AN OVERVIEW ON A STUDY ON SELF-CURING CONCRETE USING POLYETHYLENE GLYCOL-400 (PEG)

Mr. KAMALAKARA G K [(1)], Mr. ABISHEK K A [(2)], Mr. BHAVISH K M [(3)],

Mr. PRATHIK GOWDA R [(4)].

1 Assistant Professor Civil Engineering Department, Rajarajeswari College of Engineering, Bengaluru, Karnataka.

2,3,4 UG Students, Rajarajeswari College of Engineering, Bengaluru, Karnataka.

ABSTRACT

Research on water conservation for concrete production and building is desperately needed, as water is becoming a precious resource on a daily basis. In order for concrete to acquire the desired qualities in its early phases, it must be cured, or kept at a suitable moisture content. Good curing, however, is frequently impractical. Concrete's microstructure and pore structure are developed by curing, which enhances the material's performance and longevity. We shall try to create self-curing concrete by employing water-soluble polyethylene glycol as a self-curing agent, keeping this in mind. The purpose of this study is to examine the durability and strength characteristics of concrete by employing self-curing water-soluble polyethylene glycol.

Keywords: *polyethylene glycol-400 [PEG-400], self-curing concrete, conventionally cured concrete.*

I. INTRODUCTION

Introduction: In order for concrete constructions to achieve performance and durability standards, proper curing is necessary. This is accomplished in traditional curing by applying external curing following mixing, putting, and finishing. A method called self-curing, also known as internal curing, allows concrete to retain more moisture, which improves cement hydration and decreases self-desiccation. According to the ACI-308 Code, "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." Traditionally, curing concrete entails setting up circumstances so that water does not evaporate from the surface; in other words, curing is believed to occur internally. Internal curing, on the other hand, permits curing."

II. LITERATURE REVIEW

- Jagannadha Kumar, M. V., et al. They investigated the application of polyethylene glycol (PEG-400), a shrinkage-reducing additive that promotes improved hydration and, consequently, strength in concrete by aiding in self-curing. By changing the percentage of PEG by weight of cement from 0% to 2% for M20 and M40 mixes, the effects of admixture (PEG-400) on compressive strength, split tensile strength, and modulus of rupture were investigated. It was also discovered that, in order to achieve maximal strength without sacrificing workability, M20 grade concretes should contain 1% of PEG-400 by weight of cement, whereas M40 grade concretes should contain 0.5%.
- M. Saravanan and K. Vedhasakthi The workability and strength properties of concrete using self-curing agents—both normal strength and high strength—have been examined in this study and contrasted with similar concrete that has been conventionally cured. The dosage of super plasticizer was adjusted based on the concrete grade. For M60, M70, and M80 grades of concrete, trial dosages of 0.8%, 1%, and 1.2% of the cement's weight were utilized; for medium strength concrete, trial dosages of 0.25% and 0.3% of the cement's weight were employed; and for high strength concrete, trial dosages of 0.4% of the cement's weight were utilized. The self-curing agent has better workability, according to the results of the workability test. Concrete treated with this self-curing chemical is shown to yield more

- Shikha Tyagi The current study examines how the curing chemical affects compressive strength and workability (slump and compaction factor). This study fixed the dosage of the internal curing ingredient and varied the proportion of PEG by weight of cement from 0% to 2%. The test findings for the M40 and Mas mixtures were examined. This experiment investigation has shown that PEG-400 aids in self-curing by improving workability and providing strength comparable to that of the traditional curing process.

- Robert Keith Sun and Roland Tak Yong Liang worked on the concrete internal curing composition, which contains wax and glycol. The discovery that adding a mixture of wax and glycol to concrete allows for internal curing—which is comparable to or better than conventional methods of curing concrete in many ways—led to the innovation. For the first time, an internal curing composition is made available by the invention, which when combined with concrete or other cementitious mixes, satisfies the curing requirements outlined in Australian Standard AS 3799. The invention describes a preferable internal curing composition that consists of paraffin wax and PEG with a molecular weight of approximately 200.

- By adding pre-wetted LWA to 25% of the volume of the aggregates, Silvia Weber and Hans W. Reinhardt created a new kind of high-performance concrete. This allowed the concrete to retain water internally, allowing for continuous wet curing. The microstructure of the hardened cement paste and the most significant mechanical characteristics of the concrete under various curing conditions were examined. The outcomes demonstrated that the technique of adding a water reservoir can be used to create High Performance Concretes (HPC) that have better qualities and are less susceptible to curing.

