Effect of Mechanical Properties on PEG-400 as Partial Replacement of Cement for M-25 Concrete

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Abstract— Concrete is most widely used construction material due to its good compressive strength and durability. Concrete can be cured by water curing and by self curing agent. Conventional concrete require water curing for a minimum of 28 days to complete its target strength. Self-curing concrete is one of the extraordinary concrete which is gaining importance in recent days as it avoid errors which were caused by human, structures which are not available, terrains where curing becomes complicated and in places where the fluoride content badly influences the property of concrete Plain concrete needs pleasant atmosphere by providing moisture for a minimum period of 28 days for good hydration and to attain desired strength. Self curing concrete is the one which can cure itself by retaining its moisture content. In the this research, the affect of admixture (PEG-400) on compressive strength, by varying the percentage of PEG-400 by weight of cement from 0% ,0.9%,1.8%,2.7% & 3.6% are studied for M25 mixes.

Keywords: PEG-400, Cement, M-25 Concrete

I. Introduction

Proper curing of concrete structures is very important to fulfill performance and durability necessities. In typical curing this can be achieved by external curing applied when combination, putting and finishing. Self-curing or internal curing could be a technique that may be wont to give extra wetness in concrete for simpler hydration of cement and reduced self-desiccation. The ACI-308 Code states that "internal curing refers to the method by that the association of cement happens due to the supply of extra internal water that's not a part of the blending water". the extra internal water is usually provided by using comparatively little amounts of saturated, lightweight weight, polythene Glycol, super absorbent chemical compound particles within the concrete.

II. Material Used

A. Cement: Ordinary Portland cement (OPC) grade 43 is used in this research..

B. Sand: Sand is available near Narmada River. This sand is used for the above research work.

C. Natural aggregate: 20 mm natural coarse aggregate is used having a specific gravity of 2.72.

D. Polyethylene Glycol (PEG):

The polyethylene-glycol is employed to scale back water evaporation from concrete, and thus increase the water retention capability of concrete that results in improved compressive strength. the utilization of polyethylene-glycol in concrete mixes improves the mechanical properties of concretes which can be attributed to a stronger water retention and causes continuation of the association method of cement past leading to less voids and pores, and larger bond force between the cement paste and aggregates. The PEG-400 used for this research.

Particle size	1 mm(Average)
Water absorption with distilled water	150 g for 1 g of PEG
pH of absorbed water	Neutral
Density	1.08
Bulk density	0.85
Hydration / Dehydration	Reversible
Decomposition in sun light	6 months
Available water	95% approx.

Table 1: Properties of Polyethylene Glycol

III. Experimental Work and Test

A. Compressive Strength Test:

The mould is prepared for cubes used in the compression test having a size of 150mmx150mmx150mm. After preparing cubes rest on the compression testing machine and load is applied. After applying load the value noted from the dial gauge. Compressive strength determine at 7 & 28 days.

B. Flexural Strength Test:

The mould is prepared for beams used in the bending test having a size of 50cmx10cmx10cm. After preparing beams rest on the flexural testing machine and load is applied. After applying load the value noted from the dial gauge. Bending strength determine at 7 & 28 days

C. Split Tensile Strength:

The mould is prepared for cylinder used in the tensile test having a size of 150mm diameter and 300mm height. After preparing cylinder rest on the compression testing machine and load is applied. After applying load the value noted from the dial gauge. Tensile strength determine at 7 & 28 days

IV. Test Results

A. Compressive Strength:

The below table shows the compressive strength for different percentage of PEG which is vary from 0%-3.6%.

Mix Design	% PEG	7 days Compressive Strength	28 days Compressive Strength
Mix-01	0	21.98	31.75
Mix-02	0.9	25.72	35.89
Mix-03	1.8	23.69	30.82
Mix-04	2.7	22.72	29.78
Mix-05	3.6	22.52	28.25

Table 2: Compressive Strength Result

B. Flexural Strength The below table shows the Bending strength for different percentage of PEG which is vary from 0%-3.6%.

Mix Design	% PEG	7 days Flexural Strength	28 days Flexural Strength
Mix-01	0	3.72	5.44
Mix-02	0.9	4.65	6.78
Mix-03	1.8	4.42	5.82
Mix-04	2.7	4.10	5.42
Mix-05	3.6	3.82	4.93

Table 3: Flexural Strength Result

C. Split Tensile Strength The below table shows the tensile strength for different percentage of PEG which is vary from 0%-3.6%.

