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Mechanical Studies on Alccofine Concrete with Variation of Steel Fiber Content

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ABSTRACT

. The production of cement gives the large amount of Co2 into the atmosphere and a major contribution to the green house effect and the global warming. Hence the desired performance of adding agents like alccofine 1203 is a specially processing material based on slag of high glass content with high strength.It provides water demand for a given workability, even up to10% replacement of alccofine 1203 gives the high range water reducer and high compressive strength and hence the work ability will be improved. Alccofine varying from steel fiber varying from 0 to 1% at an constituent cement ratio keep in 10% alcofineconstant since the alccofine 1203 having more compressive strength and gives the better results in constructional areas. In , hybrid fibers (steel fibers) along with admixture like Alccofine-1203 will be used. The hybrid fiber will help to reduce the cracks due to shrinkage, creep and early age cracking along with an increase in ductility, toughness and fatigue resistance. The mineral admixture (Alccofine-1203) will help to increase the strength of concrete, modulus of elasticity along with workability, durability, and reduction in segregation. Both the mineral admixture (Alccofine) and hybrid fibers (Steel fiber) will be beneficial to HFRC to achieve better structural performance. They also reduce the permeability of concrete and thus reduce bleeding of water. Experiments will be conducted to study the effect of steel fiber in different proportion in hardened concrete. we are conducting Tests like Compressive strength test, Flexural strength test and durability tests like , Water absorption test and will be conducted on hybrid fiber reinforced concrete using Steel Fiber and Alccofine-1203.

Keywords: *Alccofine 1203, Steel Fiber, Cement ,Fine Aggregate , Coarse aggregate , Water Compressive strength, Split tensile strength, Flexural strength.*

1. INTRODUCTION

The concrete is an largely used in an construction areas for different type of structures due its structural alignment and strength. The ordinary Portland cement is one of the most ingredient used for the manufacturing of concrete and as an alteration in the civil industries. In an construction areas concrete plays major role structural element. The concrete is identified as one of the best material in construction areas for the present situation. The production of cement gives the large amount of Co2 into the atmosphere and a major contribution to the green house effect and the global warming. Hence the desired performance of adding agents like alccofine 1203 is a specially processing material based on slag of high glass content with high strength.It provides water demand for a given workability, even up to10% replacement of alccofine 1203 gives the high range water reducer and high compressive strength and hence the work ability will be improved. Alccofine varying from steel fiber varying from 0 to 1% at an constituent cement ratio keep in 10% alcofineconstant since the alccofine 1203 having more compressive strength and gives the better results in constructional areas.

About an these microfine material is an new generation product which was seen by Ambujaconstructions , they knew that these material as an high compressive strength of the various masonry works. Taking an these product for the experimental purposes can be known that it shows an high strength, more durable, effective than other microfine materials.The alccofine 1203 is ordered through vss group of microfine

products private limited, Kolkata they knew the more advantages of this product and they saled of these material through the offline and online facilities.so these made the study of microfine product is the suitable for the experimental investigations for the postgraduate students.regularlly the flyash,gypsum,limestone etc., are replacing the materials into the cement.but now even we can replace the cement through the alccofine 1203 material,so there will be less usage of cement in construction can be done.It is known that there will be an more positive effects for the alcofine 1203 material and it can be used in various types of construction purposes hence the most companies are replacing these product. Keeping these points about an alccofine 1203 material we conducted experimentally testing the with the compressive strength of the alccofine with various purposes like walls etc.,hadmade me to study the percentages like 10%, for the 7 days and 28 days with alccofine and andwithout alccofine and without steel fiber. Since by adding the increasing percentage of steel fiber came to know that the more percentage of steel fiber gives the more strength and durability.

2. EXPERIMENTAL STUDY

2.1 MATERIALS USED:

Alccofine 1203:

It is an microfine material with less calcium silicate chemical and is an porous material with self healing properties, it can be used for the high risedbuildings,roads,bridges,ports etc., with more over concrete industries. The quarry dust by replacing sand and replacing this product can be known the various output tests conducted experimentally in laboratories, with increasing alccofine percentages like 6%,8%,10%,12% gives the percentage values with an high compressive strength and workability. Hence the main aim of the alccofine is to deduce the water-cement ratio,chemical add mixture and the improves the high compressive strength, high rise durability and studying the impermeability conditions.

