Self Curing Concrete by Adding Natural Admixtures

Sakthivel S[1], S.Priya[2], S.Raghul[3], S.Sowmiya[4], J.Vishnu[5]
[1] Assistant Professor, Dept of Civil Engineering
[5]Dept of Civil Engineering
[1, 2, 3, 4, 5] The Kavery Engineering College, Mecheri

Abstract- *Admixtures are ingredients other than water, aggregates, hydraulic cement, and fiber that are added to the concrete batch immediately before or during mixing. A proper use of admixtures offers certain beneficial effect to concrete, including improved quality, acceleration of setting time, enhanced frost and sulfate resistance, control of strength development, improved workability, and enhanced finish ability. It is estimated that 80% of concrete produced in North America these days contains one or more types of admixtures. According to a survey by the National Ready Mix Concrete Association, 39% of all ready mixed concrete producers use fly ash, and at least 70% of produced concrete contains a water reducer admixture. In our project lagenaria siceraria is added and the result obtained was higher when compared to the conventional concrete.*

Keywords- Admixtures ;Lagenaria Siceraria; Compressive Strength ; Flexural Strength .

I. INTRODUCTION

Making, curing and testing cubes should be carried out in the correct manner. Even small deviations from the standard procedure will usually lead to compressive strength results which are lower than the true strength of the concrete. For example, 1% air entrapped there will be a 4 to 5% loss of strength. The procedures for concrete cube making are given in British Stranded 1881:1983 Testing Concrete and Hong Kong Construction Standard (CS 1:1990) Testing Concrete. 2.

Amal Francis k et. al. (2013) The scope of the research included characterization of super absorbent polymer for use in self-curing. Experimental measurements were performed on to predict the compressive strength, split tensile strength and flexural strength of the concrete containing Super Absorbent Polymer (SAP) at a range of 0%, 0.2%, 0.3%, and 0.4% of cement and compared with that of cured concrete. The grade of concrete selected was M40.

Ya Wei et. al. (2014) investigated on internal curing efficiency of prewetted LWFAS on Concrete Humidity and Autogenous Shrinkage development.

Tarun R. Naik et. al. (2006) Influence of microstructure on the physical properties of self-curing concrete Potential benefits from concrete using lightweight aggregate include: Better thermal properties, Better fire resistance, improved skid-resistance, reduced autogenous shrinkage, reduced chloride ionpenetrability, improved freezing and thawing durability, an improved contact zone between aggregateand cement matrix and less micro-cracking as a result of better elastic compatibility.

Magda I. Mousa et. al. (2014) the mechanical properties of concrete containing self- curing agents are investigated in his paper. In this study, two materials were selected as self-curing agents with different amounts, and the addition of silica fume was studied. The self-curing agents were, pre-soaked lightweight aggregate (LECA) and polyethylene- glycol PEG (CH). The result shows that concrete used polyethyleneglycol as self-curing agent, attained higher values of mechanical properties than concrete with saturated LECA.

Hans W. Reinhardt et. al. (1998) they demonstrated on self-cured high Performance concrete that a partial replacement of normal weight aggregates by prewetted lightweight aggregates leads to an internal water supply for continuous hydration of cement. Despite water loss by evaporation there is continuous strength gain up to 25% more strength after 1 year compared to standard compressive testing after 28 days.

Vilas et. al. (2012) carried out an experimental study to investigate the use of water soluble polyvinyl alcohol as a self-cutting agent. He concluded that Concrete mixes incorporating self-curing agent has higher water retention and better hydration with time as compared to conventional concrete.

II. EXPERIMENTAL PROGRAMME

2.1. Materials used

2.1.1. Aggregates and cement

Fine and coarse aggregates were used in this study. The fine aggregate was sieved using the 4.75 mm sieve to remove avoid unwanted materials. The specific gravity of the fine grained aggregate was found to be 2.30 respectively IS383-1987[9]. Coarse aggregates with the maximum size of 20 mm, having a specific gravity of 2.56 are used. In this study the Ordinary Portland cement of grade 43 has been used. The specific gravity was found to be 3.11.

