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 ijirset@gmail.com

 www.ijirset.com



Self Curing Concrete using Poly Ethylene Glycol

Maritta Anjaly

Civil Engineer, Coimbatore, India

ABSTRACT: Selfcuring concrete does not require to be cured in water. This offers many merits over conventional concrete. This includes an improved quality of concrete and reduction of shrinkage. In this project, the mix design for control concrete grade of M₃₀ has been design as 1:1.48:2.53. The self curing concrete required have been arrived from the control concrete with addition amount of PEG is varied from 0%, 0.5%, 1%, 1.5%, 2% by weight of portland pozzolana cement for M₃₀ mixes. The curing is done in wet and dry conditions for normal concrete and air curing alone is done for self curing concrete

KEYWORDS: selfcuring, admixture, poly ethylene glycol, shrinkage.

I. INTRODUCTION

The effect of admixture (PEG 600) on self curing property of concrete is studied. Compressive strength, split tensile strength, durability test based on sulphate attack measurement and homogeneity of concrete using ultrasonic pulse velocity method are to be conducted. The amount of PEG is varied from 0%, 0.5%, 1.5%, 2% by weight of ordinary portland cement for M₃₀ mixes. The curing is done in wet and dry conditions for normal concrete and air curing alone is done for self curing concrete. The optimum amount of PEG thus obtained is used in the next stage replacing PPC and the results obtained are compared for compressive, split tensile strength and homogeneity of concrete. the main aim of the paper is to study the effects of poly ethylene glycol used as a shrinkage reducing admixture and different parameters of M₃₀ grade concrete

II. LITERATURE REVIEW

1. M. Francis, J. Jacob (2015) experimental investigation on mechanical properties of self curing concrete, International journal of emerging It was concluded that in areas with shortage of water, curing compounds can be used with better strength of self compacted concrete.

2. Selvamony S, M.S. Ravishakar (2011) Investigation on self curing concrete using poly ethylene glycol, ARPNI was also found that 1% of PEG400 by weight of cement was optimum for M₂₀ grade concrete for achieving maximum strength without compromising workability.

3. Sivakumar Anadth (2016) effect of polyethylene glycol in self curing concrete, IJERST self curing agent gives more strength than that of the conventionally cured concrete **4. G. Karthikeyan, Mohankumar (2013) study of self curing concrete, IJERT** Higher cement content and/or lower water-cement ratio leads to more effective results of self-curing agents in concrete. **5. Mathew R, John Paul (2017) self curing concrete using poly ethylene glycol, IJERST** It was also found that 1% of PEG 4000 by weight of cement was optimum for M₂₀ grade concretes for achieving maximum strength without compromising workability.

III. METHODOLOGY

In the present study, the effect of admixture (PEG 600) on self curing property of concrete is studied. Compressive strength, split tensile strength, durability test based on sulphate attack measurement and homogeneity of concrete using ultrasonic pulse velocity method are to be conducted. The amount of PEG is varied from 0%, 0.5%, 1.5%, 2% by weight of ordinary portland cement for M₃₀ mixes. The curing is done in wet and dry conditions for normal concrete and air curing alone is done for self curing concrete. The optimum amount of PEG thus obtained is used in the next stage



replacing PPC and the results obtained are compared for compressive, split tensile strength and homogeneity of concrete.

IV. MATERIALS USED

Materials used in this investigation are:

1. Portland pozzolana cement (PPC)
2. Fine Aggregate (M sand)
3. Coarse Aggregate
4. Polyethylene Glycol-600 (PEG)
5. Water

CEMENT: Cement used in the investigation was portland pozzolana cement confirming IS: 1489(Part 1):1991 The cement used for experiments was obtained from a single consignment and of same grade and same source.

SPECIFIC GRAVITY: Specific gravity of cement = 2.76

STANDARD CONSISTENCY: Standard consistency of cement = 40

INITIAL AND FINAL SETTING TIME

The initial setting time of the given sample of cement = 165 min.

The final setting time of the given sample of cement = 265 min.