The Indian Standards used are,

IRC SP: 70
IS: 12089
IS: 456

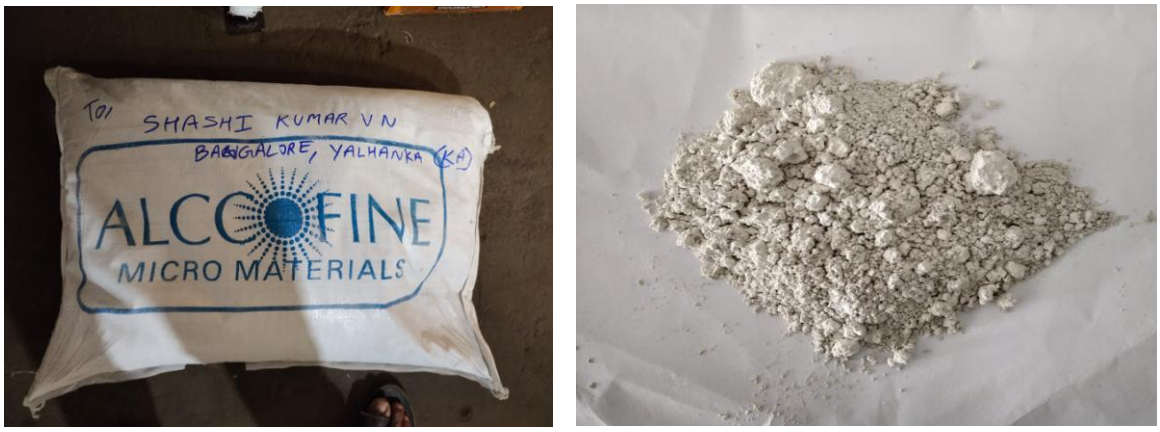

FIGURE 1

STEEL FIBER

There is a wide variety of types and shapes of steel fibers available on the market, ranging typically 30-60mm in length and 0,5-1,0mm in diameter. The tensile strength of the steel fibers are generally 700-1600 MPa, The aspect ratio of the fiber is the ratio of its length to its diameter. Typical aspect ratio ranges from 30 to 150. Fiber reinforced concrete (FRC) is concrete containing fibrous material which increases its structural integrity. hooked-end steel fiber, lengths 30-60mm, diameter 0,5...1,0mm (both separate and glued), wavy steel fiber, length 30-60mm, diameter 0,8...1,0mm,undulated segment steel fiber (Xorex-type), lengths 25-60mm,flat-end steel fiber, lengths 30-50mm, diameter 0,7...1,0mm,crimped steel fibers, lengths 30-50mm, different types of shotcrete steel fibers, length 20-40mm, diameter

0,3...0,6mm, stainless steel fibers,Steel fibers are typically supplied in 20 and 25kg carton bags. The Fibres Are Used In Four Different Percentages (0%, 0.25%, 0.5%, 0.75% And 1%).

- The Length Of The Fibre Is 30mm
- The Aspect Ratio Is 30.
- The Shape Of The Fibre (Hooked Ended) Helps In Better Bonding With The Concrete

FIGURE 2

CEMENT:

It is used as zuari ordinary Portland cement with an 43 grade,it should pass all the described test, in a particular construction cement used are rapid hardening cement in roads and it colour should be uniform then shall be grey coloureith greenish snade, the cement should free from lumbs. It shall free smooth and cool while touching, the cement also pass the float test that is some amount of cement threw in a bucket of water and it should be float before it shrinks, then the cement should be freshly manufactured and it shall used for 90days of its manufacturing date.

FINE AGGREGATE:

The fine aggregate and coarse aggregate is of 60-70% of total volume of concrete the aggregate shall be consist of crushing stone manufactured M-sand, river sand etc.,then it should be free from silts but now a days we are getting easily crushed stone manufactured sand for the constructions, and it is produced by crushing industries and it should be well graded.

COARSE AGGREGATE:

It is use one-third of concrete and are the most used material inconcrete.It as the major deciding there ability for bulding constructions then the aggregate shall be tested in laboratories with experimentally and it should be free from dust well graded with crushed ability of coarse aggregate and the parameters are considered.

