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An Overview on Characteristics of Self-Curing Concrete Using Polyethylene Glycol-400 (PEG)

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ABSTRACT: *In Today's era concrete is important material. In the construction projects use of concrete is more. To make structure strong and durable curing is essential. There is a demand for replacement of curing because of lack of water. Improper curing due to negligence's of humanalsoavoidedwith use of alternate curing method. The structures in hilly areas are not curedproperlybecause of in accessibility. Giving importance to this, usage of self-curing concrete was developed by using water-soluble Polyethylene Glycol 400(PEG) curing agent. To save water whichisused for curing PEG plays the important role. As for constructing 1m3 of concrete 3m3 of water isrequire. In that 3m3 maximum water isrequire for curing purpose. In this paper literature review, materialsused, and signifiance of self-curing concrete has given. However, this new construction materialis in the development stage and it has a wide scope in future.*
KEYWORDS -*Polyethylene Glycol 400(PEG 400), Scarcity, Self-curingConcrete.*

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I. INTRODUCTION

Concrete is the essential designing material. It is most popular and widely used for many of the civil engineering structures. It is popular because it is economical for use and having good durability also placing is easy while manufactured at site. Concrete needs curing to gain proper strength. According to the ACI 308 committee [1], ''internal curing refers to the process by which the hydration of cement occurs because of the availability of additional internal water that is not part of the mixing water''.

Construction industry is totally depending upon water. Day-by-day water is becoming a scarce material. To save water we can minimize the utilization of water at construction sites. Hence construction industry has to find ultimate solution for water, to maintain development of environment. Mix design of concrete requires water but as compare to making of concrete industry require more water for concrete curing. Self-curing admixture added during concreting will reduce water evaporation inside the concrete. Which imparts self-curing of concrete. The admixture will reduce evaporation of water in concrete and retain the water in concrete for hydration reaction of cement. This paper involves study of PEG as internal curing compound.

II. LITERATURE STUDY

2.1 An Experimental Investigation of Self Curing Concrete Incorporated with Polyethylene Glycol as Self Curing Agent: ShikhaTyagi introduced article which help to locate the ideal dose of PEG400 for maximum strength is observed to be 1% for M25 and 0.5% for M40 grade. The impact of PEG400 on workability is studies by taking slump cone and compaction factor tests. In this investigation the dosage of PEG400 has been fixed from 0% to 2%. The test outcomes were contemplated both for M25 and M40 grade. Conclusion cab be made with the help of this experiment that this self-curing agent help in self-curing and gives strength compare to conventional curing technique and furthermore enhanced workability.

2.2Studies On Properties Of Self-Curing Concrete Using Poly-Ethylene Glycol: Basil M Joseph conclude in the paper that percentage of self curing admixture that is PEG400 is giving maximum compressive strength, maximum modulus of rapture and tensile strength. It was observed that when the percentage of PEG400 exceeds 1% strength is reduced slightly. As a alternative instead of conventional curing in concrete, we use self-curing method for concreting it will be really helpful in desert area where water availability is less. The purpose of this examination was to assess the utilization of water-solvent polymeric glycol which act as a self-curing agent. Utilization of admixture of self-curing is essential from the perspective that the water is getting important consistently. As 1m3 of concrete require 3m3 of water for curing [2].

2.3 An Experimental Investigation on Internally Cured Concrete: Siddiqui Mohammed Junaid work a lot on creating self-curing concrete by utilizing Polyethylene Glycol (PEG-400). In this experimental examination the conventional concrete prepares with the addition of self-curing admixture known as PEG-400 have been studied concern with strength. Mix design was prepared by using IS method. In this experiment M20 grade concrete is referred. For taking trial dosage, PEG is varied from 1% to 3% by weight of cement. The outcomes found with 1% and 2% PEG-400 measurement gives high compressive strength when compared with conventional cured concrete. With increase of dose of PEG-400 the strength of cement reduces.

2.4 Self-Curing Concrete – Literature Review: Riyaz Ahamed K.has examines research papers and given a review. By this examination he expresses that the durability as well as strength of cement mainly depend on the curing of cement. 'interior curing' is taking into account curing 'from within to outside' through the inside reservoirs in the form of lightweight aggregate, super absorbent polymer, or saturated wood fibres Made. Shrinkage reducing agents, lightweight aggregate, for example, Polyethylene-glycol and Leca, Silica smoke and stone chips are utilized separately to accomplish successful curing comes about. Internal curing of concrete is the response to numerous issues looked because of absence of proper curing. Self-curing concrete is an alternative option to ordinary cement in desert districts where the major issue is shortage of water.

2.5 A Comparative study of mechanical properties of M25 grade self-curing concrete (using PEG-400) with conventional concrete: J Saran Kumar, T Suresh Babuhas a main aim to this examination is that the appropriate measurement of PEG-400 for M20 grade concrete is 1%. For this dosage the compressive strength observed is maximum. Wrapped curing is less productive than Layer curing. He additionally expresses that self-curing is applicable to straight forward and additionally complex shapes. In this examination, the investigation is done on the compressive strength and split rigidity of concrete in which self-curing agent is incorporated with those of traditionally cured concrete.

