International Journal of Research in Advent Technology (IJRAT)
(E-ISSN: 2321-9637)
Special Issue National Conference "CONVERGENCE 2018", 09th April 2018

Review on Study of Self Curing Concrete

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Abstract- The objective of present paper is to summarized the experience available today in the field of concrete .The necessity of concrete is increasing day by day because of demand in construction industry . Concrete needs curing for the minimum period of 28 days to achieve good hydration and mechanical properties .Any problems of curing is affect the strength and durability of concrete .Self curing concrete is one of these type of concrete and it is used in areas where there is less storage of water .These information is explained in this present paper .

Index Terms- Self Curing Concrete , Polyethylene Glycol , Workability , Compressive Strength .

1. INTRODUCTION

The most important construction materials are cement based materials and it is most likely that will continue to have the same importance in future. Construction industry is a major contributor to economic development of the country. A common and basic factor in all above activities is concrete and concrete structures. Self-curing concrete is one type of concrete, which cure itself by retaining water (moisture content) in it, Self curing concrete is mainly used in areas where there is an acute shortage of water and the application of water curing is not possible for economic reasons. It increases water retention capacity of mix. So many studies are done about the usage of Self curing concrete. Curing of concrete is maintaining satisfactory moisture content in concrete during its early stages in order to develop the desired properties. The self-curing process of concrete takes place from inside to outside, thus reducing the autogenously shrinkage and self-desiccation, especially for the high-performance concrete with relatively low water/binder ratio. The durability and the workability of self-curing concrete are improved, compared with conventional air-cured concrete, while the mechanical properties may be either enhanced or compromised due to the dual function of self-curing agent. Self-curing concrete has been widely applied in actual practice, mostly bridge decks and pavements.

Proper curing of concrete structures is important to meet performance and durability requirements. In conventional curing this is achieved by external curing applied after mixing, placing and finishing. Self-curing or internal curing is a technique that can be used to provide additional moisture in concrete for more effective hydration of cement and reduced self-desiccation.

The concept of self-curing agents is to reduce the water evaporation from concrete, and hence increase the water retention capacity of the concrete compared to conventional concrete. It was found that water soluble polymers can be used as self-curing agents in concrete.

The materials used in that concrete mixture are cement, water, coarse aggregate, fine aggregate, and polyethylene glycol.

Methods of self curing

There are two major methods available for internal curing of concrete.

The first method uses saturated porous lightweight aggregate (LWA) in order to supply an internal source of water, which can replace the water consumed by chemical shrinkage during cement hydration. The second method uses poly-ethylene glycol (PEG) which reduces the evaporation of water from the surface of concrete and also helps in water retention.

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 weight. One common feature of PEG appears to be the water-soluble nature. The PEG-400 use in the investigation have Molecular Weight 400, Appearance Clear liquid, pH 5-7, Specific Gravity 1.126

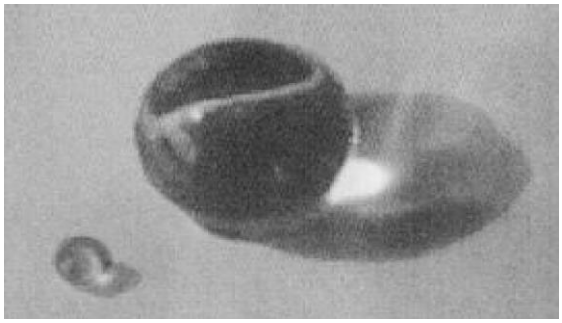

Fig.1.1 Polyethylene Glycol

2. LITERATURE REVIEW

In the field of self curing concrete different studies where done and some of them are listed below. Researchers found that self curing concrete is an effective replacement of conventional concrete.

2.1 Mohanraj A et.al (2016) [1] Studied on "self-curing concrete incorporated with polyethylene glycol". The compressive strength of cube for Self-cured concrete is higher than of concrete cured by conventional curing method. The split tensile strength of self-cured concrete specimen is higher than that of the conventionally cured specimen. Self-cured concrete is found to have less water absorption values compared with concrete cured by other methods. Self-cured concrete thus have a fewer amount of porous.

2.2 Basil M Joseph (2016) [2] Studied on self curing concrete and PEG400 were used as a self curing agent in concrete. M20 grade of concrete is adopted for investigation. The author added 0-1.5% of PEG400 by weight of cement for M20 grade concrete from that he found 1% of PEG400 by weight of cement was optimum for M20 grade of concrete for achieve good maximum strength. The author found that the percentage of PEG400 gets increased slump as well as compaction factor also get increased.

2.3 Mousa M I et.al (2015) [3] In their study water retention and durability of concrete with or without silica fume along with self-curing agents such polyethylene-glycol, and leca is investigated and compared to conventional concrete. The concrete mass loss and the volumetric water absorption were measured, to evaluate the water retention of the investigated concrete. Significant improvement in all considered concrete properties due to the addition of 15% SF along with self-curing agents has been achieved, especially with 2% of Polyethylene-glycol which absolutely ensured the best results and good durability properties.

2.4 Shikha Tyagi (2015) [4] Studied on self-curing concrete and had use PEG400 as a self-curing agent in concrete.M25 and M40 gradeof concrete are adopted for investigation. The author added 1-2% of PEG400 by weight of cement for M25 and M40 grade concrete. The author was determine that the optimum dosage of PEG400 for maximum Compressive strength was to be 1% for M25 and 0.5% for M4O grades of concrete.

