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Behaviour Of Self Compacting Concrete With Flyash And Acclofine

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Abstract - A Self-compacting concrete (SCC) is flowing concrete which can merge under its own particular weight. The essential point of this examination is to investigate the feasibility of using SCC by looking at its flow properties and durability characteristics by performing different tests such as slump flow test, L-box test, U-box test, J-ring, V-funnel, accelerated curing test, tensile test, compression test and flexural test. A broad review was conducted to investigate the current situation with information on the durability performance of self-consolidating concrete. Be that as it may, in light of the fact that it typically requires a high nominal cover and synthetic admixtures contrasted with standard concrete, its material cost is for the most part 20-50% higher, which has been a noteworthy constraint to a more extensive execution of its utilization. This paper mainly focuses on: (i) development of an appropriate mix for SCC that would fulfill the prerequisites of the plastic state; (ii) cube casting of concrete specimens and testing them for compressive strength, flexural strength, tensile strength, accelerated curing test. Local aggregates, cement, flyash, alccofine and ADWA 960 were utilized in this work. The significance of this work lies in its endeavor to give some execution information of SCC so as to draw attention to the possible utilization of SCC

Keywords- Self compacting concrete, Alccofine, Flyash, flow properties, durability, workability.

1. INTRODUCTION

A. SELF-COMPACTING CONCRETE (SCC)

The SCC is a concrete which gets compacted because of its self-weight and is the air is removed (no captured air) totally while flowing in the form work. In highly reinforced structural members, it fills almost all voids and concrete maintains horizontal level after it is placed

1. The previously mentioned properties of SCC are accomplished by limiting aggregate where in energy required for flowing is taken by internal stress (high deformability) which leads to blockage of total particles.
2. Limiting coarse aggregate whose energy utilization is high to a level lower than normal is effective in elude such kind of blockages.
3. The ability to flow high with high deformability can be accomplished just by use of a super plasticizer keeping w/p proportion to a low value.

B. FLY ASH

Fly ash is a group of materials that can vary significantly in composition. It is residue left from burning coal, which is collected on an electrostatic precipitator or in a sack house. It mixes with flue gases that result when powdered coal is used to produce electric power

C. ALCCOFINE

Alccofine is a new generation, micro fine material of particle size much finer than other hydraulic materials like cement, fly ash, silica etc. being manufactured in India. Alccofine has unique characteristics to enhance 'performance of concrete' in fresh and hardened stages due to its optimized particle size distribution. It can be used as practical substitute for Silica Fume as it has optimum particle size distribution not too coarse, not too finer either. There are two types of Alccofine**:** Alccofine 1203, Alccofine 1101.

ADMIXTURE: (ADVA960) 0.8%

Chemical Analysis	***Mass %***	***Physical analysis***	***Range***
CaO	32-34	Bulk Density	600-700 kg/m3
Al2O3	18-20	Surface Area	12000 cm2/gm
Fe2O3	1.8-2	Particle shape	Irregular
SO3	0.3-0.7	Particle Size, d10 d50 d90	< 2 µ < 5µ < 9 µ
MgO		8-10	
SiO3		33-35	

TABLE-1: PROPERTIES OF ALCCOFINE

2. LITERATURE REVIEW

Prof. Aijaz Ahmed Zende, Dr R.K Khadirnaikar have given that the paper audits the recent investigations which were done on Self Compacting Concrete (SCC) and compare it with normal concrete (NC). All the nations are confronting an immense decline in accessibility of skilled workers in the construction industry, and henceforth the need of special concrete turned out to be extremely important in the world where the utilization of concrete is just next to water. "Special Concrete" alludes to the concrete which meets the special prerequisites and performance which may not be achieved by utilizing regular materials and ordinary techniques for concreting. Self-Compacting Concrete is one of the kinds of a special concrete which flows and consolidates under its own weight in the way that it takes out the issue of putting concrete in difficult conditions and furthermore decreases the time in placing large section and in the meantime giving high quality and better durability characteristics when compared with ordinary cement. This paper examine different aspects of SCC including the materials and mix design, various test methods such as V-Funnel test, L-Box test Etc, as well as the performance characteristics in the fresh and hardened concrete.

Prasanna T, Sandya D, Arjun: Concrete is the one of the for the mostly utilized material all through the world in the different fields, which essentially comprises of cement, sand and crushed quarry stones are locally and naturally accessible, then sand and pulverized stone are used as a filler material in concrete and cement is utilized for bonding and quality parameters of the concrete. Accordingly concrete is utilized widely; it has many drawbacks for the production of one tone of concrete about one tone of co2 is to be discharged which has impact on nature. And furthermore the concrete can withstand compressive loads however it will have tensile and flexural failure. To improve the tensile and flexural strength of concrete, number of test studies and investigations are to be done. The experimental work is done to find out the mechanical properties such as compressive quality, split tensile and flexural strength for normal strength concrete and high strength cement. Normal concrete and High strength concrete is made by replacing alccofine by weight of cement. Different percentages such as 0% ,9%, 10% , 11% ,12% ,13%, 14%.using consistent water cement proportion of 0.45 and 0.30 for M30 and M70 concrete respectively, super plasticizer are utilized for required degree of workability. The specimen casted is cured in atmospheric temperature and hardened properties for 7, 14 and 28days.