2.6 Self-curing concrete –case study: Indirajith. A.J & Vishnu. AA studied about the concrete in which self-curing is present at different rate is examine and distinguish with the ordinary concrete. This investigation has intended to perform the relative trial tests between self-curing concrete (both outside self-curing what's more, inside self-curing) by utilizing PEG and regular concrete for M40 grade. The goal of this study is to use the super absorbent polymer as self-curing agent. It is more significant in draught prone areas where water is not adequately available.

2.7 Mechanical properties of self-curing concrete (SCUC): Magda I. Mousaexamines in this examination that two materials are picked up as internally curing agent with different proportions and the expansion of silica rage was considered. Polyethylene-glycol ;1%, 2%, and 3% was taken to the weight of cement. To complete this investigation, the cement substance of 300, 400, 500 kg/m 3, water/cement proportion of 0.5, 0.4, 0.3 and 0.0%, 15% silica fume to the weight of cement as an added substance were used as a part of cement mixes.

2.8 Strength characteristics of self-curing concrete: M.V. Jagannadha Kumar examines the utilization PEG-400 as a shrinkage reducing agent because of which better hydration is achieved with subsequently strength. The effect of PEG-400 on M20 and M40 grade is observed with respect to its compressive strength and split tensile strength. For this observation the percentage of admixture is changes from 0 to 2 to the weight of cement. Addition of PEG-400 will increase the slump and compaction factor which will ultimately improve the workability of concrete. For M20 workability is more as compare to M40. Hence it is predicted that that 1% admixture is used for M20 grade and 0.5% is used for M40 grade.

III. Material

Following are the materials used for making concrete are cement, crushed sand, coarse aggregate, water and PEG 400.

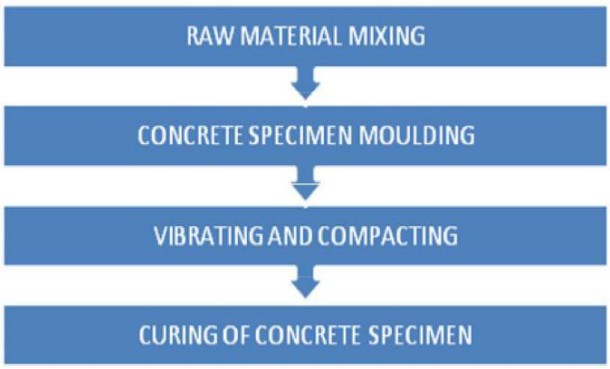
3.1Cement: Generally, selection criteria for cement is depend on requirement of strength and durability of concrete. The cement used in this experimental works is "Vasavadatta 43 Grade Ordinary Portland Cement". Grade-43 cement has the good quality and high durability. It is generally used for concreting of residential buildings.

3.2 Fine Aggregates: Fine aggregate is the artificial material. The fine aggregate effectively fills all the open spaces in the middle of coarse aggregates. Therefore, it diminishes the porosity of the last mass and significantly builds its quality. Natural sand driven from river stream is not eco-friendly so finely crushed sand is used as fine aggregate. Sand used forthe product is crushed sand. The fine aggregate means the stones which are passing through the 4.57 mm sieve with specific gravity of 2.79 and water absorption is 3.5%.

3.3Coarse aggregate: Coarse Aggregates are a main material of concrete. The role of aggregate is to give reinforcement in concrete. The 10mm and 20mm sized coarse aggregates are used. The water absorption capacity of it is 2.2%.

IV. MANUFACTURING PROCESS

The process of manufacturing of self-curing concrete is nearly same as in regular or traditional concrete only the polyethylene glycol is mixed in the concrete. Self-curing concrete is produced by adding 1% PEG400 by the weight of cement in the concrete mix. PEG-400 appears to be the water-soluble nature. It is non- toxic, odourless, neutral, lubricating, non-volatile and non-irritating and is used in various type of pharmaceuticals.



V. Significance Of Self-Curing Concrete

The self-curing technique is more important in water lacked areas. Due to this chemical shrinkage arising during cement hydration, voids are generated in the cement paste because of chemical reaction between cement and water. Early age cracking may produce because of shrinkage. The utilization PEG-400 is imperative for sustainable advancement. The advantage of self – curing agent are huger in forsake zones where water isn't sufficiently accessible.

VI. CONCLUSION

The purpose of this literature survey was to understand the different characteristics of self curing concrete and hence from this conclusion can be made that with the assistance of Self-Curing, hydration of cement is done, which is not only done by mixing water but also by curing water. Also this literature survey suggests that 1 percentage of self curing admixture that is PEG400 is giving maximum compressive strength, maximum modulus of rapture and tensile strength. It Gives water for keeping relative humidity (RH) high, likewise keeping self-drying up from happening. Due to self-curing beginning time splitting can be decreased. Self - curing can compensate for a portion of the inadequacies of outside curing, like both humans related that is basic period required for curing is initial 12 to 72 hours and hydration.

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