Use of Alccofine and Steel Fibre in Self Compacting Concrete

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ABSTRACT

In this experimental work is especially is principally worried with the examine of behavior of cement concrete through the employment of Alccofine and steel fiber as addition to cement. Alccofine were introduced up to 25% via weight of cement inside the respective courses of 10%, 15%, 20%, and 25% for generating concrete. Alccofine and steel fiber has excessive pozzolanic reactivity and occasional price. It reduces loose drying shrinkage and restrains the shrinkage cracking width. It additionally facilitates in enhancing the compressive energy and sturdiness of concrete. ALCCOFINE1203 plays in superior way than all different mineral admixtures utilized in concrete inside India. Thanks to its inbuilt CaO content, ALCCOFINE1203 triggers two way reactions at some point of hydration 1.Primary reaction of cement hydration. 2. Pozzolanic reaction: ALCCOFINE 1203 also consumes by means of product hydroxide from the hydration of cement to shape additional C-S-H gel, a bit like pozzolans. These outcomes in denser pore shape and ultimately higher electricity gain. This assessment paper discusses the outcomes of silica fume and alccofine on the concrete properties like electricity, modulus, ductility, permeability, chemical assault resistance, corrosion, freeze-thaw sturdiness, creep rate. Characterization of silica fume and alccofine additionally to its bodily and chemical homes also will be reviewed during this paper.

Index Terms— *ALCCOFINE 1203, steel fiber, mineral admixtures, cement hydration, C-S-H gel, pozzolans.*

1. INTRODUCTION

Self-compacting concrete (SCC) is taken into account as a concrete which could be placed and compacted underneath its self-weight with little vibration attempt and which is at the equal time cohesive sufficient to be proscribed without segregation or bleeding. There are many advantages of the employment of SCC, particularly whilst the material value is minimized. These include: Reducing the event time and labor cost, Eliminating the necessity for vibration, Reducing the pollution, Improving the filling ability of rather congested structural members, Facilitating constructability and ensuring good structural performance. Due to addition of steel fiber in concrete it reduces crack in concrete and also improves the static and dynamic properties of concrete. This form of concrete is assumed as Fiber concrete. Hence Alccofine Steel Fiber Self Compacted Concrete is described as a mixture of concrete, alccofine 1203 and discontinuous, discrete, uniformly dispersed steel fibers.

2. NECESSITY

ASFSCC gives numerous financial and technical benefits; the utilization of Steel fibres extends its possibilities. Steel fibres acts as a bridge to minimize their cracks propagation, and improve numerous characteristics of the concrete. Fibres are known to seriously have an effect on the workability of concrete. Therefore, an experimental investigation was executed to healthy the houses of plain normal compacting concrete (NCC) and SCC with alccofine and Steel fiber. Ash has high pozzolanic reactivity and low rate compared to silica fume and ash because it could be a synthetic product. It reduces loose drying shrinkage and restrains the shrinkage cracking width. It also facilitates in improving the compressive energy and sturdiness of SCC.

3. OBJECTIVE

The main aim of this study is to find out the behavior of ASFSCC composite with constant % of steel fiber and various % of alccofine to investigate the following properties:

1. To find out the strength properties of ASFSCC composite with constant % of steel fiber and various % of alccofine such as Compressive Strength, Flexural Strength and Split Tensile Strength.
2. To find out the properties of ASFSCC composite with constant % of steel fiber and various % of alccofine such as Workability.
3. To check the properties of ASFSCC with constant % of steel fiber and various % of alccofine.

4. ALCCOFINE

Specially processed product supported slag of high glass content with high reactivity obtained through the strategy of managed granulation is called an Alccofine. The raw materials of alccofine are composed with low calcium silicates. The processing with other select ingredients ends up in controlled particle size distribution. The calculated blain value supported PSD is around 12000cm^2/gm, which is really ultra-fine. Thanks to its ultra-fine particle size and unique chemistry, Alccofine reduces water demand even up to 70%. Alccofine also can be used as a excessive variety water reducer to enhance compressive strength or as an brilliant workability useful resource to enhance flow.

