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An Experimental Investigation on Effect of Alccofine in Self Compacting Concrete

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ABSTRACT: Self-compacting concrete is a flowing concrete type mixture that is able to consolidate under its own weight and that can go through obstructions by its own weight and without the need of vibration. The high fluid nature of Self compacting concrete makes it suitable for difficult condition and in section with difficult reinforcement.Use of SSC can also help in minimize hearing related damage on the work site that is induced by vibration of concrete. Another advantage of SCC is that the time required to place large sections is considerably reduced. The SCC has gained wide use in many countries for different application and structural Configurations SSC require a high slump that can be achieved by incorporating several chemical admixtures

High seismicity in geographical region requires the use of high level steel reinforcement in construction. The use of SCC appeared as a solution to improve the filling up of zones which are not very accessible to conventional method of concrete compaction. But use of the Self-compacting concrete is uneconomical. We can try to make it economical by replacing cement with other by products. In this Project, we have replaced cement with Alccofine. By conducting trail mixes. Our project is about the analysis of self-compacting concrete using different type of additives like Alccofine. All the studies are done to analyse the properties such as flowabilityand compressive strength of thesepozzolanic materials on Self compacting concrete.

KEYWORDS: Slump flow, V-funnel test, V-funnel at T5 minutes, L-box test

I. INTRODUCTION

Concrete is the most frequently and widely used construction material on the planet. Global consumption of concrete per capita is approximately two tonnes per year. In India, since last decade mega construction projects have been successfully implemented and executed by using concrete. The type and quality of concrete being used have undergone varied transformation, from its increasing strength to escalating performance of concrete. Enhancing the concrete properties (fresh & hardened) is continuously one of the main necessities for construction of structures. High strength concretes having compressive strength ranging from 50 MPa up to 130 MPa has been used around the world in tall buildings and bridges with long spans or buildings in aggressive environmental conditions. The major advancement in the concrete technology includes increasing the strength of concrete, increasing the performance of concrete and introduces self-compact ability in concrete.

SELF-COMPACTING CONCRETE

SCC is an innovative concrete that flow under its own weight and does not require vibration as conventional concrete needs vibration immediately after it is placed to eliminate entrapped air. It is at the same time cohesive enough to be handled without segregation or bleeding. In conventional concrete, compaction is done with the vibrators and the assurance of quality is compromised in complex structures due to lack of workmanship. Insufficient compaction considerably reduces the ultimate performance of concrete i.e. strength of concrete and the permeability of concrete, which in turns reduces the durability of concrete structures. Vibration also causes health problems in worker like HAVS (Hand Arm Vibration Syndrome), etc.

The introduction of SCC technology allows the improvement in concrete construction methods for increased and improved results. The need of this type of concrete was introduced by Okamura in 1986. The fundamental research on the workability of self-compacting concrete had been done by Ozawa and Maekawa at University of Tokyo in 1989. For the concrete to be self-compacted concrete it should pass EFNARC Guidelines those are: passing ability, filling ability, flowing ability and segregation resistance.

1.1 BENEFITS AND APPLICATIONS OF ALCCOFINE

A. Technical Benefits at Fresh Stage

1) Improves workability retention
2) Improves flow ability

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3) Reduces segregation
4) Reduces heat of hydration

B. Technical Benefits at Hardened Stage

1) Improves strength at all ages
2) Improves durability
3) Improves resistance to Alkali Silica Reaction
4) Improves resistance to chemical attack
5) Lowers permeability

C. Fields of Applications

1) RCC residential, commercial structures
2) High rise structures with challenging situations to pump the concrete with ease
3) Temperature controlled mass concrete for raft and pile foundation
4) Aluminium / tunnel form work with high flow or self-compacting concrete
5) High performance concrete with extremely low water to binder ratio
6) Shot Crete with improved cohesion and faster initial strength gain
7) Precast concrete elements for tunnels, bridge, segmental construction, hollow core slabs, commercial precast units
8) Post tension / pre stressed concrete slab
9) Construction grouts, plasters, repair mortars

II. METHODOLOGY

2.1 REQUIREMENTS FOR SELF-COMPACTING CONCRETE:

APPLICATION AREA:SCC may be used in pre-cast applications or for concrete placed on site. It can be manufactured in a site beetling plant or in a ready mix concrete plant and delivered to site by truck. It can then be placed either by pumping or pouring into horizontal or vertical structures. In designing the mix, the size and the form of the structure, the dimension and density of reinforcement and cover should be taken in consideration. These aspects will all influence the specific requirements for the SCC.

