To Study High Grade Concrete M30 as Building Material with Ambuja Method using with and without Alccofine

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Abstract

The term Concrete Mix Design is the process of selecting suitable ingredients of concrete and determining their relative amounts with the objective of producing a concrete of the required, strength, durability, and workability as economically as possible. The proportioning of ingredient of concrete is governed by the required performance of concrete in 2 stages, namely the plastic and the hardened stage. If the plastic concrete is not workable, it cannot be properly placed and compacted. The property of workability, therefore, becomes a vital importance.The compressive strength of hardened concrete which is generally considered to be an index of its other properties, depends upon many factors, e.g. quality and quantity of cement, water and aggregates; batching and mixing; placing, compaction and curing. The aim of this study is to evaluate the high performance of concrete containing supplementary cementations materials such as Alccofine. . In the present study, the effect of Alccofine on properties of concrete has been studied.

Keywords: - *Alccofine, M30, Concrete, Mix Design*

I. INTRODUCTION

Concrete is a mixture of port-land cement, water, sand and gravel or crushed aggregate which when placed in forms and allowed to cure becomes hard. The hardening is caused by chemical action between water and cement by which it gains strength progressively. Concrete is a composite material composed of coarse granular material (the aggregate or filler) embedded in a hard matrix of material (the cement or binder) that fills the space between the aggregate particles and glues them together. We can also consider concrete as a composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregates.

Concrete is the most widely used construction material in the world. It is used in many different structures such as dam, pavement, building frame or bridge. Also, it is the most widely used material in the world, far exceeding other materials. Its worldwide production exceeds that of steel by a factor of 10 in tonnage and by more than a factor of 30 in volume. The present consumption of concrete is over 10 billion tons a year, that is, each person on earth consumes more than 1.7 ton of concrete per year. It is more than 10 times of the consumption by weight of steel.

II. CONCRETE MIX DESIGN

Concrete mix design they are more accustomed to. Concrete mix design is step by step procedures to work out the various proportions of the ingredients which go to make concrete .There are various methods of mix design available. These methods can only give guideline to the site engineer to work out the various parameters of concrete mix & it may or may not be necessary to make minor adjustments thereafter. However , it is very essential for the site engineer to get the feel of concrete material & concrete by continous check on workability , cohesiveness , finished surface , strength & durability parameter. It is only then that the engineer acquires the art of designing concrete mixes.

III. HIGH GRADE CONCRETE

The properties of a high-strength concrete-mix with a compressive strength of more than 30 MPa is greatly influenced by the properties of aggregates in addition to that of the water-cement ratio. To achieve high strength, it is necessary to use lowest possible water-cement ratio, which invariably affects the workability of the mix and necessitates the use of special vibration techniques for proper compaction. In the present state of art, a concrete with a desired 28 day compressive strength of upto 70 MPa can be made with suitably proportioning the ingredients using normal vibration techniques for compacting the concrete mix.
The definition of high strength changes over the years as concrete strength used in the field increases. This publication considers high-strength concrete (HSC) to have a strength significantly beyond what is used in normal practice. For example, today about 90% of ready mixed concrete has a 28-day specified compressive strength ranging from 20 MPa to 40 MPa, with most ofit between 28 MPa and 35 MPa . Therefore, HSC considered here has a design strength of at least 70 MPa . Most high-strength concrete

applications are designed for compressive strengths of 70 MPa . For strengths of 70 MPa and higher, stringent application of the best practices is required.

IV. ALCCOFINE 1203

Alccofine is a specially processed product based on slag of high glass content with high reactivity obtained through the process of controlled granulation. Due to its unique chemistry and ultra fine particle size, alccofine provides reduced water demand for a given workability, even up to 70% replacement level as per requirement of concrete performance. Alccofine can also be used as a high range water reducer to improve compressive strength or as a super workability aid to improve flow. Alccofine is known to produce a high-strength concrete and is used in two different ways: as a cement replacement, in order to reduce the cement content (usually for economic reasons); and as an additive to improve concrete properties (in both fresh and hardened states). Therefore, utilization of Alccofine1203 together with fly ash provides an interesting alternative and can be termed as high strength and high performance concrete. One of the main advantages of mineral admixtures in high strength concrete is reducing the cement content, which is not only economic and environmental benefits but also means reducing the rise in temperature at the same time increasing the compressive strength and durability properties.

As a rule of thumb, the total temperature produced by the pozzolanic reactions involving mineral admixtures is considered to be half as much as the average heat produced by the hydration of Portland cement.