Vikram K. Shadi, M.A. Banarase: In the present paper, the impact of alccofine on properties of concrete has been considered. The point of this Study is to assess the high performance of concrete containing supplementary cementitious materials like Alccofine. In this paper writings of different researchers were focused on durability of high performance concrete with alccofine and fly ash. The need of high strength concrete is increasing day-by-day due to demand in the construction industry. In recent years, efforts for improving the strength and durability characteristics of concrete suggest that cement replacement materials along with natural admixtures can enhance the overall performance of concrete. This alccofine material is pozzalonic materials that are getting popular in the construction industry as these materials bring technical revolution in the civil engineering field. . Alccofine is new generation micro fine concrete material for high Strength Concrete which plays vital role in regards of workability and strength. Alccofine is easy to utilize and can be mixed directly with cement, ultrafine particle of alccofine gives better and smooth surface finishing. The cost of the concrete mix prepared with alccofine is lesser than the concrete without alccofine for high strength concrete. It likewise brings down the water/cement proportion. It was discovered that the alccofine material increases the strength (both in flexural and compression) to a substantial degree. If the percentage level of alccofine is increased beyond that level it acts as a filler material and yields good workability to the concrete.

3. MIX DESIGN

- Taken M 40 Grade
- Type of cement (O.P.C) = 53 grade
- Size of coarse aggregate = 20 mm

Step 1: Target mean strength for mix proportion

($F'_{ck} = F_{ck} + K*S$)
Here $F_{ck} = 40$
K = Risk factor = 1.65
S = Standard deviation= 5
Hence
F'ck = 40+ (1.65*5)
=48.25 N/mm^2

Step 2: Selection of water content

Maximum water content = 186 liters (it is selected based on sige of aggregate)

Step 3: Corrected water content

Maximum water content for 50mm slump is 186 lit
If 3% of water is added then 25mm slump will increases
Now assuming slump as 100 mm, then
W= 186+ [186*(6/100)]

- **W=197.16 lit**

Step 4: Calculations for cement content

W/C = 0.45
Here W/C = Water Cement ratio.
197.16/C = 0.45

- **Cement = 438.13 Kg/m^3**

Step 5 : Determination of aggregates

From (table 3 IS 10262:2009) zone 2
and coarse aggregate (20mm) at W/C ratio
Volume of coarse aggregate = 0.62 m^3
Corrected volume = 0.01/0.05 *0.05 = 0.01
= 0.62+0.01=0.63

- **Coarse aggregate = 0.567 m^3**
- **Fine aggregate = 1- 0.567 = 0.433 m^3**

CALCULATIONS

Volume of concrete = 1 m^3

- Absolute volume of cement =(C/ S.P gravity of cement) * (1/1000)
  = (438.13 / 3.15) * (1/1000) = **0.13 m^3**
- Volume of water = (W / 1000)
  = 197.16 / 1000
  = **0.19716 m^3**
- Volume of materials = absolute vol. of cement + vol. of water = 0.13+0.197
  =-**0.336 m^3**
- Absolute total aggregate = 1 – 0.336
  =**0.664 m^3**
- **Weight of coarse aggregate :**
  (Absolute total aggregate * vol of C.A * S.P gravity of C.A * 1000)
  = 0.664 * 0.56 * 2.8 * 1000
  Coarse aggregate =1054.1664 Kg / m^3
- **Weight of fine aggregate :**
  (Absolute total aggregate * vol of F.A * S.P gravity of F.A * 1000)
  = 0.664 * 0.433 * 2.7 * 1000
  Fine aggregate =776.28Kg / m3
- **Total density :**
  (Weight of cement + weight of water + weight of C.A + Weight of F.A)
  = 438.13 + 197.16 + 1054.16 + 776.28
  Total density = 2441.58 Kg / m3

WATER	CEMENT	COARSE AGGREGATE	FINE AGGREAGTE
197.16 Kg/m^3	438.13 Kg/m^3	1054.16 Kg/m^3	776.28 Kg/m^3

TABLE-2

4. METHODS

The various tests performed on the materials used are listed below:
TESTS ON CEMENT: Specific gravity, Standard consistency, Initial setting time, Final stetting time, Fineness modulus, Compression strength, Soundness,
TESTS ON AGGREGATES: Fineness Modulus of Sand, Specific Gravity of Aggregate, Bulk Density, Water Absorption and moisture,
TESTS ON WATER: Alkalinity (12ml of 0.02N, H_2SO_4 is consumed for 50ml sample), Suspended matter, Acidity, Chlorides, Sulphates, Inorganic, Organic, P_h value.
TESTS ON CONCRETE:
FRESH CONCRETE: Workability Tests- Slump-Flow by Abram's cone, L-Box, U-Box, V-Funnel, J-ring.
HARDENED CONCRETE: Compression Test, Split Tensile strength, Flexural strength, Accelerated Curing Test.

