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Study on Properties of Self Curing Concrete

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ABSTRACT:
The increase in population has resulted in a rapid increase of construction activities and also caused an imbalance in water management, water being a major requirement in construction used in mixing and curing of concrete and governs hydration of cement. Majority of the water is used in curing of concrete, conventional curing is carried out from the exposed part of concrete to its inner part whereas the contrast is performed at self-curing which also helps in minimizing the wastage of water, where the hydration of cement occurs due to additional water available which is not part of the mixing water. The present study reviews mechanism of self-curing, different self-curing methods and various researches and their impact on utilization of PEG-400 as self-curing agent in order to produce eco-friendly self-curing concrete.

The curing of concrete requires high water demand. In this study reinforcement corrosion protection of self-curing concrete (SC) mixtures incorporating two water-soluble polymers; polyethylene glycol (PEG) and polyacrylamide (PAM) have been evaluated. Durability indices, electrical resistivity, chloride ion penetrability and water permeability, were evaluated and compared to that of control concrete mixture with no self-curing agents under different curing regimes.Self-curing concrete represents a step towards a new construction material due to its lower demand for curing water and hence can reserve the limited water resources in many parts of the world.

Keywords:- Self Curing Concrete(SC),Polyethylene Glycol(PEG),PEG-400,Conventional Method ,Compressive strength.

I. INTRODUCTION :

Curing of concrete plays a major role in developing the concrete microstructure. According to the ACI 308R, Guide to Curing Concrete, "the term 'curing' is frequently used to describe the process by which hydraulic cement concrete matures and develops hardened properties over time as a result of the continued hydration of the cement in the presence of sufficient water and heat". Thus, the role of curing practice lies in reducing water evaporation from concrete to maintain satisfactory moisture content inside concrete which is essential for the continuation of hydration of the cement, and consequently the development of concrete microstructure, pore structure, and needed properties. Proper curing is vital for structures to meet their designed life and minimize maintenance cost. However, good curing is not always practical in many cases. Several studies concluded that increasing the water retention in the mixture can act as internal curing . Several researchers introduced the concept of self-curing concrete .

Self-curing concrete can be produced by incorporating self-curing agents in the concrete mixture . The self-curing agents were mainly chemicals that can absorb and retain water inside the concrete mixture which will reduce water evaporation from the concrete mixture. As the cement hydration proceeds and the internal relative humidity decreases, the self-curing agent will release the absorbed water as an internal water curing source. Hydrophilic water-soluble polymers were successful as self-curing agents. Hence the use of self-curing concretes would be of great benefit in areas where water is not adequately available and will shift the concrete construction to a new level of sustainability

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II. MOTIVATION:

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Scope of the study is to identify the effect of polyethylene glycol (PEG) on strength characteristics of self-curing concrete and also to evaluate influence of poly ethylene glycol on mechanical properties

III. PROBLEM STATEMENT:

- When Concrete is not cured properly, its strength & abrasive resistance are affected. Due to inadequate curing concrete develops cracks , a considerable loss in the strength of the concrete.
- Addressing this problem, we are going to use some self curing chemicals as external & internal chemicals agents & aggregates to increase the strength of the concrete.
- This research aims to examine that which self curing chemical agent is the best suitable to increase the strength of concrete by performing test on the concrete.

IV. METHODOLOGY:

➢ CONVENTIONAL METHOD.
- Preparation of concrete as per mix proportion.
- Casting of 9-10 nos. standard sized cubes. i.e. 150*150*150
- Curing with conventional method by water curing .

➢ BY ADDING CHEMICAL
- Preparation of concrete with same proportion by adding some amount of chemical.
- Casting of same no of standard sized cubes.
- No any type of curing require for Self curing concrete.

➢ Testing
➢ Analysis of results

V. PROCUREMENT OF MATERIALS

5.1.Cement :

The most commonly used is Ordinary Portland Cement.The OPC 53 grade compatible to IS 8112-1989 was the standard followed in the mix.

5.2.Aggregate :

The fractions from 20 mm to 4.75 mm are used as coarse aggregate. The Coarse Aggregates was made from locally available resources.

5.3. Water :

Water is an important ingredient of concrete as it actively participated in chemical reaction with cement. Here

Water-Cement ratio is maintained at 0.42.Water used work for mixing should be as per IS 10262: 2019 whose pH is around 7.

5.4. Self-CuringMaterial :

Self-curing can be adopted by utilizing different methods such as by using super absorbent polymers. Majority of the researches are carried out on utilizing PEG-400 as self-curing agents. It acts as a water saving material and reduces the cracking and shrinkage in concrete.