V. EXPERIMENTAL WORKS

Experiment work consists for making of M30 grade concrete. The design of M30 is as per the IS code 1062: 2009 mix ratio obtained as 1:1.42:2.67:0.45

1. *Sieve Analysis:* Sieve analysis of fine aggregates

Table 1: Sieve Analysis of Fine Aggregates

Sieve	Retained on Each Sieve		Cumulative % Retained	Passing Through	
	WT	%		WT	%
4.75mm	130	13	13	870	87
2.36mm	88	8.8	21.8	782	78.2
1.18mm	154	15.4	37.2	628	62.8
600 µm	180	18	55.2	448	44.8
300 µm	342	34.2	89.4	106	10.6
150 µm	65	6.5	95.9	41	4.1
Pan	41	4.1		0	0
Total	**1000**	**100**	**312.5**		

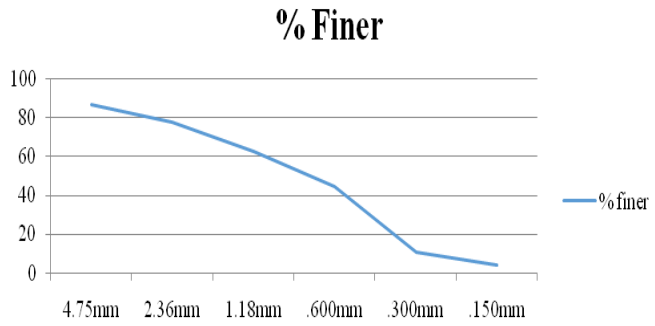

Figure 1: Represents Sieve Analysis of Sand Sieve Analysis of Coarse Aggregates for CAI - 10 mm and CAII – 20 mm

Table 2: Sieve Analysis for 10mm

Sieve	Retained on Each Sieve		Cumulative % Retained	Passing Through	
	Wt	%		Wt	%
12.5mm	25	2.5	2.5	975	97.5
10mm	185	18.5	21	790	79
6.3mm	680	68	89	110	11
4.75mm	110	11	100	0	0
12.5mm	25	2.5	2.5	975	97.5

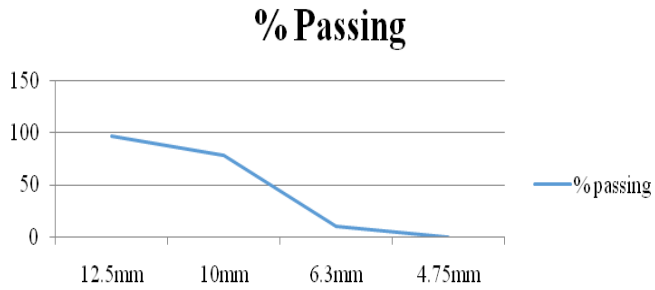

Figure 2: Represent Sieve Analysis of CAI

Table 3: Sieve Analysis for 20mm

Cube no.	Workability	Weight of cube	Compressive strength (kg/sq. cm)		
			3 days	7 days	28 days
1	70mm	7.980	148.00	-	-
2		8.00	155.00	-	-
3		7.950	153.00	-	-
4		7.970	-	219.00	-
5		7.990	-	208.00	-
6		7.940	-	218.00	-
7		7.960	-	-	320.00
8		7.950	-	-	315.00
9		7.940	-	-	320.00

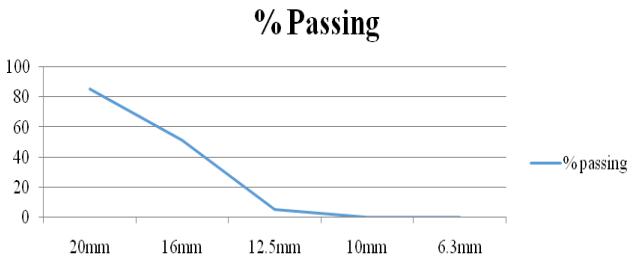

Figure 3: Represent Sieve Analysis of CAII

2. *Dry Loose Bulk Density Test:* DLBD of 10 mm is 1475kg/m^3 and 20mm is 1350kg/m^3 as per IS code.
3. *Silt Test:* The sum of the percentages of all deleterious material shall not exceed 5%. Fine aggregate must be checked for organic impurities such as decayed vegetation humps, coal dust etc. The test shows that the silt content is 2.43% which is as per the recommendations i.e. less than 5% as per IS code.
4. *Specific Gravity Test By Pycnometer:* The specific Gravity test shows that the soil sample has a Specific Gravity of 2.75 as per IS code.
5. *Compressive Strength:* The compressive strength of 28 days is 318.33 kg/sq.cm without Alccofine. The compressive strength for 28 days is 322 kg/sq.cm with Alccofine.

