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"A Review on Self Cured Concrete"

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ABSTRACT

The imagination of a world without concrete is impossible. Concrete is a soul of infrastructures. Concrete is necessary to gain strength in structures. Conventional concrete is a mixture of cement, fine aggregate, coarse aggregate and water needs curing to achieve strength. It is required to cure for a minimum duration of 28 days for good hydration & to achieve target mean strength. Lack of water curing can badly affect the strength & durability. Self curing concrete is one type of modern concrete, which cure itself by retaining water in it. For the same an admixture called Poly Ethylene Glycol (PEG) used as a self curing admixture. Many researchers used PEG by taking into account preparation & analysis of self curing concrete is done. Effect of admixture on compressive strength of M25 & M30 mix for 7, 14 & 28 days is analysed. This paper presents a review of all such authors who had used PEG in various forms for to determine its optimum doses and its various properties. Also its effect on the structures like permeability, porosity, corrosiveness and moisture content are checked.

Keywords: Poly Ethylene Glycol (PEG), Self-curing concrete (SCC), Normal curing concrete (NCC), Compressive strength.

I. INTRODUCTION

"Concrete is a pourable mix of cement, water, sand and gravel that hardens into a super strong building material. Sidewalks, foundation and highways are all made of concrete."

Curing is the process of maintaining satisfactory moisture content and temperature in freshly cast concrete for a definite period of time. In simple language it is the process of pouring water on concrete after initial settling of concrete.

Curing of concrete plays a major role in developing the strength and hardness of concrete, which leads to its improvement in durability and performance. Proper curing of concrete structures is important to meet the 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.

Currently, 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.

Self-curing refers to the process by which the hydration of cement occurs because of availability of additional internal water that is not a part of mixing water, that is curing is taken to happen from inside to outside. Internal curing distributes extra water throughout the entire microstructure, thus maintaining saturation of the cement paste during hydration. There are two major methods available for internal curing of concrete. The first method uses saturated porous lightweight aggregate in order to supply an internal source of water which can replace the water consumed by chemical shrinkage during cement hydration. These saturated porous lightweight aggregate stores water in it and act as reservoirs which will be able to release the water whenever the concrete requires. The second method uses poly-ethylene glycol which reduces the evaporation of water from the surface of concrete and also helps in water retention.

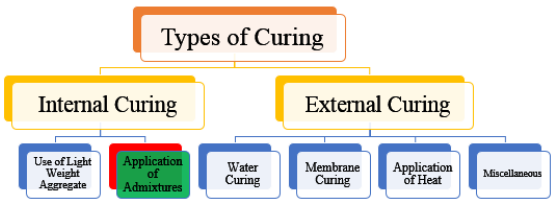

Figure 1. Types of Curing

II. LITERATURE REVIEW

1.Mohammed ShafeequeSanofar.P.B, Praveen.K.P., Jitin Raj, Nikhil.V.P, Gopikrishna(2016) has used PEG600 as a self-curing agent in concrete. M20 and M25grade of concrete are adopted for investigation. They added 0-2% of PEG600 by weight of cement for M20 and M25 grade concrete. From that they found 1% of PEG600 by weight of cement was optimum for M20 and M25 grade of concrete for achieve maximum strength.[1]

2. Basil M Joseph(2016) Studied on self-curing concrete and PEG400 were used as a self-curing agent in concrete. M20 grade of concrete is adopted for investigation. He 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 maximum strength. He also found that if percentage of PEG400 gets increased slump as well as compaction factor also increased[8]

3. ShikhaTyagi (September2015) Used polyethylene glycol as shrinkage reducing admixtures as a internal curing compound. This compound when added to concrete result in self curing and better hydration and good compressive strength. Traps the moisture within structure and hence water is available for hydration .The effect of curing compound on workability and compressive strength is studied.[2]

4. Wen-Chen Jau(2014) stated that self-curing concrete is provided to absorb water from moisture and from air to achieve better hydration of cement in concrete. It reduces the problem when the degree of cement hydration is lowered due to no curing or improper curing by using poly-acrylic acid as a self-curing agent which has strong capability of absorbing moisture from atmosphere and providing water required for curing concrete.[3]

5. Stella Evangeline(2014) had use poly vinyl alcohol as self-curing agent in concrete. He added 0.03-0.48% by weight of cement from that he found 0.48% of poly vinyl alcohol by weight of cement provides higher compressive, tensile as well as flexural strength than the strengths of conventional mix.[4]

6. DayalanJ(2014) had used super absorbent polymers as a self-curing agent in concrete. He was added 0.0-0.48% of super absorbent polymer by

weight of cement for M25 grade concrete. He was found that super absorbent polymer 0.48% by the weight of cement provides higher compressive, tensile as well as flexural strength than the strength of conventional mix.[5]

