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REVIEW ON SELF CURING CONCRETE USING POLY-ETHYLENE GLYCOL (PEG-400) IN CEMENT CONCRETE

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Abstract

As we know that water is becoming a scarce material, there is an urgent need to do research work to saving of water in making concrete and in constructions. As some areas has a scarcity of work for construction work.Curing of concrete is maintaining satisfactory moisture content in concrete during its early stages in order to develop the desired properties. Curing of concrete plays a vital role in developing the construction and hence improves its durability and performance. Curing is the process of maintaining the proper moisture content to promote optimum cement hydration immediately after placement. The main objective of this experimental investigation is to find out behavior of self-curing concrete. The experiments are designed by adding an admixture(POLYETHYLENE GLYCOL-400)at different percentages such as 0%, 0.5%, 1%, 1.5%, 2% of cement content. .The specimens are cured without water for 28 days and later different strength characteristics such as compressive strength, tensile strength are studied.

Index Terms: *self-curing concrete; self-curing agent; PEG-400.*

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1. INTRODUCTION

Concrete is the basic engineering material used in most of the civil engineering structures. Its popularity as basic building material in construction is because of its economy of use, good durability and ease with which it can be manufactured at site. Concrete like other engineering materials needs to be designed for properties like strength, durability, workability. With advent of new generation admixtures, it is possible to achieve higher grades of concrete with high workability levels economically. Curing is the maintaining of a satisfactory moisture content and temperature in concrete during its early stages so that desired properties (of concrete) may develop.

As we know that the concrete gains the strength only in presence of water and this water is provided after placing the concrete in formwork with the help of appropriate curing method. In places where scarcity of water is there and availability of water is less for the construction activity purpose some chemical admixture is use for effective curing. Many researcher has invented the effectiveness of Poly-ethylene Glycol as a self-curing agent.

In this work we are going to study the effect of polyethylene glycol on cement concrete and to estimate the optimum dose of Polyethylene glycol in concrete.

Polyethylene-Glycol (PEG): Polyethylene glycol is produced by the interaction of ethylene oxide with water, ethylene glycol, or ethylene glycol oligomers. The reaction is catalyzed by acidic or basic catalysts. It is used as water reducing agent.

1.1Need and scope of study

Curing of concrete is maintaining satisfactory moisture content in concrete during its early stages in order to develop the desired properties. However good curing is not always practical in many cases. The aim of this investigation is to evaluate the use of water-soluble polymeric glycol as self-curing agents. The use of self-curing admixture curing admixtures is very important from the point of view that the water resources are getting valuable every day. The benefit of self -curing admixtures is more significant in desert areas where water is not adequately available .In this study the

mechanical properties of self-curing at different percentages of poly ethylene glycol will be evaluated and compared with conventional concrete specimen. 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 which are experimentally investigated.

2. OBJECTIVES

- To study the mechanical characteristic of concrete i.e., compressive strength, split tensile strength and modulus of rupture by varying the percentage of PEG from 0% to 1.5% by weight of cement for M25 grade of concrete.
- To attain the optimum percentage of PEG in concrete.
- To study the mechanical properties of concrete mix by varying percentage of this chemical admixture.

3. BEHAVIOR OF PEG IN CONCRETE

When water is mix with dry concrete it start reacting with the cement and heat of hydration takes place due to which exothermal heat is generated. This causes shrinkage cracks at its early stage. At the same time evaporation of water takes place and that's why cracks is formed. When PEG is added to concrete it form a shell around water particles and water is entrapped between these shells. These shells are formed on water particles present in the concrete. The thicknesses of these shells are around 2nm. Due to formation of this shell water is not able to evaporate from concrete this reduces rate of evaporation and water is always available at the time period when heat of hydration is going on. Due to this early age shrinkage cracks will not form. As evaporation does not takes place there is no need of water as curing for a particular period and ultimately water is saved.

4. MATERIALREQUIRED AND ITS PROPERTIES

4.1 Poly Ethylene Glycol (PEG-400):-

Fig.1: PEG (400)

Table 1:- Properties of PEG-400.

Sr. No.	DESCRIPTION	PROPERTIES
1	Molecular Weight	400
2	Appearance	Clear Fluid
3	Moisture	0.2%
4	Ph	6
5	Specific Gravity	1.12

4.2 Cement:-

Ordinary Portland Cement (OPC) of 53-Grade.

4.3 Aggregates:-

4.3.1 Fine Aggregate:-

Local river sand is used as a fine aggregate sieved from 4.75 mm IS sieve.

4.3.2 Coarse Aggregate:-

Crushed stone aggregate from the local stone quarries of nominal size of 10-20 mm.

4.4 Water:-

Fresh portable water is used for mixing and curing the concrete.

5. PHYSICAL PROPERTIES OF PEG

Depend on molecular weight the wide range of the physical property such as solubility, Hygroscopic, vapor pressure, freezing point and viscosity are variable:

Solubility- Increasing the molecular weight of PEG results in decreasing solubility in water & solvents. PEG is also soluble in many polar organic solvents such as acetone, alcohols.

Stability- PEGs have low volatility and are thermally stable for a limited period of time below 300°c and without O_2.

6. METHODOLOGY

- In the present study, an experimental work was carried out to establish the suitability of a curing compound and its dosage in self curing concrete of M20 grade. In this study we are using Poly-Ethylene Glycol (PEG-400) a hydrophilic compounds in different doses like (0%, 0.5%, 1.0%, 1.5% and 2% by mass of cement) and three curing conditions (no curing, curing by conventional water immersion and self / internal curing) are considered as the parameters of this investigation.
- A comparison was made between specimens not subjected to any curing, subjected to conventional wet curing and with those cured with hydrophilic compounds i.e., PEG-400 self curing compounds.
- Slump cone test and Compaction Factor tests were carried out to check the flow ability as per IS: 1199-1959. Cubes of size 150 mm X 150 mm X 150 mm were cast to determine compressive strength of specimens

7. CONCLUSIONS

- From this experimental study we conclude that the compressive strength of the concrete cubes has gradually increased up to adding admixture of 1.5% of cement by PEG-400.
- Compared to compressive strength of 0.5%, 1.0% and 1.5% adding admixture of cement by PEG-400, the compressive strength of 2.0% PEG-400 concrete has been decreased.
- Whereas comparing to traditional concrete, compressive strength of concrete has been increased by adding 1.5% of cement by PEG-400.
- This use of Admixture is more effective where there is scarcity of water.
- Hence for economical view 1.5% adding admixture is suggested as we use 2.0% it became uneconomical as per our observation.
- The gain in compressive strength is improved depending upon the adding admixture level of PEG-400 in weight of cement.

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