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Performance Of Self Compacting Concrete By Using Alccofine

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ABSTARCT :

In Japan, in early eighties, premature deterioration of concrete structures were detected almost everywhere in the country. The main cause of the deterioration was recognized as inadequate compaction. In addition, the gradual reduction in the number of skilled workers in Japan`s construction industry led to a reduction in the quality of construction work. As a solution for these social and technical requirements, the concrete of SCC was proposed by Prof. Okamura at Tokyo University in 1988.

The use of Self Compacting Concrete (SCC) bypasses the need for external vibration, eliminating the problem of unskilled labour. Self Compacting Concrete shortens the construction, period, eliminates noise due to vibration and provides high stability during transport and placement. There is a reduction in cracking and micro structural defects.

The study explores the use of the Alccofine powder to increase the amount of the fines and hence achieve self – compatibility. The study focuses on comparison of the properties of SCC containing Alccofine with that standard one. The main variable is proportion of Alccofine keeping cement, flyash, water, coarse aggregate, fine aggregate and super plasticizer contents constant.

Keywords :- Self Compacting Concrete, Alccofine, Compatibility, Strength.

I. INTRODUCTION

Cement-based materials are among the most important construction materials, and it is most likely that they will continue to have the same importance in the future. However, these construction and engineering materials must meet new and higher demands. When facing issues of productivity, economy, quality and environment, they have to compete with other construction materials such as plastic, steel and wood. One direction in this evolution is towards self-compacting concrete (SCC), a modified product that, without additional compaction energy, flows and consolidates under the influence of its own weight. The use of SCC offers a more industrialised production. Not only will it reduce the unhealthy tasks for workers, it can also reduces the technical costs of in situ cast concrete constructions, due to improved casting cycle, quality, durability, surface finish and reliability of concrete structures and eliminating some of the potential for human error. However, SCC is a sensitive mix, strongly dependent on the composition and the characteristics of its constituents. It has to possess the incompatible properties of high flow ability together with high segregation resistance. This balance is made possible by the dispersing effect of high-range water-reducing admixture (superplasticizer) combined with cohesiveness produced by a high concentration of fine particles in additional filler material.

To produce SCC, the major work involves designing an appropriate mix proportion and evaluating the properties of the concrete thus obtained. In practice, SCC in its fresh state shows high fluidity, self-compacting ability and segregation resistance, all of which contribute to reducing the risk of honey combing of concrete (Su et al., 2001).With these good properties, the SCC produced can greatly improve the reliability and durability of the reinforced concrete structures. In addition, SCC shows good performance in compression and can fulfil other construction needs because its production has taken into consideration the requirements in the structural design.

II. MATERIALS

CEMENT: - OPC

Cement in general can be defined as a material, which possesses very good adhesive and cohesive properties that make it possible to bond with other materials to form a compact mass. Thus cement is a material which possesses cementations properties. The cement used by engineers solidifies when mixed with water.

Properties:

Fineness		=	8%
Normal consistency		=	29.5%
Soundness		=	2 mm
Setting time	Initial	=	53 min.
	Final	=	493min
.			
Specific gravity		=	3.15

AGGREGATE:-

The sieve analysis of fine and coarse aggregate was performed. The physical properties of fine and coarse aggregate are summarized below.

Properties of Aggregate

Sr. No.	Property	Fine Aggregate	Course Aggregate
1	Specific Gravity	2.46	2.66
2	Fineness Modulus	3.1	7.69
3	Water Absorption	1.62%	0.60%
4	Surface Texture	Smooth	--
5	Particle Shape	Rounded	Angular
6	Crushing Value	---	17.40
7	Impact Value	---	12.50

Fly Ash:-Physical Properties of Fly ash

Sr. no.	Physical properties	Test value	Specification limit as per 3812-1981
1	Specific gravity	2.55	
2	Specific surface (cm^2gm)	3850	3200
3	Limit reactivity (Kg/ cm^2)	52.5	40
4	Fineness by sieving % passing 300 µ % passing 150µ % passing 75 µ % passing 53 µ	 97.5 93.0 84.5 80.1	

Chemical properties

Particle Size <0.1m – 100 µ

Specific gravity: 2.15

Chemical Properties of Fly ash

Sr. No.	Chemical Constituents	Percentage
1	Silica	62.12
2	Iron oxide	6.48
3	Calcium oxide	1.23
4	Titanium oxide	1.80
5	Potassium oxide	128
6	Magnesium oxide	0.49
7	Phosphorous Pentaoxide	0.40
8	Sulphur	0.36
9	Disodium oxide	0.28

Alccofine

For mixes other than control concrete, Alccofine is used as admixture . The Chemical and physical properties of Alccofine are as below.

Properties of Alccofine

Constituents	% by wt of sample (Alccofine)
SiO_2	33.6
$S O_3$	0.19
Al_2O_3	22.6
Fe_2O_3	2.2
MnO	0.62
MgO	8.00
CaO	31.00
Na_2O	0.42
Chloride Content	0.02
Sulphide Sulphur	1.1
Specific gravity	2.86

III. EXPERIMENTATION

For evaluation of performance of SCC using Alccofine six different mixes are proposed. These are subdivided into four groups:

1. Control concrete without Alccofine
2. Control concrete with 5% of Alccofine.
3. Control concrete with 10% of Alccofine
4. Control concrete with 15% of Alccofine

In order to study the effect on properties of SCC with different percentage of Alccofine, SCC's is tested for