The Indian Standars are:
IS 383-2012

Water:

The water cement ratio is considered as per code with grade of concrete consider in the mix design of concrete calculations then more over it is used with tallying the average cement with water taken in the ratio to be considered either the milliliters. Fresh water to be used with correct ratio calculated for total mix design. Apply the water after mixing of powder with steel fiber.

2.2 MIX PROPORTION

MACHINE MIXING:

In this mixing the wastage materials is given with minimum and there is no water leakage. Here the half quantity of coarse aggregate, fine

aggregate, cement, Alccofine1203,Steel fiber, Water are added to the drum and mix it well. Then here the proportions of alccofine is taken as 10% then the steel fiber is taken 0 to 1% of the and water is added gradually the water cement ratio is taken 0.5%. At last the mix is done until to get anconsistency of concrete mix.

SAMPLING:

The cubes of standard size are oiled from the inner surface. The blocks are filled with concrete, the filling is done for three layers and the tamping is done for 25 times in each layer. The top surface is finished using trowel with an surface level and the specimens should kept with an temperature of twenty seven degree Celsius plus or minus two degree Celsius

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CURING:

After demolding in twenty-four hours, the blocks are removed and kept aside then the water with clean and tidy at an room temperature of twenty-four degree Celsius to thirty degree Celsius the blocks are placed in that water, the curing is done according to their recommendation like seven days and twenty eight days.

2.3 TEST PROCEDURE

COMPRESSIVE STRENGTH

The cubes, cylinder and specimens are removed from water at least ten minutes before testing to get an better results and the surface of blocks are dried and cleaned with cotton cloth. After this the blocks is placed under the 2 plates of the testing machine. Testing days,

1. At 7^{th} day.
2. At 28^{th} day.

In this experimental test the number of cubesare taken were three for each trial of testing therefore the formula is given by,
compressive strength = compressive load/cross sectional area

Tabular column: Schedule for cube casting

Date of casting	Details
03/02/20	10% replacement
04/02/20	10% replacement
05/02/20	10% replacement
06/02/20	10% replacement

Flexural & Tensile Testing

All the aggregates are mixed with shovel on which is non absorbing, the cementitious material like alccofine 1203 is added and Steel fiber with varying percentage of 0 to 1% then the amount of water cement ratio is taken under the mix design according to the IS codes recommendations then the mixture mixed until to get an homogenous with an adequate consistency.

In this mixing the wastage materials is given with minimum and there is no water leakage. Here the half quantity of coarse aggregate, fine aggregate, cement, Alccofine1203,, Water are added to the drum and mix it well. Then here the proportions of alccofine is taken as 10% and then the steel fiber is added with 0.25%,0.5%,0.75%,1%, and water is added gradually the water cement ratio is taken 0.5%. At last the mix is done until to get an consistency of concrete mix.

The block specimens are removed from water at least ten minutes before testing to get an better results and the surface of blocks are dried and cleaned with cotton cloth. After this the blocks is placed under the 2 plates of the testing machine.

3 RESULTS AND DISCUSSION

FOR 28 DAYS CUBES

Table: 10% replacement of alccofine without steel fiber

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	11.59	10.37	11.42
Compressive load(KN)	1100	1200	1150
Cross-Sectional area(mm2)	225	225	225
Compressive Strength(kN/MM2)	48.8	53.3	51.1
Average Compressive strength(kN/mm2)	51.06		

Table: 10% replacement of alccofine with 0.25% steel fiber

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	11.98	12	12.32
Compressive load(KN)	1250	1100	1200
Cross-Sectional area(mm2)	225	225	225
Compressive Strength(kN/MM2)	55.55	48.8	53.3
Average Compressive strength(kN/mm2)	52.6		

Table: 10% replacement of alccofine with 0.5% steel fiber

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	12.56	12.78	12.2
Compressive load(KN)	1400	1250	1350
Cross-Sectional area(mm2)	225	225	225
Compressive Strength(kN/MM2)	62.22	55.55	60
Average Compressive strength(kN/mm2)	59.15		

Table: 10% replacement of alccofine with 0.75% steel fiber

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	13	12.89	12.95
Compressive load(KN)	1350	1250	1300
Cross-Sectional area(mm2)	225	225	225
Compressive Strength(kN/MM2)	60	55.55	57.77
Average Compressive strength(kN/mm2)	57.77		