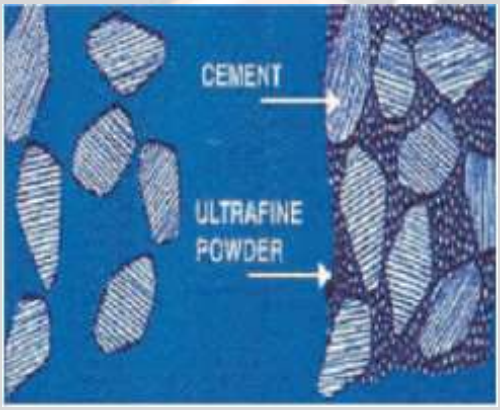

Fig .4.1 Packing Effect of Alccofine

5. METHODOLOGY

In present study cube compression test, flexural test on beams and Cylindrical split tensile test on self-compacting concrete with constant fraction of steel fibre were carried out.

i) Compressive Strength Test:

A compressive strength test is performed on standard cubes of plain SCC and SCC with alccofine and steel fibre of size 150 x 150 x 150 mm after 28 days of immersion in water for curing. The compressive strength of specimen is calculated by the following formula:

$$f_c = P / A$$

Where,

P = Failure load in compression, kN

A = Loaded area of cube, mm^2

ii) Split Tensile Test:

The split tensile test is well known indirect test used to determine the tensile strength of concrete. Due to difficulties involved in conducting the direct tension test, a number of indirect methods have been developed to

determine the tensile strength of concrete. In these tests, in general a compressive force is applied to a concrete specimen in such a way that the specimen fails due to tensile stresses induced in the specimen.

The tensile strength at which failure occurs is the tensile strength of concrete. In this investigation, the test is carried out on cylinder by splitting along its middle plane parallel to the edges by applying the compressive load to opposite edges. The arrangement for the test is shown in photo with the pattern of failure. The split tensile strength of cylinder is calculated by the following formula,

$$f_t = 2P / \pi LD$$

Where,

f_t = Tensile strength, N/mm^2

P = Load at failure, N

L = Length of cylinder, mm

D = Diameter of cylinder, mm

iii) Flexural Test:

Standard beams of size 150 x 150 x 700mm are supported symmetrically over a span of 400mm and subjected two points loading till failure of the specimen. The deflection at the centre of the beam is measured with sensitive dial gauge on UTM.

The flexural strength is determined by the formula

$$f_{cr} = Pf\ L / bd2$$

Where, f_{cr} = Flexural strength, MPa

Pf = Central point through two point loading system, KN

L = Span of beam, mm

b = Width of beam, mm

d = Depth of beam, mm

Self-Compacting Concrete

Workability Test conducted on SCC:

Test to be conducted for verifying the flow characteristics of Fresh SCC are

i) Slump flow

ii) V-Funnel

iii) L Box

iv) U Box

v) J Ring

Table 5.1 Requirements of Workability

Sr. No.	Method	Unit	Typical Ranges of Values	
			Minimum	Maximum
01.	Slump flow by Abrams cone	mm	650	800
02.	T50 cm Slump flow	Sec	2	5
03.	J-ring	mm	0	10
04.	V-funnel	Sec	8	12
05.	V-funnel at T5 minutes	Sec	0	+3
06.	L-box	H2/H1	0.8	1.0
07.	U-box	(H2-H1) mm	0	30

Table 5.2 Schedule of Specimen Preparation for specimen

Sr. No	Types of Steel fiber	Aspect Ratio	Alccofine (%)	Fly Ash	Steel Fiber content (%)	W/C ratio	Compressive Strength Test	Flexural Strength test	Split tensile Test
							28 days	28 days	28 days
1	0	00	00	0.3	00	0.408	3	3	3
2	CR-50/50	50	5	0.3	1	0.408	3	3	3
3	CR-50/50	50	10	0.3	1	0.408	3	3	3
4	CR-50/50	50	15	0.3	1	0.408	3	3	3
5	CR-50/50	50	20	0.3	1	0.408	3	3	3
6	CR-50/50	50	25	0.3	1	0.408	3	3	3