5.4.1 Polyethylene Glycol :

Polyethylene glycol is a condensation polymer of ethylene oxide and water with the general formula H(OCH 2CH 2)nOH, where n is the average number of repeating oxyethylene groups typically from 4 to about 180. 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. Polyethylene glycol is non-toxic, odourless, neutral, lubricating, non-volatile and non-irritating and is used in a variety of pharmaceuticals.

Sl.No.	DESCRIPTION	PROPERTIES
1.	MOLECULAR WEIGHT	400
2.	APPEARANCE	CLEAR FLUID
3.	MOISTURE	0.2%
4.	pH	6
5.	SPECIFIC GRAVITY	1.12

Fig: Properties of PEG-400

VI. EXPERIMENTAL WORK :

6.1.Quantities of materials in kg:

Mix proportions of M25 grade: 1:1:2
Water cement ratio = 0.45
Size of cube = 150*150*150 mm
Volume of one cube=0.00375 m3
Volume of 30 cube =0.00375*30
=0.10125 m3

For cubes:

- Cement=38.91 kg
- Fine aggregate=38.91 kg

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- Coarse aggregates=77.96 kg
- Water=25.26 liter.

6.2.Cube casting :

- Prepared concrete as per mix design of m25 concrete.
- Casted 9-10 standard sized cubes. i.e. 150*150*150.
- Cured with conventional method by water curing.
- Prepared concrete by adding different amount of chemical (PEG-400).

i. 0.5 % of PEG.
ii. 1.0 % of PEG.
iii. 1.5 % of PEG.

Casted of 9-10 standard sized cubes of each proportion.

6.3. Testing :

- Testing of specimen under universal testing machine (UTM)
- Tested specimen at:

7 Days
28 Days

- Results are included below.

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VII. RESULT:

Average Compressive strength results for self-curing concrete by using PEG-400

Sr. No.	Percentage of PEG-400	7 Days	28 Days
1	Conventional concrete (0%)	17.93	27.82
2	0.5%	17.17	27.57
3	1.0%	18.39	29.15
4	1.5%	16.61	25.23

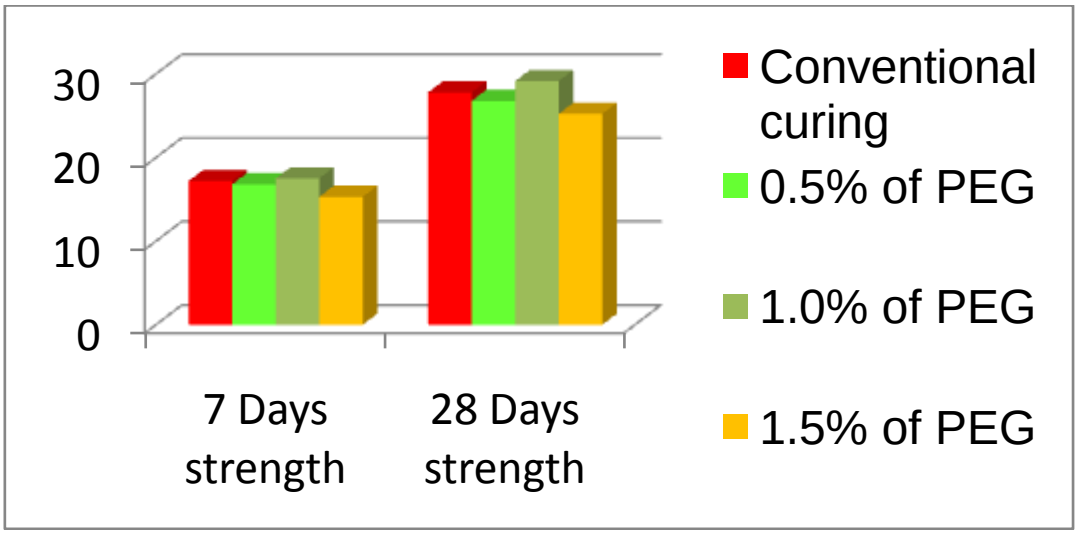

Fig: Graphical Representation of Results

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VIII. CONCLUSION :

- Strength of self-curing concrete is relatively high when compared with conventional concrete.
- Self-curing concrete is an alternative to conventional concrete in desert regions where scarcity of water is a major problem.
- The optimum dosage of PEG400 for maximum strengths (compressive) was found to be 1%.
- If dosage exceeds 1% there is a slight decrease in the strengths mentioned above.

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