2.1.2 Water reducing and set retarding Admixture:

SBTJM- water-reducing and set retarding admixture is a synthetic powder based on beta-naphthalene sulphonate formaldehyde condensates and reactive polymer. It has the performances of high range water reduction, set-retarding and excellent strengthening. SBTJM- is adaptable to middle-strength or high-strength concrete where high range water reduction and set-retarding is desired .SBTJM- is formulated to comply with the following specification for concrete admixture: ASTM494, Type D; GB8076-1997.

2.1.3 Method of Curing:

The warmer the curing environment the faster the reaction proceeds. Precast concrete plant take advantages of these with steam curing near C to development -days strength in less than 24 hours. For large surface or those outdoor subject to windy condition the sprays are the more approximate choice yet they are all too commonly used improperly with insufficient converge to do a proper job. The picture below is from a recent Winnipeg project curing was done with a lick and a proper and it looks more like graffiti scrawled on the concrete instead of the even coverage. Delay of a half day can mean significant losses of surface abrasion resistance and durability of a pavement slab or an industrial floor.

2.1.4 Strength of Concrete:

The quality of concrete is determined by its mechanical properties as well as its ability to resist deterioration. The mechanical properties can broadly be divided into short-term properties. The long term properties include its behavior under creep, shrinkage and fatigue and its durability characteristics that help it withstand environmental forces such as porosity, impermeability abrasion, and freeze-thaw resistance.

2.1.5 Mix Proportion

Table 1.1 Mix Ratio

Water	Cement	Fine Aggregate	Coarse Aggregate
197.16 liter	362 kg	615 kg	1070kg
0.545	1	1.69	3

2.2 SPECIMEN DETAILS

For cube compression testing of concrete, 150 mm cubes were used. All the cubes were tested in saturated condition, after wiping out the surface moisture. For each trial mix combination, three cubes were tested at the age of 1 day, 3 days, 7 days, 14 days, 21 days, 28 days.

2.3 SPECIMEN TEST

2.3.1 CUBE

Cubes must be cured before they are tested. Unless required for the test at 24 hours, the cube should be placed immediately after demoulding in the curing tank or mist room. If curing is in a mist room the relative humidity should be maintained at no less than 95%. Curing should be contained as long as possible up to the time of testing.

Fig 1.1 Compression Test

2.3.2 CUBE TEST RESULT

Cement - 1220 g
Sand - 2076 g
Aggregate - 3600 g

Table 1.2 Compressive Test Result

S.No	Water (ml)	Admixture		Days	Load (kN)	Stress (N/mm^2)
		Name	ml			
1	658.3	Lagenaria Siceraria	6.7	3	286	12.6
2	665	Curing	-	3	303	13.5
3	658.3	Lagenaria Siceraria	6.7	7	444	19.7
4	665	Curing	-	7	386	17.2
5	658.3	Lagenaria Siceraria	6.7	14	493	22
6	665	Curing	-	14	449	20
7	658.3	Lagenaria Siceraria	6.7	28	607	27
8	665	Curing	-	28	560	25

2.3.3 CYLINDER

Cylinder Compressive Strength tests were carried out on cylinder specimens of size 150mm diameter and 300mm height at the age of 28 days curing, using AIMIL Compression testing machine of 3000KN capacity as per BIS: 516-1959.

To start with, the average compressive strength of concrete at the age of 28days curing was determined by conducting compression test on cube specimens using AIMIL 3000KN capacity compression testing machine. After that, cylinder specimens of size 150mm diameter and 300mm height were used to determine the modulus of elasticity of concrete in compression at the age of 28 days curing as per BIS: 516 – 1959.

The test cylinder was attached with a longitudinal compress meter to measure compressive strain over middle 2/3 of the specimen (gauge length = 200mm). Four cycles of loading and unloading was done, the cycles were continued till the percentage difference between two consecutive cycles was less than 5%. The modulus of elasticity was found out by plotting the stress-strain curve. The modulus of elasticity was obtained with reference to tangent modulus. The experimental set up for the compressive strain measurements on HSC cylinder specimen.

