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"AN EXPERIMENTAL INVESTIGATION OF SELF CURING CONCRETE INCORPORATED WITH PEG – 400 AND PVA".

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Abstract: — **Curing is said to be the method of maintaining minimum moisture content after construction to develop the desirable properties. In many situation curing is not possible so, to overcome those situation we are using chemicals to attain the process of curing. The chemicals like Poly-vinyl alcohol (PVA)and Poly ethylene glycol (PEG-400) contribute on cement by giving good Strength and hydration rate. This self curing agents gave better compressive strength and split tensile strength.**

***Index Terms - Self curing, Polyethylene glycol (PEG-400), Poly-vinyl alcohol, Strength*.**

I. INTRODUCTION

In construction curing plays a crucial role and it is necessary process required to develop the potency of a structure. In this developing world traditional method ofcuring took more quantity of water. This is not only about conserving water and environmental sustainability but also about ensuring construction in water scarcity areas. Traditional method requires more water but alternatively by using of chemicals and internal curing to maintain optimum moisture condition for cement hydration. Materials used in self-curing are light weight aggregate (LWA), super absorbent polymer (SAP) and shrinkage reducing admixture (SRA) (propylene glycol type i.e. Polyethylene-glycol). Significance of self-curing is that water is one of the materials mostly employed in building where it is used for casting and mixing of concrete and it is also used for curing. Here water serves as a hydration material in concrete. To replace the hydration material, we are providing PEG-400 and PVA as hydration agents. These chemicals provide perfect hydration to concrete and provides good strength internal curing provides curing water from the aggregates with in the concrete. This improves concrete's performance by increasing the reaction of cementitious materials. The advantages of internal curing is that it reduces the usage of water. This technique would be very useful in water scarcity areas. It also provides the same desirable properties as that of traditional curing. By utilizing of chemical admixture like PVA and PEG-400, which gives good approach regarding with traditional curing methods. These chemicals are used as self-curing admixture as PVA is added with concrete and by externally coating with PEG-400, it will help to attain sustainable development goals and sepoy ethylene glycol is a chemical admixture, by adding PEG-400 for the concrete mixture it will help to reduce self – designation and improve mechanical characteristic. This PEG-400 retains the internal water for proper hydration of cement concrete. It has low molecular weight grade of polyethylene glycol. It is clear, colorless, viscous liquid. Polyvinyl alcohol is water soluble synthetic fiber (CH_2CH) n the chemical name PVA which is first synthetic colloidal prepared by Hermann and Haehnel in the year 1924. The world production of PVA is about 650,000 tons per year. China, Japan, UK, are the largest producer and consuming countries of PVA worldwide. It is colorless and odorless used to manufacture water soluble films. Adding PVA to Cement and concrete mixes help to create strong bond between the particles.

II. RELATED WORK

STRENGTH CHARACTERISTICS OF SELF – CURING CONCRETE, IJRET BY: (M.V JAGANNADHA KUMAR, M. SRIKANTH, K. JAGANNADGA ROA, 2012)

The use of peg 400 in concrete have some benefits in self curing and hydration. The study on this effect shows the compressive strength. Split tensile strength, and modulus of rupture. In this we have some different mix ratios which gives values for curing. Here, PEG 400 or polyethylene glycol is used for shrinkage which reduces admixture properties which is used in concrete. In this we can control water hydration during curing process, shrinkage and cracking. and can reduce The percentage of cement also varies from 0% to 2% can impact on concrete mixes such as M20 and M40 grade.

of five years. The time series monthly data is collected on stock prices for sample firmsand relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

M. Lokeshwari, B.R. Pavan Bandakli, S.R. Tarun, P. Sachin, Venkat Kumar. ("A review on Self – curing concrete'')
Self curing needs more amount of water in concrete curing. By adding additional water to hydrate the cement, it can reduce the external water application and can reduce wastage and hydrate water and gives more strength to the concrete structure. It can give more quality of work. Self Curing have some advantages like it can minimize the shrinkage of concrete and also it can give more strength and can enhances the durability of structure. In this Self Curing we can overcome from curing issues, we can ensure better crack resistance and reinforcement protection.

Patel Manishkumar Dahyabhai, Prof. Jayeshkumar Pitroda 2014 studied on ("Introducing the self-curing concrete in construction industry")
By utilizing self curing admixtures we can indeed and enhance the compression strength of the concrete. By researching or finding the M25 grade concrete the dosage of PEG 400 has maximum compressive strength that the weight of the cement is 1%. Self Curing Concrete posses more precise solution for which the challenges in desert areas or where the proper curing is not done and lacking in curing can reduces the strength and environmental conditions.

