+30%) of Cement and GGBS provides relatively required strength and it is ideal to use.

7.2.SPLIT TENSILE STRENGTH

fsplit =2 P/πD, where P=load, D= diameter of cylinder, L=length of the cylinder. Following tables and graph shows the variation of split tensile strength with addition of PEG

Table 7: Split tensile strength of 0.5% PEG

Age of curing	Mix1	Mix2
7	2.89	2.64
28	3.45	3.28

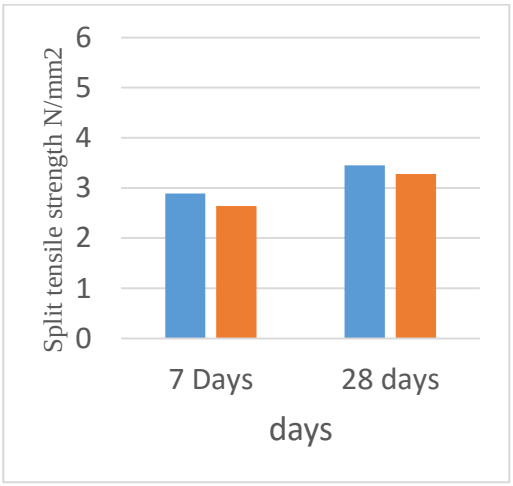

chart 3. Comparison of 7 and 28 days of split tensile strength for 0.5% PEG

Table 8: Split tensile strength of 1% PEG

Age of curing	Mix1	Mix2
7	3.07	2.57
28	3.57	4.59

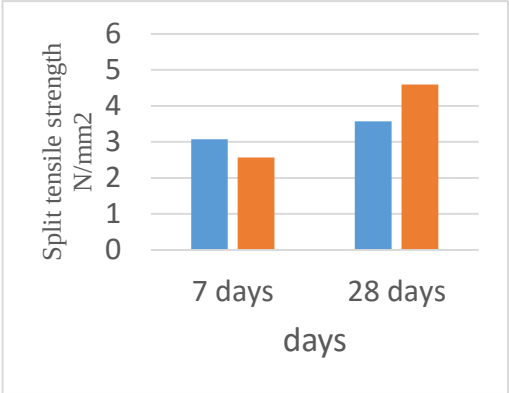

chart 4:Comparision of 7 and 28 days of split tensile strength for 1% PEG

Figure 3 and 4 indicates the difference in split tensile strength of different concrete mixes. X-axis indicates the days of curing and Y-axis indicates the maximum split tensile strength. As it can be seen that 28 day curing period 1% of curing agent provides maximum strength comparing to 28 days curing period of 0.5% PEG, therefore as the dosage of curing agent and curing period increases strength also increases.

7.3 Modulus Of Rupture:

f Rup = (WL)/(bd2), Where, W = load at failure L = length of specimen (500mm) b = width of specimen (100mm) d = depth of specimen (100mm) when 'a 'is greater than 20.0cm for 15.0 cm specimen ,in cm ,or greater than 13.3 cm for a 10.0 cm specimen.

Table 9 flexural strength results of 0.5% PEG

Age of curing	Mix1	Mix2
7	8	6
28	9	7.5

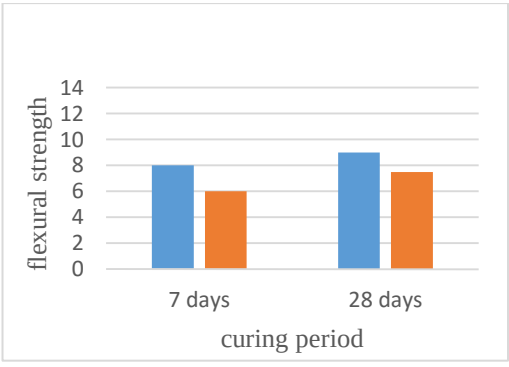

Chart 5: Comparison of 7 and 28 days of flexural strength for 0.5% PEG

Table 10: flexural strength results of 1% PEG

Age of curing	Mix1	Mix2
7	7.5	7
28	11.3	9.5

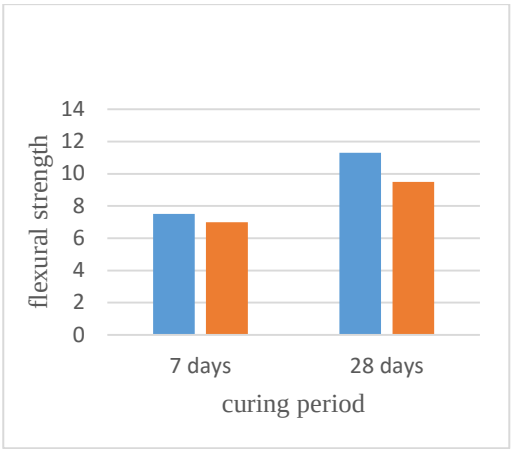

chart 6: Comparison of 7 and 28 days of flexural strength for 1% PEG

8. CONCLUSION

On the basis of Experimental tests results and observations, following conclusions are made:

1. According to the outcomes acquired in tables compressive quality of different blends for M40 Grade of solid, we presume that the compressive quality of blends utilizing self curing mixes (PEG-400) are at standard with that of the solid with regular curing.
2. The ideal measurements of PEG400 for greatest quality was observed to be 1% all the blends for M40 review.
3. As measurement rate of PEG-400 expanded droop expanded for M40grades of cement.
4. From the workability test comes about , it was discovered that the self-curing specialist enhanced workability.
5. 90% concrete and 10% alchofine with 0.40% W/C proportion execution was great every one of them. At 7 days air-cured compressive quality outcome is not as much as water cured. At 28 days general outcome was great and accomplishes the most noteworthy estimation of compressive quality at 28 days in all trail blend tests.
6. Self-compacting self-curing solid execution and results are attractive with 0.5% and 1% of Polyethylene glycol-400. After the fruitful aftereffect of blends, we are choosing this blend 2 for self-characterized concrete with the expansion of PEG-400 and its worked and indicating palatable outcomes. 0.5% PEG comes about marginally

lower than 1% of at 7 days compressive quality. It implies the early age quality affected with increase the PEG percentage. Overall results of 7 and 28 days are satisfactory with higher percentage of PEG.

Recommendations for future scope of work :

A lot more work needs to be done before we can freely use self-curing compounds as a replacement to conventional curing techniques. Since the strength results are as good as compared to that achieved by conventional curing method but it needs additional research work to improve its quality and will certainly help to promote the usage of self-curing compounds in concrete.

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