FINENESS: Fineness of cement = 7.2 %

COMPRESSIVE STRENGTH OF MORTAR CUBES

Compressive strength at 7 days = 19.05 N/mm²

Compressive strength at 28 days = 37.41 N/mm²

SPECIFIC GRAVITY: specific gravity of fine aggregate = 2.6

FINENESS MODULUS: Fineness modulus (Sum of the cumulative % wt. retained / 100) = 2.52

COARSE AGGREGATE

Sl.No	Description	Test Results
1	Specific Gravity (IS:2386(Part-III)-1963)	2.8
2	Fineness modulus	3.12
3	Water absorption	0.7%

Table 4.1 Properties of coarse aggregates



POLYETHYLENE GLYCOL-600

Polyethylene glycol-600	
Molecular weight	600 g/mol
Appearance	Clear liquid
Moisture	0.2% max
PH	5 – 7
Specific gravity	1.12 - 1.13

Table 4.2 Specifications of Polyethylene Glycol-600

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

MIX DESIGN DATA

	Water (kg/m ³)	Cement (kg/m ³)	Fine Aggregate (kg/m ³)	Coarse Aggregate (kg/m ³)
PPC	186	433	640	1095

Table 4.3 Mix Design Data

MIX PROPORTIONS

Ingredient	Unit	A	B	C	D	E	F
Water	kg/m ³	186	186	186	186	186	186
Cement	kg/m ³	433	433	433	433	433	433
Fine aggregate	kg/m ³	640	640	640	640	640	640
Coarse aggregate	kg/m ³	1095	1095	1095	1095	1095	1095
W/C ratio	By mass	0.43	0.43	0.43	0.43	0.43	0.43
PEG	%	0	0	0.5	1	1.5	2

Table 4.4 Mix Proportions

A – Concrete with 0% poly ethylene glycol for wet curing

B - Concrete with 0% poly ethylene glycol for dry curing

C - Concrete with 0.5% poly ethylene glycol

D - Concrete with 1% poly ethylene glycol

E - Concrete with 1.5% poly ethylene glycol

F - Concrete with 2% poly ethylene glycol



V. EXPERIMENTAL RESULTS

5.1 SLUMP TEST

Sl no.	Composition	Slump height (mm)
1	Concrete with 0% poly ethylene glycol for wet curing	50
2	Concrete with 0% poly ethylene glycol for dry curing	50
3	Concrete with 0.5% poly ethylene glycol	60
4	Concrete with 1% poly ethylene glycol	65
5	Concrete with 1.5% poly ethylene glycol	68
6	Concrete with 2% poly ethylene glycol	72