- In order to lessen autogenous shrinkage by IC, M.R. Geiker, D.P. Bentz, and 0.M. Jensen investigated two internal water supply sources. First, partially saturated lightweight fine aggregate is substituted for some of the sand, and second, superabsorbent polymer particles (SAP) are added. The SAP system is seen to be more effective at reducing autogenous shrinkage at later ages at equal water addition rates, most likely because the additional curing water is distributed more uniformly within the three-dimensional mortar microstructure.

III. MATERIALS

MATERIALS TO BE USED

The different materials will be used in this investigation are

- 53 Grade Portland pozzolona cement
- Fine Aggregate
- Coarse Aggregate
- Polyethylene Glycol-400
- Water

Cement: Cement will be used in the investigation is 53 grades Portland pozzolona cement confirming IS: 12269: 1987. The cement will be used for experiments will be obtained from a single consignment and of same grade and same source after procuring the cement it will be stored properly.

Fine aggregate: The fine aggregate conforming to zone II according to IS: 383-1970 will be used. The fine aggregate used was obtained from a crushed stone source. The specific gravity of the sand used was 2.52. The sand obtained was sieved as per IS sieves (i.e. 4.75mm, 2.36mm, 1.18mm, 600microns, 300 microns, and 150 microns).

Coarse aggregate: Crushed granite will be used as coarse aggregate. The coarse aggregate according to IS: 383. 1970 will be used. Maximum coarse aggregate size used is 20 mm. The details of particle size distribution and grading are given in table. Properties of natural aggregate are shown in table.

Polyethylene Glycol-400: Polyethylene glycol is a condensation polymer of ethylene oxide and water with the general formula H(OCH2CH2), OH, where n is the average number of repeating oxy ethylene groups typically from 4 to about 180. The abbreviation (PEG) is termed in combination with a numeric suffix which indicates the

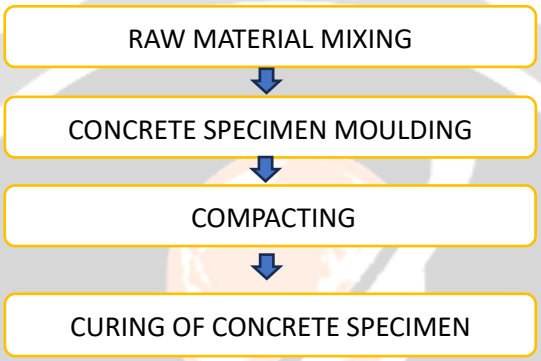
average molecular weight. One common feature of PEG appears to be the water-soluble nature. Specifications of PEG-600 are listed in table.

Water: Potable water will be used in the experimental work for both mixing and curing purposes.

IV. MANUFACTURING PROCESS

The only difference between conventional and traditional concrete manufacture and self-curing concrete manufacturing is the addition of polyethylene glycol to the concrete mixture. By adding in different % [0%,0.5%,1%,1.5%,2%] of PEG400 to the weight of cement in the concrete mix, self-curing concrete is created. It seems that PEG-400 has a water-soluble nature. It's not harmful.

neutral, lubricating, non-volatile, odorless, and non-irritating substance that finds application in a range of therapeutic products.



V. SIGNIFICANCE OF SELF-CURING CONCRETE

The method of self-curing holds greater significance in regions devoid of water. The chemical reaction between the cement and water causes gaps in the cement paste as a result of this chemical shrinkage that occurs during cement hydration. Shrinkage may result in early age cracking. The use of PEG-400 is essential.
for long-term progress. In areas of a forest where water is scarce, the benefits of self-curing agents are enormous.

VI. CONCLUSION

It is possible to conclude from this literature review that self-curing concrete helps hydrate cement by curing water in addition to mixing it. This is because the goal of the review was to comprehend the many properties of self-curingconcrete. This literature review as well indicates that the maximal modulus of rapture, tensile strength, and compressive strength are all given by 1% of the self-curing additive, or PEG400. In addition to preventing self-drying, it provides water to maintain a high relative humidity (RH). Time splitting can be reduced because of the self-curing starting.

VII. REFERENCES

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