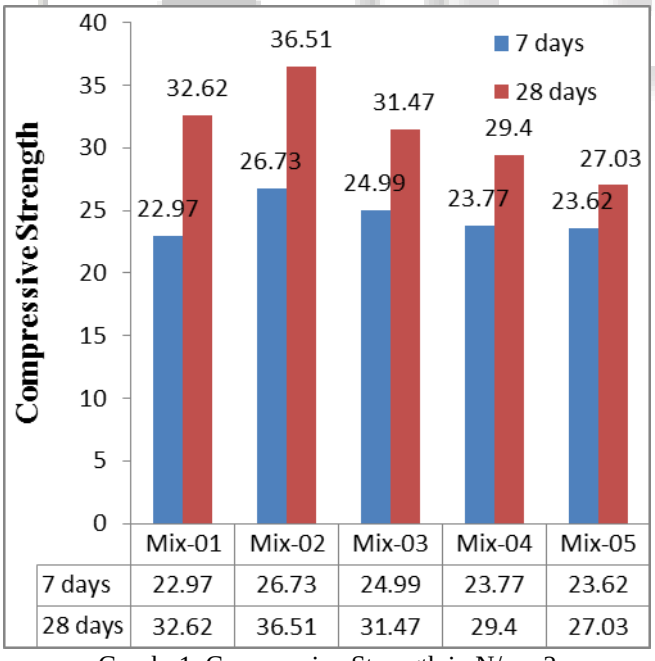
Mix Design	% PEG	7 days Split Tensile Strength	28 days Split Tensile Strength
Mix-01	0	3.48	4.78
Mix-02	0.9	4.79	6.84
Mix-03	1.8	4.38	6.25
Mix-04	2.7	3.97	5.48
Mix-05	3.6	3.24	498

Table 4: Tensile Strength Result

V. Discussion on Test Results

A. Compressive Strength Test:

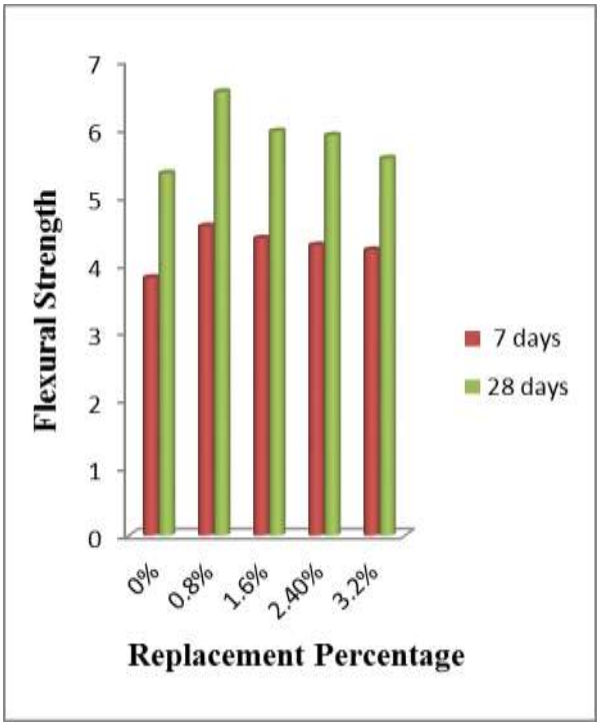
From the graph 1 it is conclude that 7 & 28 days compressive strength 23.8% & 21.06% increases when percentage upto 0.8%. After that strength decreases when percentage of PEG increases.



Graph: 1. Compressive Strength in N/mm2

B. Flexural Strength:

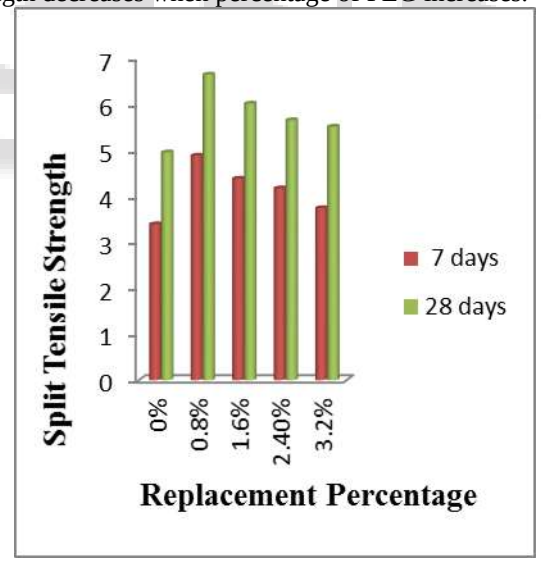
It is conclude that 7 & 28 days bending strength 20% & 22.47% increases when percentage upto 0.8%. After that strength decreases when percentage of PEG increases.



Graph 2: Flexural Strength in N/mm2

C. Split Tensile Strength:

It is conclude that 7 & 28 days tensile strength 43.95% & 34.19% increases when percentage upto 0.8%. After that strength decreases when percentage of PEG increases.



Graph 3: Split Tensile Strength in N/mm2

VI. Conclusions

Based on the various tests conducted on concrete with varying proportion of PEG the results were obtained and discussed in previous chapter from which the following conclusions are drawn.

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