6. MIX DESIGN

Cement	Fly ash	Sand	Coarse Aggregate	Water
1	**0.3**	**1.814**	**1.48**	**0.408**

7. RESULT AND DISCUSSION

Table 7.1 Compression Test of Cubes of SCC at the End of 28 Days

Sr. No.	Alccofine (%)	Steel Fiber(%)	Flyash (Bwc)	Comp. Load (KN)	C/S Area (mm2)	Comp. Strength (N/ mm2)	Avg. Comp. Strength (N/ mm2)
1.	0	0	0.3	415	22500	18.44	19.37
				458		20.35	
				435		19.33	
2.	5	1	0.3	569	22500	25.28	25.61
				572		25.42	
				588		26.13	
3.	10	1	0.3	621	22500	27.60	27.35
				614		27.88	
				598		26.57	
4.	15	1	0.3	700	22500	31.10	30.88
				695		30.88S	
				690		30.66	
5.	20	1	0.3	498	22500	22.13	23.34
				543		24.13	
				535		23.77	
6.	25	1	0.3	453	22500	20.13	20.05
				434		19.28	
				467		20.75	

Table 7.2 Split Tensile Strength on Cylinder of SCC at the End of 28 Days

Sr. No.	Alccofine (%)	Steel Fibre (%)	Fly ash	Load (N)	Split Tensile Strength (N/mm^2)	Avg. Split Tensile Strength (N/mm^2)
1.	0	0	0.3	131	1.85	1.94
				145	2.02	
				138	1.95	
2.	5	1	0.3	158	2.23	2.31
				164	2.32	
				166	2.38	
3.	10	1	0.3	170	2.40	2.40
				171	2.42	
				168	2.37	
4.	15	1	0.3	174	2.46	2.50
				181	2.56	
				176	2.49	
5.	20	1	0.3	122	1.72	1.61
				112	1.58	
				109	1.54	
6.	25	1	0.3	98	1.38	1.45
				107	1.51	
				105	1.48	

Table 7.3 Flexural Strength on SSC at the End of 28 Days

Sr. No.	Alccofine (%)	Steel fibre(%)	Flyash (Bwc)	Applied Load At Failure (KN)	Flexural Strength (N/mm^2)	Avg. Flexural Strength (N/mm^2)
1.	0	0	0.3	15	3.11	3.45
				18	3.73	
				17	3.52	
2.	5	1	0.3	22	4.56	5.18
				25	5.18	
				28	5.80	
3.	10	1	0.3	30	6.22	5.36
				23	4.68	
				25	5.18	
4.	15	1	0.3	32	6.63	6.7
				37	7.67	
				28	5.80	
5.	20	1	0.3	22	4.56	4.73
				25	5.18	
				21	4.45	
6.	25	1	0.3	14	2.90	3.17
				17	3.52	
				15	3.11	

8. CONCLUSION

The present study has shown that it's possible to design alccofine and steel fibre in self-compacting concrete incorporating with fly ash. The SCCs have a slump flow value within the range of 505.5-612.5 mm, a flow time between 2 to 4 s, V-funnel flow in between 15 to 121 sec, L-Box ratio starting from 1.66 to 10.55, U box test value in between 60 to 600mm and J-Ring test value in between 2 to 6mm. it had been observed that it's possible to realize self-compaction with different percentage of alccofine and constant volume fraction steel fibre i.e. 1% inclusion.

The SCC developed compressive strengths starting from 19.37 to 30.88 Mpa, at the tip of 28 days. The SCC developed split tensile strengths ranging from1.61 to 2.50 Mpa at the tip of 28 days. The SCC developed flexural strengths starting from 3.45 to 6.7 Mpa at the tip of 28 days. The strength of ASFSCC composite is increase up to 15% addition of alccofine, beyond 15% of alccofine the strength of concrete get reduced. Though SCC increases the compressive strength of concrete by using alccofine and steel fiber but it reduces the workability of concrete. Addition of super plasticizer in SCC to take care of flow ability gives proper compaction of concrete which enhance all properties of SCC. Also the addition of ash in SCC improves microstructure of concrete that also helpful to boost all mechanical properties with the sturdiness of concrete.

9. REFERENCES

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