REQUIREMENTS:SCC can be designed to fulfil the requirements of EN 206 regarding density, strength development, final strength and durability. Due to high content of powder, SCC may show more plastic shrinkage or creep than ordinary concrete mixes. These aspects should therefore be considered during designing and specifying SCC. Current knowledge of these aspects is limited and this is an area requiring further research. Special care should also be taken to begin curing the concrete as early as possible.

The workability of SCC is higher than the highest class of consistence described within EN 206 and can be characterized by the following properties:

1) Filling ability
2) Passing ability and
3) Segregation resistance.

A concrete mix can only be classified as Self-Compacting Concrete if the requirements for all three characteristics are fulfilled.

2.2 METHODS OF TESTING FRESH CONCRETE:

Many different test methods have been developed in attempts to characterize the properties of SCC. So far no single method or combination of methods has achieved universal approval and most of them have their adherents. Similarly, no single method has been found which characterizes all the relevant workability aspects so each mix design should be tested by more than one test method for the different workability parameters. Alternative test methods for the different parameters are listed.

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Table 2.1: Methods and Properties

	Method	Property
1	Slump-flow	Filling ability
3	J-ring	Passing ability
4	V-funnel	Filling ability
5	V-funnel	Segregation resistance
6	L-box	Passing ability
7	U-box	Passing ability
8	Fill-box	Passing ability abilityability

For the initial mix design of SCC all three workability parameters need to be assessed ensure that all aspects are fulfilled. A full-scale test should be used to verify the self-compacting characteristics of the chosen design for a particular application.

Acceptance criteria for SCC

SI. No	Method	Unit	Typical range of values minimum	Maximum	Result obtained
1	Slump flow test	Mm	650	800	650
2	V-funnel test	Sec	6	12	9
3	V-funnel at T5 minutes	Sec	6	15	10
4	L-box test	H2/H1	0.8-1.0	1.0	1.0

CONCRETE MIX PROPORTIONING

CEMENT	FINE AGGREGATE	COARSE AGGREGATE
1	1.75	1.35

ADJUSTED VALUES OF MIX PROPORTION

Table no 2.2 Result obtained by various proportions

SL NO.	MIXING PROPORTIONS C:FA:CA:W	RESULTS
1	1:2.7:1.59:0.45	Need more fluidity
2	1:2.5:1.5:0.6	Required fine content
3	1:2.3:1.4:0.55	Required fine content
4	1:2.2:1.3:0.6	Bleeding
5	1:2.1:1.2:0.55	Segregation
6	1:2.0:1.3:0.6	Segregation
7	1:1.9:1.3:0.58	Bleeding
8	1:1.8:1.35:0.55	Need more fines
9	1:1.75:1.35:0.6	Bleeding
10	1:1.75:1.35:0.55	Required result obtained

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III. RESULTS

COMPRESSIVESTRENGTH

In this research the values of compressive strength for different replacement levels of ALCCOFINE contents (0%, 5%, 7.5%, 10%, 12.5%, 15% and 17.5%) at the end of different curing periods (7days, 28days).

COMPRESSIVE STRENGTH TEST RESULTS:

Table 3.1: Compressive Strength of Self –Compacting Concrete cubes replaced with 0%.

Cube no.	7 days Compressive strength in N/mm2	Cube no.	28days Compressive strength in N/mm2
1	19.78	4	32
2	19.89	5	31.56
3	17.76	6	30.69
Average	**19.14**		**31.42**

Table 3.2: Compressive strength of self – Compacting concrete cubes replaced with 5%.