Table 5.1 Slump value

5.2 COMPACTION FACTOR TEST

compaction factor =0.85 and workability is medium

5.3 COMPRESSIVE STRENGTH

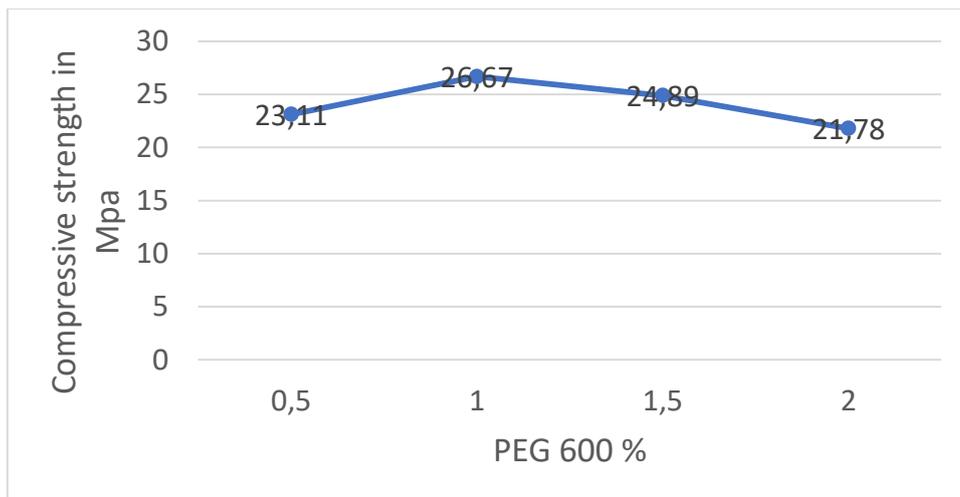


Fig 5.2 Variation of 7 day Compressive Strength

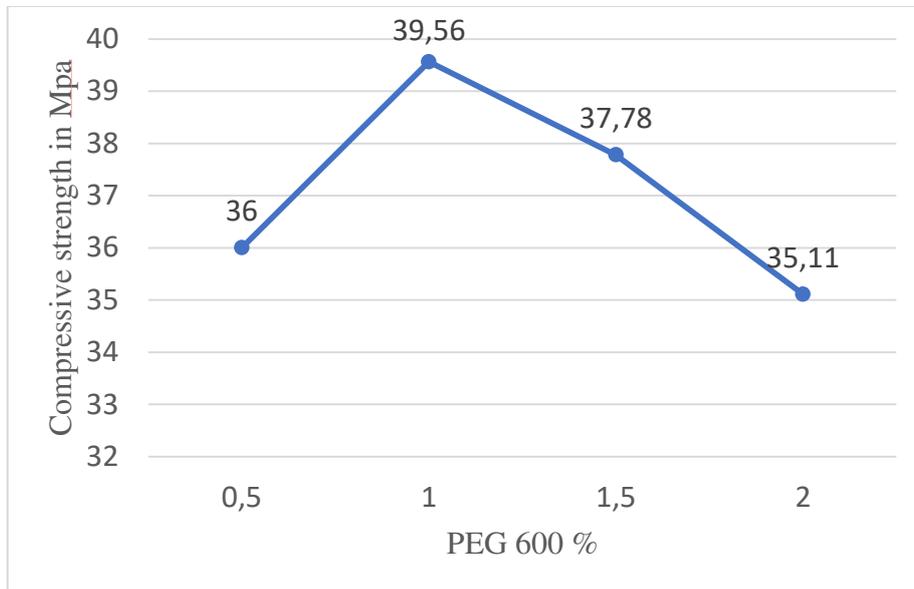


Fig 5.3 Variation of 28 day Compressive Strength

5.4 SPLIT TENSILE STRENGTH

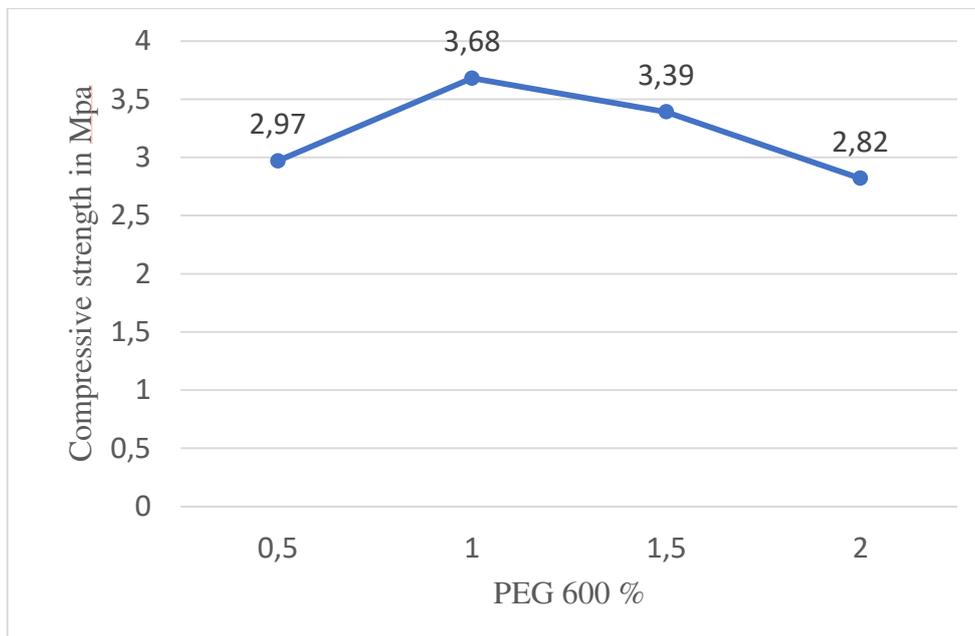


Fig 5.4 Variation of Split Tensile Strength

VI. CONCLUSION

It is observed from the test results and the following conclusion have been drawn,

- The optimum dosage of PEG600 for maximum strengths (compressive, tensile, non destructive method) was found to be 1.5% for M30 grade of concrete.



- The optimum dosage is taken for comparative study of PPC concrete then also the maximum strength is attained in both cases.
- From this result the self-curing concrete that can be used in PPC works.
- Strength of self-curing concrete is on par with conventional concrete.
- This method of curing technique can be adopted efficiently and economically in construction areas where there is scarcity of water predominant in remote areas without compromising with performance characteristics of concrete.

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1. M. Francis, J. Jacob (2015) experimental investigation on mechanical properties of self-curing concrete, International journal of emerging
2. Selvamony S, M.S. Ravishakar (2011) Investigation on self-curing concrete using polyethylene glycol, ARPJ
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