7. Patel Manish Kumar Dahyabhai& professor Jayesh Kumar Pitroda(2013)studied on "introducing the self-curing concrete in construction industry". Compressive strength of self-curing concrete is increased by applying self-curing admixtures. The compressive strength of concrete mix increased by 37% by adding 1.0% of PEG600 and 33.9by adding 1.0% of PEG1500 as compared to the conventional concrete. The optimum dosage of PEG600 for maximum compressive strength was found to be 1% of weight of cement for M25 grade of concrete. The optimum dosage 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.[6]

8. A.S. EL-Dieb et al. (2013) Investigated water retention for the concrete mixes.Self curing suffered less self desiccation (dryingness) under sealed condition compare to conventional concrete. S.C.C resulted in better hydration with time under drying condition compared to conventional concrete. Water sorptivity and water permeability values for self curing concrete decreased with age indicating lower permeable pores percentage as a result of the continuation of the cement hydration.[7]

9. PietroLura(2003) The main aim of his study was to reach a better comprehension of autogenous shrinkage in order to be able to model it and possibly reduce it. Once the important role of self-desiccation shrinkage in autogenous shrinkage is shown, the benefits of avoiding self-desiccation through internal curing become apparent.

10. Roland Tak Yong Liang, Robert Keith Sun(2002) carried work on internal curing composition for concrete which includes a glycol and a wax. The invention provides for the first time an internal curing composition which, when added to concrete or other cementitious mixes meets the required standards of curing as per Australian Standard AS 3799.[10]

Table 1

Year	Author	Experiment Conducted	Material Used/ Admixture	Grade	Findings
2016	Mohammed Shafeeque Sanofar.P.B, Praveen K.P., Jitin Raj, Nikhil V.P, Gopikrishna	Used PEG600 as a self-curing agent in concrete.	PEG-600	M20 and M25grade	1% of PEG600 by weight of cement was optimum for M20 and M25 grade of concrete for achieve maximum strength.
2016	Basil M Joseph	Studied on self-curing concrete and PEG400 were used as a self-curing agent in	PEG-400	M20	found that if percentage of PEG400 gets increased slump as well as compaction factor also increased.

		concrete.			
2015	ShikhaTyagi	Effect of curing compound on workability and compressive strength.	Poly ethylene glycol (PEG)	–	PEG added to concrete result in self curing and better hydration and good compressive strength.
2014	Wen-Chen Jau	Self-curing concrete is provided to absorb water from moisture and from air to achieve better hydration of cement in concrete.	Poly-acrylic acid as a self-curing agent	–	Moisture from atmosphere and providing water required for curing concrete. It reduces the problem when the degree of cement hydration is lowered due to no curing or improper curing by using poly-acrylic acid as a self-curing agent which has strong capability of absorbing.
2014	Stella Evangeline	Use poly vinyl alcohol as self-curing agent in concrete.	Poly vinyl alcohol as self-curing agent		0.48% of poly vinyl alcohol by weight of cement provides higher compressive, tensile as well as flexural strength than the strengths of conventional mix.
2014	Dayalan J.	Used super absorbent polymers as a self-curing agent in concrete.	Super absorbent polymer	M25 grade	Super absorbent polymer 0.48% by the weight of cement provides higher compressive, tensile as well as flexural strength than the strength of conventional mix.
2013	Patel Manish Kumar Dahyabhai & Prof. Jayesh Kumar Pitroda	Study of various % of PEG in M	PEG-600, PEG-1500	M25 grade & M20	Water transport (water evaporation self curing concrete is lower than air conventional concrete. Water sorpti water permeability values for self cu decreased with age.
2013	A.S. EL-Dieb et al	Water retention for the concrete mixes.	-	–	Water sorptivity and water permeability values for self curing concrete decreased with age indicating lower permeable pores percentage as a result of the continuation of the cement hydration.

2003	Pietrol Lura	Study was to reach a better comprehension of autogenous shrinkage in order to be able to model it and possibly reduce			The important role of self-desiccation shrinkage in autogenous shrinkage is shown, the benefits of avoiding self-desiccation through internal curing become apparent.
2002	Roland Tak Yong Liang, Robert Keith Sun	Work on internal curing composition for concrete which includes a glycol and a wax.	Glycol and a wax	_	The invention provides for the first time an internal curing composition which, when added to concrete or other cementitious mixes meets the required standards of curing as per Australian Standard AS 3799.

III. CONCLUSION

Based on literature review, following conclusions are obtained:

- ✓ The optimum dosage of PEG400 for maximum strength (compressive, tensile and modulus of rupture) was found to be 1% for the M20.
- ✓ As percentage of PEG400 increased slump increased for M20 grade of concrete.
- ✓ Strength of self-curing concrete is on par with conventional concrete.
- ✓ Self-curing concrete is the answer to many problems faced due to lack of proper curing.
- ✓ Self-curing concrete is an alternative to conventional concrete in desert regions where scarcity of water is a major problem.

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