Cube no.	7 days Compressive strength in N/mm2	Cube no.	28days Compressive strength in N/mm2
1	21.84	4	34.52
2	24.50	5	37.18
3	24.69	6	33.09
Average	**23.68**		**34.93**

Table 3.3: Compressive strength of self – Compacting concrete cubes replaced with 7.5%.

Cube no.	7 days Compressive strength in N/mm2	Cube no.	28days Compressive strength in N/mm2
1	24.52	4	42.32
2	25.36	5	39.82
3	25.30	6	40.02
Average	**25.06**		**40.72**

Table 3.4: Compressive strength of self – Compacting concrete cubes replaced with 10%.

Cube no.	7 days Compressive strength in N/mm2	Cube no.	28days Compressive strength in N/mm2
1	26.54	4	46.32
2	28.03	5	43.96
3	29.10	6	48.62
Average	**27.89**		**46.30**

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Table 3.5: Compressive strength of self – Compacting concrete cubes replaced with 12.5%.

Cube no.	7 days Compressive strength in N/mm2	Cube no.	28days Compressive strength in N/mm2
1	29.56	4	54.21
2	30.03	5	52.12
3	28.92	6	55.03
Average	**29.50**		**53.79**

Table 3.6: Compressive strength of self – Compacting concrete cubes replaced with 15%.

Cube no.	7 days Compressive strength in N/mm2	Cube no.	28days Compressive strength in N/mm2
1	25.62	4	50.30
2	24.50	5	45.62
3	22.26	6	49.08
Average	**24.13**		**48.24**

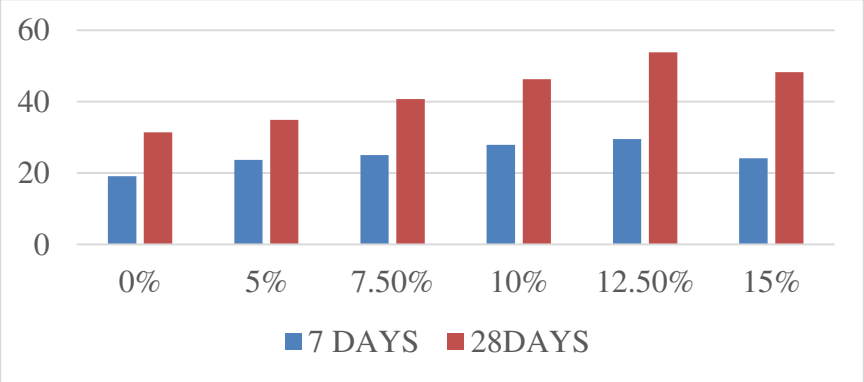

Chart no 3.1 Compression of Compressive Strength

3.2 SPLIT TENSILE STRENGTH

In this research the values of split tensile strength for different replacement levels of ALCCOFINE contents (0%, 5%, 7.5%, 10%, 12.5%, 15% and 17.5%) at the end of different curing periods (7days, 28days).

SPLIT TENSILE STRENGTH RESULTS

Table 3.7: Split tensile strength of self – Compacting concrete cylinders replaced with 0%.

Cylinder no.	28days Split tensile strength in N/mm2
1	2.60
2	2.64
Average	**2.62**

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Table 3.8: Split tensile strength of self – Compacting concrete cylinders replaced with 5%.

Cylinder no.	28days Split tensile strength in N/mm2
1	2.85
2	3.01
Average	**2.93**

Table 3.9: Split tensile strength of self – Compacting concrete cylinders replaced with 7.5%.

Cylinder no.	28days Split tensile strength in N/mm2
1	3.38
2	3.66
Average	**3.52**

Table 3.10: Split tensile strength of self – Compacting concrete cylinders replaced with 10%.

Cylinder no.	28days Split tensile strength in N/mm2
1	4.15
2	3.89
Average	**4.02**

Table 3.11: Split tensile strength of self – Compacting concrete cylinders replaced with 12.5%.