2.5 Sona K. S et.al (2015) [5] studied Internal curing technique that can be used to provide additional moisture in concrete for effective hydration of cement. The effect of variation in strength parameters i.e., compressive strength, split tensile strength, flexural strength and durability were studied for different dosage of self curing agent and compared with that of conventional cured concrete. The optimum dosage of SAP for maximum compressive strength split tensile strength, flexural strength was found to be 0.5% of weight of cement for M25 and M30.Also determiner Self curing concrete was the best solution to the problems faced in the desert region and faced due to lack of proper curing.

2.6 Mousa Magda I et.al (2014) [6] The mechanical properties of self curing concrete incorporated with self curing agents is analyzed. For their study, two materials were selected as self-curing agents such as pre-soaked lightweight aggregate (Leca) or polyethylene-glycol with different dosages, and the addition of silica fume was studied. The effects of different dosages of the self curing agents were analyzed, and the optimum values are identified. In all cases, either 2% PEG Or 15% Leca was the optimum ratio compared with the other ratios The improvement in the mechanical properties of self-curing concrete was high while using self-curing agent of chemical type (polyethylene-glycol) compared to aggregate type (saturated leca). The incorporation of silica fume causes additional improvement in the mechanical properties of concrete.

2.7 Mousa Magda I et.al (2014) [7] The physical properties of self curing concrete incorporated with self curing agents such as pre-soaked lightweight aggregate (Leca) or polyethylene-glycol is analyzed, and the addition of silica fume on the properties was studied. The concrete used polyethylene-glycol as self-curing agent, shows improved properties than concrete with saturated Leca. In all cases, either 2% PEG. or 15% Leca was the optimum ratio compared with the other ratios. Results of their study demons treat that a significant improvement took place in the Physical properties studied for self-curing concrete with poly-ethylene glycol (Ch.) as self-curing agent.

2.8 Dahyabhai, et.al (2014) [8] studied on "introducing the self curing concrete in construction industry". Compressive strength of self curing concrete is increased by applying self curing admixtures. The optimum amount of PEG600 for Maximum effective compressive strength was found to be 1% of weight of cement for M25 grade of concrete. The optimum amount of PEG1500 of maximum compressive strength was found to be 1% of weight of cement for M25 grade of concrete. Self

curing concrete is the best solution to the problem faced in the desert region and faced due to lack of proper curing.

2.9 Vedhasakthi K et.al (2014) [9] studied the investigation, workability and strength characteristics of Normal Strength and High Strength Concrete, cast with the self curing agents have been studied and compared with the corresponding conventionally cured concrete. For the Normal Strength Self Curing Concrete of grade M20, M30 and M40, IS method of mix design was adopted.. Super plasticizer dosage was varied with grade of concrete. Trial dosages of 0.8%, 1% and 1.2% of the weight of cement were used for M60, M70 and M80 grades o f concrete respectively. The Strength of the concrete increases significantly with the increase of self curing agent. i.e., concrete with 0.3% of PEG gives more strength than that with 0.25%.

2.10 Manoj Kumar, D. (2013) [10] Studied on self curing with Super absorbent polymer was used as self curing agent. M40 grade of concrete is adopted for investigation. Water retention for the concrete mixes incorporating a self curing agent is higher compared to conventional concrete mixes. As found by the weight loss with time. The optimum is 0.3 % addition of SAP leads to increase of mechanical strength. Compressive strength of self cured concrete for the dosage of 0.3% was higher than water cured concrete. Split tensile strength of self cured concrete for dosage of 0.3% is higher than water cured concrete. Flexural strength of self cured concrete is lower than conventionally cured concrete. Performance of the self curing agent will be effected by the mix proportions. There was a increase in the strength for dosage from 0.2to 0.3 % and later reduced. Self cured concrete using SAP was more economical than conventional cured concrete.

2.11 El-Dieb (2007) [11] studied water retention of concrete using water-soluble polymeric glycol as self-curing agent. Concrete weight loss and internal relative humidity measurements with time were carried out, in order to evaluate the water retention of self-curing concrete. The water transport through the concrete is analyzed by measuring permeable voids%, water sorptivity, absorption%, and water permeability. The water transport through self-curing concrete is evaluated with age and compare with normal concrete.

2.12 Dhir RK et.al (1994) [12] the feasibility of self curing concrete by adding water-soluble chemicals which reduce water evaporation in the concrete, making it self-curing Among the set of chemicals most suitable one which provide self curing property was determined. The main property of the self curing agent was that they form hydrogen bonds between water molecules and an -OH group on a polymer molecule and reduce the water evaporation from the surface. Ceramic tiles aggregate (CTA) are crushed uniformly to about 20mm size manually or by crushing machine and sieved through 20mm IS Sieve. The aggregates passing through IS sieve 20mm and retained on 12.5mm were taken.

3. CONCLUSION

The conclusion from the paper can be drawn that polyethylene glycol being used as admixture in concrete mix increase the initial strength than the ordinary concrete.

- By applying the self–curing admixture compressive strength of self curing concrete is increases.
- The percentage of PEG400 for maximum strengths (compressive, tensile and modulus of rupture) was found to be 1% for M20 and 0.5% for M40 grades of concrete.
- Strength of self curing concrete is on equalizing with conventional concrete.
- Self curing concrete is solved to many problems faced due to lack of proper curing.
- Self curing can be applied to simple as well as complex shapes.

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