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Use of Polyethylene Glycol as Self Curing Agent in Self Curing Concrete - An Experimental Approach

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Abstract - *In the present era the most widely material used in the construction is concrete because of its high quality of strength & durability. Water curing is very much necessary to prevent unsatisfactory properties of cement concrete. In order to have good quality curing, surplus of evaporation from the surface need to be prevented. In this research the influence of polyethylene glycol on Compressive strength and Flexural strength of concrete by varying the percentage of polyethylene glycol-400. Polyethylene glycol replaced by cement in different percentages (0%. 0.8%, 1.5%, 2.4% & 3.2%). The optimum strength achieved to 2.4% of polyethylene glycol by the weight of cement of M-20 grade of concrete & 1.6% of polyethylene glycol by the weight of cement of M-25 grade of concrete.*

Key Words: Compressive Strength, Different Mix, Flexural Strength, Polyethylene Glycol, Self-curing Concrete.

1. INTRODUCTION

In the civil engineering concrete structures curing is the important factor for the strength & durability of concrete. 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. Once this water isn't pronto offered, as a result of non-percolation of the capillary body, for instance, vital autogenic deformation and (early-age) cracking might result. As a result, the chemical shrinkage occurs throughout cement hydration. During the early stages concrete curing is important because they maintain the moisture content & temperature so properties of concrete might expand. By the help of polyethylene glycol reduces the water loss of concrete and enhances the water preservation capacity compare to conventional concrete.

2. PROJECT OBJECTIVE

1) By using Poly ethylene Glycol improve the water content of mix concrete.
2) By adding poly ethylene glycol in different percentage we have to determine the compressive strength & tensile Strength of concrete.
3) Determine the strength of normal concrete & self-curing concrete & compare them.

3. MATERIALS & METHODOLOGY

3.1 Cement: Ordinary Portland cement is used to prepare the mix design of M-25 grade. The cement used was fresh and without any lumps Water – cement ratio is 0.42 for this mix design using IS 456:2007. Cement is an extremely ground material having adhesive and cohesive properties which provide a binding medium for the discrete ingredients.

Table -1: Chemical Composition of Cement

Chemical Composition	Percentage
Lime	60-to 67
Silica	17 to 25
Alumina	3 to 8
Iron oxide	0.5 to 6
Magnesia	0.1 to 6
Sulphur trioxide	1 to 3
Soda & Potash	0.5 to 3

3.2 Sand: Natural river sand of maximum size of 4.75mm was used Locally available sand zone-II with specific gravity 2.65,water absorption 2% and fineness modulus 2.6,confirming to I.S. 383-1970.

3.3 Course aggregate: crashed granite stone of 20mm size having specific gravity of 2.70, fineness modulus of 2.9, confirming to I.S. 383-1970.

3.4 Polyethylene glycol - 400: Polythene glycol could be a condensation chemical compound of ethene chemical compound and water with the overall formula H (OCH2 CH2) n American state, wherever n is that the average variety of continuation of ethylene teams usually from four to concerning one hundred eighty. It seems to be water soluble. It's nontoxic and inodorous.

3.5 Compressive Strength Test: In this study, a total number of 45 cubes for the control and cement replacement levels of 2.5%, 5%, 10% and 20% were produced respectively. For the compressive strength, 150mm x

150mm x 150mm cubes mould were used to cast the cubes and 3 specimens were tested for each age in a particular mix (i.e. the cubes were crushed at 14 days). All freshly cast specimens were left in the moulds for 24 hours before being de – moulded and then submerged in water for curing until the time of testing.

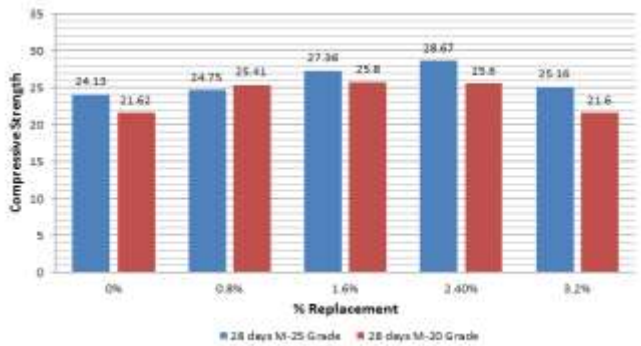
3.6 Flexural strength: Beams of size 10cm x 10cm x 50cm are casted for determining flexural strength. Test on beams are performed at the age of 28 days of the specimen. Placement of specimen in machine is done as per IS: 516-1959 in the clause no 8.3.1 page no 17. Load is applied at increasing rate of 108 KN/min. Load is applied until specimen fails and load at which specimen fails is recorded.

4. RESULTS & DISCUSSION

4.1 Compressive Strength Test: A minimum of three cubes are casted in each batch mix for determining compressive strength. Tests are performed at the age of 28 days of the specimens. Specimens are placed in the test machine as per IS: 516-1959 clause no 5.5.1 page no 11, also loading is applied on the specimen as per the same IS code.

Table -2: Result of Compressive Strength on Cubes

Mix	% Replacement	Compressive Strength (N/mm^2) for M-25 Grade	Compressive Strength (N/mm^2) for M-20 Grade
		28 Days	28 days
Mix-1	0	24.13	21.62
Mix-2	0.8	24.75	25.41
Mix-3	1.6	27.36	25.8
Mix-4	2.4	28.67	25.6
Mix-5	3.2	25.16	21.6

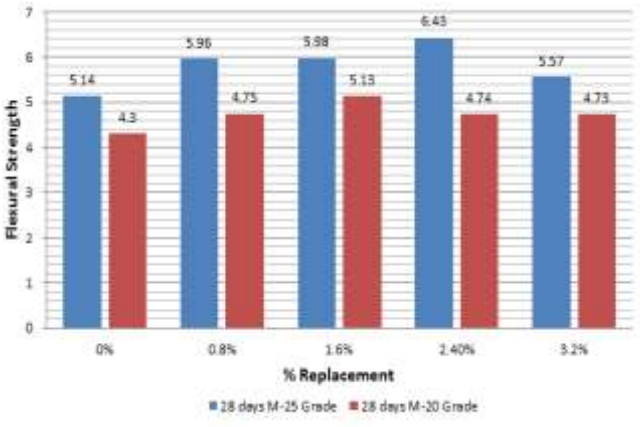


Graph -1: Graphical Representation of Compressive Strength in N/mm^2 for 28 Days

4.2 Flexural strength: Beams of size 10cm*10cm*50cm are casted for determining flexural strength. Test on beams are performed at the age of 28 days of the specimen. Placement of specimen in machine is done as per IS: 516-1959 in the clause no 8.3.1 page no 17. Load is applied at increasing rate of 108KN/min. Load is applied until specimen fails and load at which specimen fails is recorded. As specified in the IS code flexural strength is calculated and tabulated below.

Table -3: Result of Flexural Strength on Beams

Mix	% Replacement	Flexural Strength (N/mm^2) for M-25 Grade	Flexural Strength (N/mm^2) for M-20 Grade
		28 Days	28 Days
Mix-1	0	5.14	4.30
Mix-2	0.8	5.96	4.75
Mix-3	1.6	5.98	5.13
Mix-4	2.4	6.43	4.74
Mix-5	3.2	5.57	4.73



Graph -2: Graphical Representation of Flexural Strength in N/mm^2 for 28 Days

3. CONCLUSIONS

1. The maximum strength achieved by the PEG400is found to be 1.6% for Mix-25 and 2.4 %for Mix-20 grade.
2. The concrete strength gaining by the PEG400 is comparable for M25 & M20 mix.

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