5. TEST RESULTS

Mix Design (Cement + Fly ash + Alccofine)

MATERIAL	MASS (Kg/m^3)	ABSORPTION	MOISTURE	FINAL QUANTITY (Kg/m3)	BATCH WEIGHT (Kg)	WATER CORRIOSION
CEMENT	450	-	-	450	16.65	
FLYASH	150	-	-	150	5.55	
ALCCOFINE	25	-	-	25	0.93	
WATER	160	-	-	183	6.77	22.98
20MM	0	-	-	0	0	-
10MM	977	0.5%	0	972	35.97	4.89
CRUSHED SAND	670	3%	0.3%	652	24.12	18.09
ADMIXTURE	0.8%			4.8	0.178	

TABLE 3-Test results for Properties of Fresh concrete

Tests/Time	Initial (min)	60min	120min	180min
Slump-Flow by Abram's cone	690mm	640mm	580mm	490mm
J-ring	10	10	10	20
V-Funnel	10	6	6.9	5
L-Box (H2/H1)	0.84	0.84	0.94	0.81
U- Box (H2-H1)	20	15	18	20

TABLE 4-Test results for Properties of Hardened concrete

Compressive strength, Tensile strength and Flexural strength is determined for the moulds which are immersed in water for 7days, 28days, 56 days and 90 days and results are shown in below graph and are calculated using formula: Compressive strength = load / area, Tensile strength = 2p / πdl, Flexural Strength = Pl / bd^2

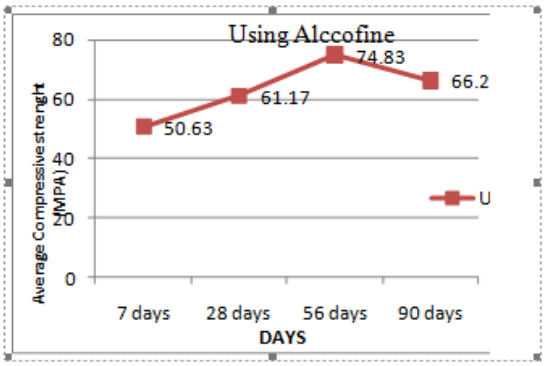

FIG 1- Compressive Strength of Cubes Using Alccofine

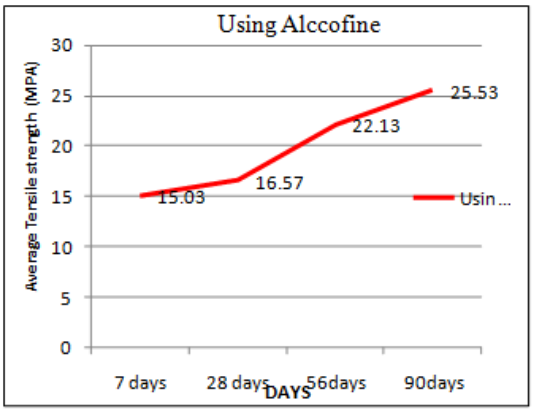

FIG 2-Tensile strength of cylinders using Alccofine

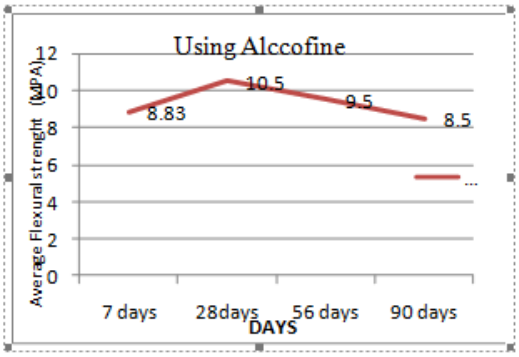

FIG 3-Flexural strength of beams using Alccofine

ACHIEVEMENT OF THE OBJECTIVES

The project achievements are as follows:

- ✓ In this project, the review and research of current usage of self compacting concrete mixed with fly ash and alccofine was discussed into different sectors, such as construction of bridge, building and tunnel constructions.
- ✓ The SCC mixed with flyash and alccofine specimens have been tested for compressive strength, flexural strength, accelerated curing test and tensile strength. However, not all the specimens had achieved to the high strength requirement.
- ✓ All the results for the tests were recorded in an appropriate manner.

6. CONCLUSION

In this investigation, the self compacting concrete properties were found to be good when flyash and alccofine were added, as the addition of flyash and alccofine increase the workability properties and strength of concrete. The flow properties were satisfying the recommended values given by EFNARC

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