Table 4: Compressive Strength of M30 without Alccofine

Sieve	Retained on Each Sieve		Cumulative % Retained	Passing Through	
	Wt	%		Wt	%
20mm	148	14.8	14.8	852	85.2
16mm	338	33.8	48.6	514	51.4
12.5mm	464	46.4	95	50	5
10mm	50	5	145	0	0
6.3mm	Nil	0	0	0	0

Table 5: Compressive Strength of M30 with alccofine

Cube no.	Workability	Weight of cube	Compressive strength (kg/sq. cm)		
			3 days	7 days	28 days
1	72mm	7.980	152.00	-	-
2		7.960	151.00	-	-
3		7.990	155.00	-	-
4		7.980	-	223.00	-
5		7.990	-	225.00	-
6		7.950	-	222.00	-
7		7.960	-	-	322.00
8		7.950	-	-	319.00
9		7.990	-	-	325.00

VI. RESULT

For testing compressive strength of the M30 mix 9 cubes are prepared without Alccofine and 9 cubes are prepared with Alccofine. 3 cubes each are tested for the strength developed in 3 days, 7 days and 28 days in both the cases.

Table 6: Comperision of Compressive Strength of M30 without and with Alccofine

Days	Without Alccofine kg/sq. cm	With Alccofine kg/sq. cm
3 Days	152	160
7 Days	215	225
28 Days	318	322

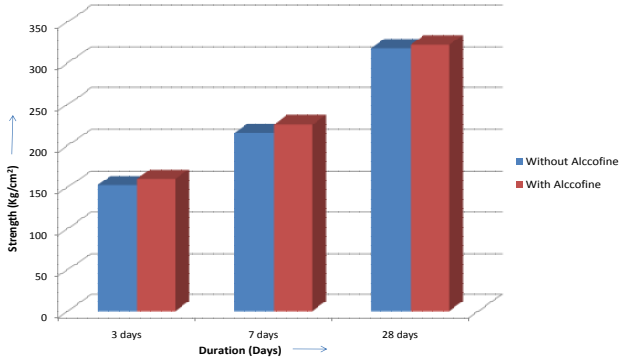

Figure 4: Variation of Compressive Strength in 3, 7, 28 Days without and with Alccofine

VII. CONCLUSION

1. The result as per the experimental work shows that the strength of concrete with 5% alccofine increase the compressive strength from 318 Kg/cm^2 to 322 kg/cm^2 after 28 days of curring.
2. Simillary after 3day is 152 kg/cm^2 to 160 kg/cm^2 and after 7day is 215 kg/cm^2 to 225 kg/cm^2.
3. The result shows that the Conrete mix with Alccofine having grade M30 shows better result than the Normal Concrete of grade M30.
4. The increase in the percentage of Alccofine from 5% in the concrete shows the decrease in the compressive strength of concrete.

REFERENCES

[1] Pawar, M. S., &Saoji, A. C. (2013). Effect of Alccofine on Self Compacting Concrete. *The International Journal of Engineering And Science*, *3*.

[2] Upadhyay, S. P., &Jamnu, M. A. (2014). Effect on Compressive strength of High Performance Concrete Incorporating Alccofine and Fly Ash.*International Journal of Innovative Research and Development|| ISSN 2278–0211*, *3*(2).

[3] Qureshi, M., Tandel, Y., & Patel, B. (2013). An Experimental Study On High Strength Concrete Using Fly Ash And Alccofine. *I-Manager's Journal on Structural Engineering*, *2*(4), 1.

[4] IS: 10262-2009. Recommended Guidelines for Concrete Mix Design, Fifth Reprint March- 1998, Bureau of Indian Standards, New Delhi.

[5] IS: 5816-1999. Splitting Tensile Strength of Concrete – Method of Test, First Revision, Bureau of Indian Standards, New Delhi.

[6] IS: 2386 (Part III) -1963, Methods of Test for Aggregates for Concrete, Part III: Specific gravity, density Voids, the absorption and bul king, First Reprint March 1971, Bureau of Indian Standards, and New Delhi.

[7] IS: 2386 (Part I) -1963, Methods of Test for Aggregates for Concrete, Part I: Particle Size and Shape, Tenth Reprint March 1993, Bureau of Indian Standards, New Delhi.