III. MATERIALS AND METHODOLOGY

COLLECTION OF MATERIALS

1. CEMENT: Cement is a binding material which is used for building or construction purpose which can hardens, sets and adheres to all other materials and binds strong together. The Experiment that are conducted on cement is physical properties test such as specific gravity, standard consistency, initial setting time, and final setting time as same as procedure.

Fig - 1.1 Cement

2. M-SAND: M-Sand is a artificial sand which is made from crushing of rock or granite for building construction purposes in cement or concrete. M sand differs from normal originated river sand and have different physical and mineralogical properties. Which is made from crushing of rock or granite. This M-Sand is Man Made sand in crushing Industry.

Fig - 2.2 M-Sand

3.COARSE AGGREGATE : The Crushed stone or gravel materials that are 10mm down-size is utilized in construction. The main use of coarse aggregate is it can fill more voids or holes and it can reduce shrinkage of sand which is controlled in future and requires less cement paste.

Fig 1.3 Coarse aggregate

4.WATER : water is a crucial substance in construction which is used for mixing and curing. The water shall be clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Portable water is generally considered satisfactory for mixing concrete. Portable water which we get in concrete laboratory is used for conduction of experiments.

TESTING OF MATERIALS

1. CEMENT
   - Standard consistency of cement
   - Normal consistency of cement
   - Initial and final setting time test
   - Specific gravity of cement

2. FINE AGGREGATES

- Specific gravity test on sand
- Finess modulus of sand (Sieve Analysis)

3. COARSE AGGREGATE
   - Crushing test
   - Abrasion test
   - Impact test

5) PEG – 400

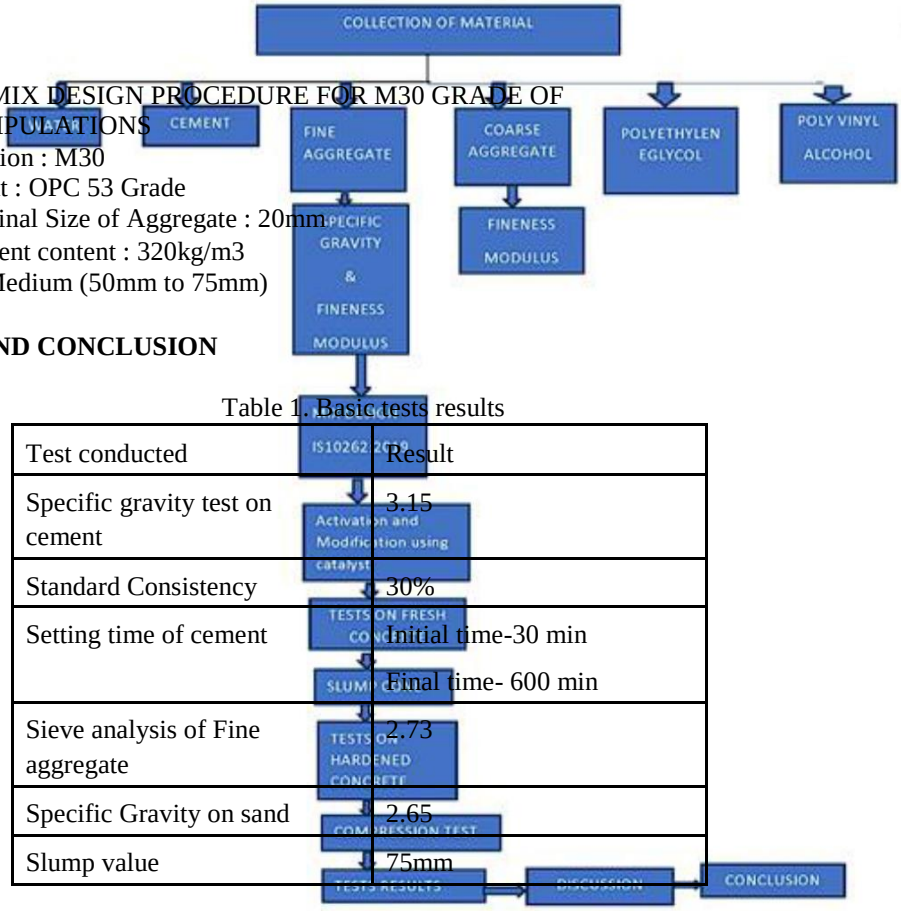
Polyethylene Glycol 400 it has less molecular weight. This material is colorless and odorless which is viscous in liquid. This material can be easily soluable in water when it is heated. This substance cannot readily dissolve in water.

6) PVA (POLYVINYL CHLORIDE)

PVA is a Chemical compound. The polymer is originated as amorphous in atmospheric nature. It has good insulation property because it has high polar nature property such as polyethylene and polypropylene.