Table: 10% replacement of alccofine with 1% steel fiber

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	13.6	12.43	12.99
Compressive load(KN)	1500	1450	1600
Cross-Sectional area(mm2)	225	225	225
Compressive Strength(kN/MM2)	66.67	64.45	71.11
Average Compressive strength(kN/mm2)	67.40		

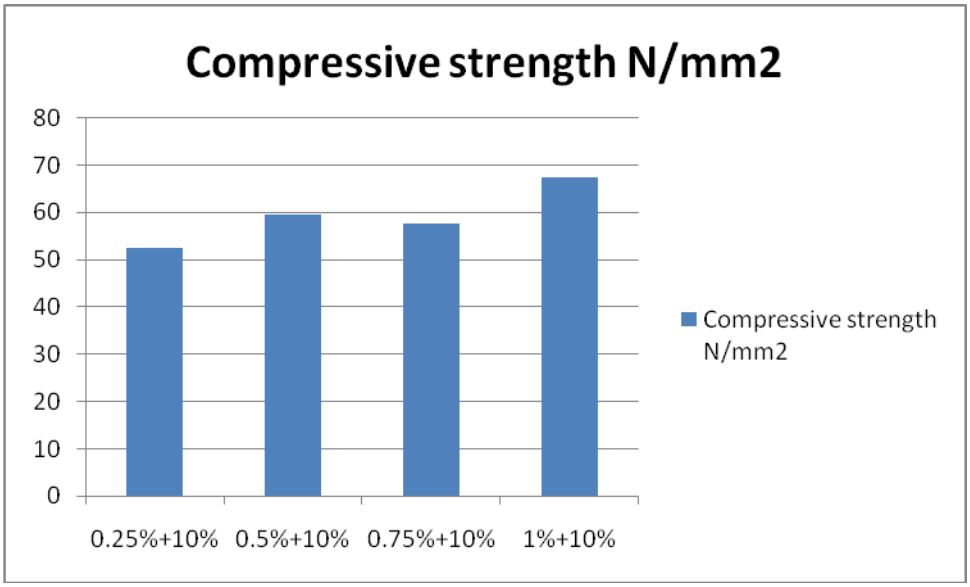


Table: 7 DAYS CUBES COMPRESSION TESTING RESULTS

PARTICULAR	AVG COMPRESSION STRENGTH (KN/M^2)
Cube containing Alccofine of 10% without Steel fiber	26.88
Cube containing Alccofine of 10% and Steel fiber of 0.25%	32.44
Cube containing Alccofine of 10% and Steel fiber of 0.5%	34.21
Cube containing Alccofine of 10% and Steel fiber of 0.75%	34.66
Cube containing Alccofine of 10% and Steel fiber of 1%	34.365

28 DAYS CUBES COMPRESSION TESTING RESULTS

PARTICULAR	AVG COMPRESSION STRENGTH (KN/M^2)
Cube containing Alccofine of 10% without Steel fiber	51.06
Cube containing Alccofine of 10% and Steel fiber of 0.25%	52.6
Cube containing Alccofine of 10% and Steel fiber of 0.5%	59.15
Cube containing Alccofine of 10% and Steel fiber of 0.75%	57.77
Cube containing Alccofine of 10% and Steel fiber of 1%	67.40

CYLINDER FOR 28 DAYS

Table: 10% replacement of alccofine with 0% steel fiber

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	11.98	12	12.32
Compressive load(KN)	220	240	235
Cross-Sectional area(mm2)	17662.5	17662.5	17662.5
Compressive Strength(kN/MM2)	12.45	13.58	13.30
Average Compressive strength(kN/mm2)	13.11		

Table: 10% replacement of alccofine with 0.25% steel fiber

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	12.98	12	12.62
Compressive load(KN)	240	260	255
Cross-Sectional area(mm2)	17662.5	17662.5	17662.5
Compressive Strength(kN/MM2)	13.58	14.72	14.43
Average Compressive strength(kN/mm2)	14.24		