Cylinder no.	28days Split tensile strength in N/mm2
1	4.74
2	5.06
Average	**4.90**

Table 3.12: Split tensile strength of self – Compacting concrete cylinders replaced with 15%.

Cylinder no.	28days Split tensile strength in N/mm2
1	4.52
2	4.68
Average	**4.60**

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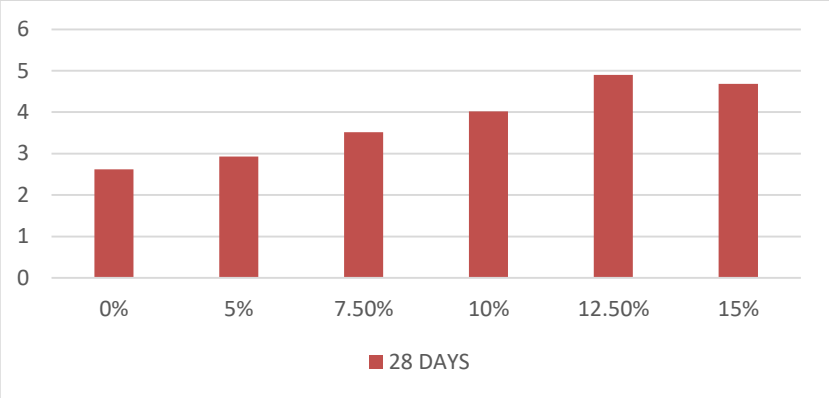

Chart no 3.2omparison of Split Tensile Strength

IV. CONCLUSION

Basic properties have been determined and found that all the material satisfy the relevant Indian standard specification.

1. At 7 days by comparing the Compressive Strength of normal concrete (control mix) and 5%, 7.5%, 10%, 12.5% & 15% Alccofine replacement attains a Compressive Strength is greater than normal concrete (control mix).
2. At 28 days by comparing the Compressive Strength of normal concrete (control mix) and 5%, 7.5%, 10%, 12.5% & 15% Alccofine replacement attains a Compressive Strength is greater than normal concrete (control mix).
3. At 7 days by comparing the Tensile Strength of normal concrete (control mix) and 5%, 7.5%, 10%, 12.5% & 15% Alccofine replacement attains a Tensile Strength is greater than normal concrete (control mix).
4. At 28 days by comparing the Tensile Strength of normal concrete (control mix) and 5%, 7.5%, 10%, 12.5% & 15% Alccofine replacement attains a Tensile Strength of is greater than normal concrete (control mix).
5. The Alccofine used in the self-compacting concrete increase the workability and strength more than the control mix.
6. The proportion of alccofine in scc is 5%, 7.5%, 10%, 12.5% is provide the more strength and the 12.5% is the peak high strength then it reduced by the proportion of 15%.

REFERENCES

[1] M.Adams Joe, A.Maria Rajesh, “Study on the Effect of Ggbs& M Sand in Self Compacting Concrete”. The International Journal of Engineering And Science (IJES) Vol. 4, Issue 8, pp. 12-18, 2015.
[2] Yatin H Patel, P. J. Patel, Prof.Jignesh M Patel, Dr. H S Patel, “Study on Durability of High Performance Concrete with Alccofine and Fly Ash”. International Journal of Advanced Engineering Research and Studies, Vol. 2, Issue 3, pp. 154-157, April-June, 2013.
[3] Sunil Suthar, B.K.Shah and P.J.Patel , “Study on Effect of Alccofine and Fly Ash Addition on the Mechanical properties of High Performance Concrete "International Journal for Scientific Research and Development pp 464-467 vol.1,issue 3,2013 ISSN(online) : 2321-0613.
[4] M.S. Pawar1, A.C. Saoji, “Effect of Alccofine on Self Compacting Concrete”, The International Journal Of Engineering And Science (IJES), Vol. 2,Issue 6,pp. 05-09, 2013.