1V METHODOLOGY

PROCEDURE FOR CONDUCTION OF EXPERIMENTS



V MIX DESIGN

CONCLUSION MIX DESIGN PROCEDURE FOR M30 GRADE OF CONCRETE STIPULATIONS

a. Grade Designation : M30
b. Type of Cement : OPC 53 Grade
c. Maximum nominal Size of Aggregate : 20mm
d. Minimum Cement content : 320kg/m3
e. Workability : Medium (50mm to 75mm)

VI RESULTS AND CONCLUSION

Table 1. Basic tests results

Test conducted	Result
Specific gravity test on cement	3.15
Standard Consistency	30%
Setting time of cement	Initial time-30 min Final time- 600 min
Sieve analysis of Fine aggregate	2.73
Specific Gravity on sand	2.65
Slump value	75mm

VII COMPRESSIVE STRENGTH

TABLE 2 RESULT OF COMPRESSION TEST

Conventional concrete:

TEST DAYS	**COMPRESSIVE STRENGTH (N/mm2)**			
	1	**2**	**3**	**AVERAGE**
7	24.30	25.80	24.65	24.47
14	34.2	34.5	34.1	34.15
28	36.7	36.1	36.5	36.6

Set-1 both chemicals were internally mixed with water and kept curing under room temperature:

TEST DAYS	COMPRESSIVE STRENGTH (N/mm2)			
	1	2	3	AVERAGE
7	24	25.5	27.00	25.5
14	32.5	32.4	31.2	32.03
28	37.4	36.2	38.6	37.4

Set-2 both chemicals were internally mixed with water and kept in oven for curing:

TEST DAYS	COMPRESSIVE STRENGTH (N/mm2)			
	1	2	3	AVERAGE
7	26	26.25	26.15	26.13
14	33.6	32.8	33.2	33.2
28	37.2	35.8	37.8	36.9

Set-3 poly-vinyl alcohol was internally mixed and polyethylene glycol was coated externally:

TEST DAYS	COMPRESSIVE STRENGTH (N/mm2)			
	1	2	3	AVERAGE
7	25.00	27.20	26.00	26.06
14	33.7	32.8	33.5	33.33
28	37.4	35.8	37.8	37.00

VIII SPLIT TENSILE STRENGTH

Conventional concrete:

TEST DAYS	SPLIT TENSILE STRENGTH (N/mm2)			
	1	2	3	AVERAGE
7	2.55	2.58	2.65	2.59
14	2.62	2.67	2.7	2.66
28	3.75	3.85	3.80	3.80

Self curing concrete split tensile strength:

TEST DAYS	COMPRESSIVE STRENGTH (N/mm2)			
	1	2	3	AVERAGE

7	12.00	11.80	11.65	11.81
14	11.90	12.5	12.3	12.23
28	13.3	14.5	15.00	14.26

Conclusions:

Conclusions are drawn from the analysis of the test findings completed for this study. When self-curing chemicals are used instead of regular concrete, superior results are achieved. When splits were made using a self-curing agent instead of a traditional method, the split tensile strength was greater.The use of self-curing agents internally with the mixing water, or set-1, produced results identical to those of the conventionally cured concrete at room temperature. However, the use of PVA internally with the mixing water and coating of PEG gave higher strength compared to other methods of application of self-curing agents. Higher temperatures cause reduction in moisture, thus strength decreases, as we can see in the case of set-2, which was kept in an oven.

References:

M.V. Jagannadha Kumar, M. Srikanth, K. Jagannadha Rao. “Strength characteristics of self-curing concrete”, IJRET, 2012.
• M.D. Patel, J.R. Pitroda, “Self-curing concrete-new technique for curing concrete”, JIARM, 2013.
• Patel Manishkumar Dahyabhai, Prof. Jayeshkumar Pitroda. “Introducing the self-curing concrete in construction industry”,2014.
• S.Azhagarsamy , S.Sundararaman 2016 “Study on strength and durability of self-curing concrete using polyethylene glycol-400”, IJETAE, 2016.
• Mohammed Shafeeque Sanofar.P.B, Praveen.K.P. Jitin Raj, Nikhil.V.P, Gopikrishna. “Experimental Study of Self Curing Concrete”,2016.
• Basil M Joseph “Studied on Self-Curing Concrete PEG400”,2017.
• Vaseem Akram.N and P. Balachandran. “Experimental Study of Self Curing Concrete”,2017.
• Arunachalam Ananthi “Experimental Study on the Properties of Self-Curing Concrete”,2017.
• M. Lokeshwari, B.R. Pavan Bandakli, S.R. Tarun, P. Sachin, Venkat Kumar 2017.
• Anurag Chaturvedi, Sumit Gangwar. “A Review Paper on Self Curing Concrete: A study of various self- curing agents”,2019. • IS 10262:2019 • IS 456:2000