1. Fresh Properties
2. Harden properties

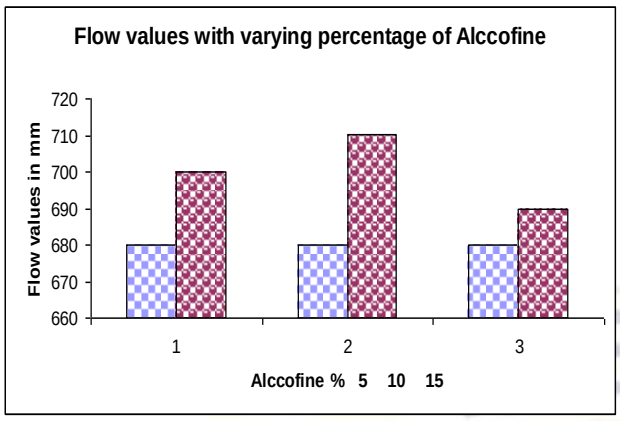
IV. RESULTS

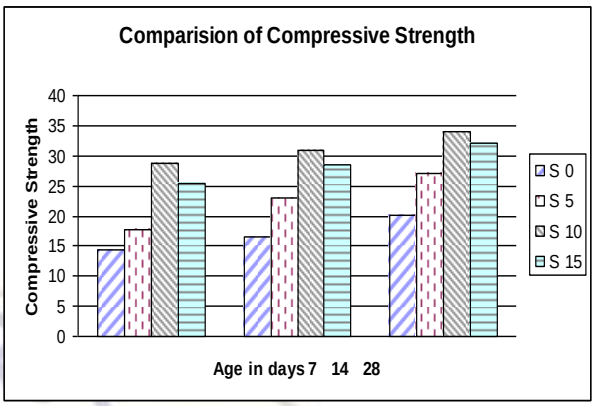
Fresh properties of SCC with Alccofine

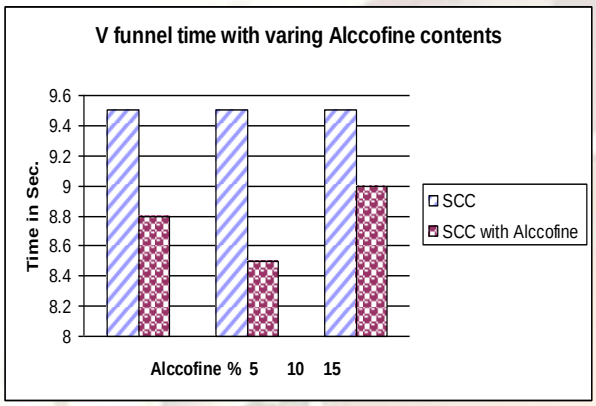
Mix Name	Slump flow values (MM)		V Funnel values in Sec		L- Box H_2/H_1 Ratio
	T 50	Dia (M.M.)	Ti (Sec)	T5(min)	
S 5	4	700	8.8	11.5	0.84
S 10	3.9	710	8.5	11.2	0.88
S 15	4.1	690	9	11.6	0.82

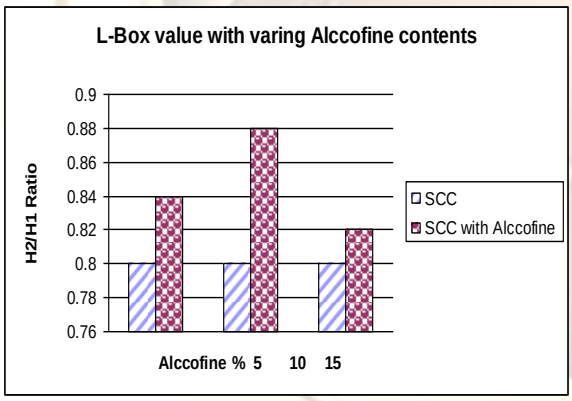
Harden properties of SCC with Alccofine

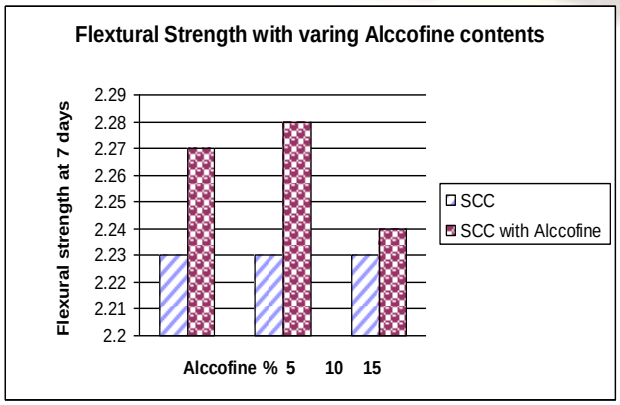
Mix Name	Avg. Compressive Strength in (MPa) at			Flextural Strength in (MPa) at	
	7 days	14 days	28 days	7 days	28 days
S 0	14.4	16.6	20.2	2.23	3.1
S 5	17.66	23	27	2.27	3.12
S 10	28.66	30.83	34	2.28	3.20
S 15	25.33	28.5	32	2.24	3.05











V - CONCLUSIONS :

Various Properties such as self Compatibility, Compressive strength of the SCC with different percentage of Alccofine are evaluated and compared with those of conventional SCC with Flyash. .From the limited experimental investigations, following conclusions can be drawn

1) Fresh and Harden properties of SCCs with Alccofine are enhanced than that of SCC without Alccofine.
2) Fresh Properties and harden Properties of SCCs with 10% Alccofine are superior than SCCs with 5% and 15% of Alccofine.

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