Fig 1.2 Split Tensile Test

2.3.4 CYLINDER TEST RESULT

Cement - 1920 g
Sand - 3260 g
Aggregate - 5700 g

Table 1.3 Split Tensile Result

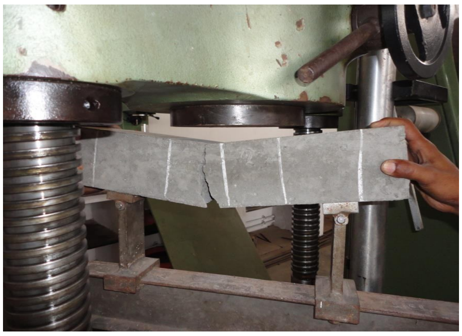
S.No	Water (ml)	Admixture		Days	Load (kN)	Stress (N/mm^2)
		Name	Ml			
1	1035	Lagenaria Siceraria	10	3	152	8.6
2	1045	Curing	-	3	146	8.3
3	1035	Lagenaria Siceraria	10	7	225	12.7
4	1045	Curing	-	7	219	12.4
5	1035	Lagenaria Siceraria	10	14	308	17.43
6	1045	Curing	-	14	290	16.4
7	1035	Lagenaria Siceraria	10	28	388	22
8	1045	Curing	-	28	367	21

2.3.5 PRISM

The standard size of the specimens are 15 x 15 x 70 cm. Alternatively, if the largest nominal size of the aggregate does not exceed 20 mm, specimens 10 x 10 x 50 cm may be used.

The mould should be of metal, preferably steel or cast iron and the metal should be of sufficient thickness to prevent spreading or warping. The mould should be constructed with the longer dimension horizontal and in such a manner as to facilitate the removal of the moulded specimens without damage.

Fig 1.3 Prism Test Result



2.3.4 PRISM TEST RESULT

Cement - 1810 g
Sand - 3075 g
Aggregate - 5350 g

Table 1.4 Flexural Strength Result

S.No	Water (ml)	Admixture		Days	Flexural (kN)
		Name	Ml		
1	980	Lagenaria Siceraria	10	28	3150
2	990	Curing	-	28	3000

III. CONCLUSIONS

3.1 COST COMPARISON

Name	Lagenaria Siceraria	Curing
Direct Charges	50	750
Indirect Charge Collect Curing	280	700
Total	330	1450

The Lagenaria Siceraria sense to have low strength but further test may prove that, the white liquid also possess higher strength.

Also the Durability properties of concrete, can also be tested which at present to shortage of time.

REFERENCES

[1] Concrete TechnologyTheory and practice By M.S.Shetty
[2] Mixture proportioning for Internal curing By Dalep, Bentz, Pietro and
[3] John Roberts
[4] Current and future trends in application of internal curing of concrete By John Roberts
[5] A.s El dill, self curing concrete water retention hydration and moisture transport Benty-D.P Lara Roberts.J.W
[6] Mixture proportioning for internal curing By DALE P.Bentz, pietrlura and John W.Roberts.
[7] Tarun R. Naik et. al. (2006)) Influence of microstructure on the physical properties of self-curing concrete ACI Committee 305R-99 “Hot Weather Concreting” Reported by ACI Committee ACI Manual of Concrete Practice, (2009)
[8] C. Selvamony, M. S. Ravi Kumar, S. U. Kannan and S. Basil Gnanappa, “INVESTIGATIONS ON SELF-COMPACTED SELF- CURING CONCRETE USING LIMESTONE POWDER AND CLINKERS ", ARPN Journal of Engineering and Applied Sciences VOL. 5, NO. 3.
[9] Amal Francis k et. al. (2013) ACI Committee 305R-99 “Hot Weather Concreting” Reported by ACI Committee ACI Manual of Concrete Practice (2009).