Table: 10% replacement of alccofine with 0.5% steel fiber

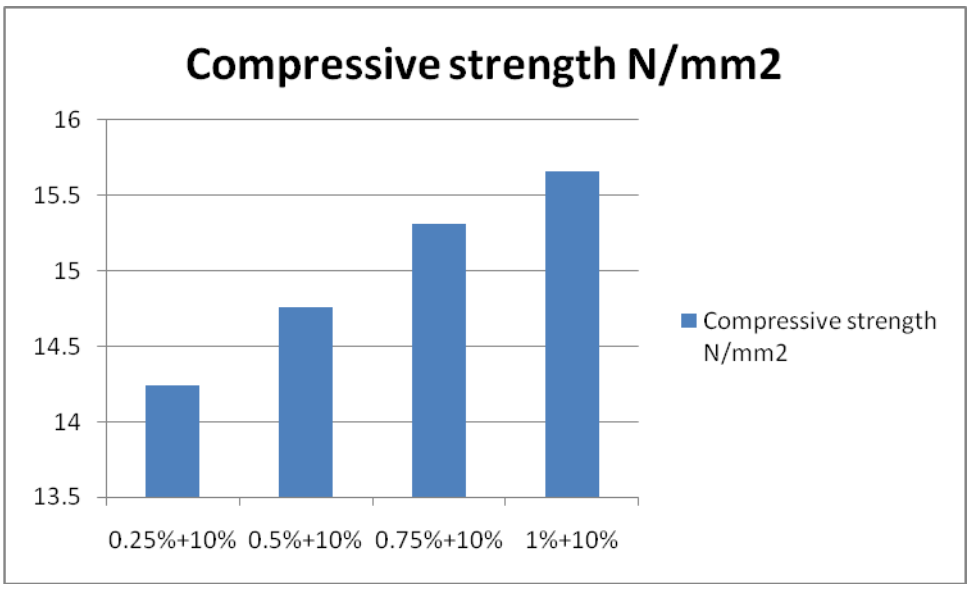
Details	Sample 1	Sample 2	Sample 3
Weight(kg)	13.76	12.98	13.32
Compressive load(KN)	270	260	255
Cross-Sectional area(mm2)	17662.5	17662.5	17662.5
Compressive Strength(kN/MM2)	15.28	14.3	14.78
Average Compressive strength(kN/mm2)	14.76		

Table: 10% replacement of alccofine with 0.75% steel fiber

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	13.88	13	13.62
Compressive load(KN)	270	265	280
Cross-Sectional area(mm2)	17662.5	17662.5	17662.5
Compressive Strength(kN/MM2)	15.28	14.8	15.85
Average Compressive strength(kN/mm2)	15.31		

Table: 10% replacement of alccofine with 1% steel fiber.

Details	Sample 1	Sample 2	Sample 3
Weight(kg)	14.44	14.78	14.62
Compressive load(KN)	270	280	280
Cross-Sectional area(mm2)	17662.5	17662.5	17662.5
Compressive Strength(kN/MM2)	15.28	15.85	15.85
Average Compressive strength(kN/mm2)	15.66		



28 DAYS CYLINDER COMPRESSION TEST RESULTS

PARTICULAR	AVG COMPRESSION STRENGTH (KN/M^2)
Cylinder containing Alccofine of 10% without Steel fiber	13.11
Cylinder containing Alccofine of 10% and Steel fiber of 0.25%	14.24
Cylinder containing Alccofine of 10% and Steel fiber of 0.5%	14.76
Cylinder containing Alccofine of 10% and Steel fiber of 0.75%	15.37
Cylinder containing Alccofine of 10% and Steel fiber of 1%	15.66

FLEXURE STRENGTH OF BEAM FOR 28 DAYS

Table: 10% replacement of alccofine with 0% steel fiber.

Details	**Specimen**		
Date:	**Sample 1**	**Sample 2**	**Sample 3**
Weight(kg)	13.78	14.34	14
Ultimate load(KN)	21	21	22
Minimum flexure area(mm2)	24	22	24
Length	500	500	500
Breadth	100	100	100
Depth	100	100	100
Flexure Strength(kN/MM2)	10.5	10.75	11
Average Flexure strength(kN/mm2)	10.75		

Table: 10% replacement of alccofine with 0.25% steel fiber.

Details	**Specimen**		
Date:	**Sample 1**	**Sample 2**	**Sample 3**
Weight(kg)	14.78	14.74	14
Ultimate load(KN)	22.5	22	22
Minimum flexure area(mm2)	24	24	22
Length	500	500	500
Breadth	100	100	100
Depth	100	100	100
Flexure Strength(kN/MM2)	11.25	11	11
Average Flexure strength(kN/mm2)	11.08		

Table: 10% replacement of alccofine with 0.5% steel fiber.

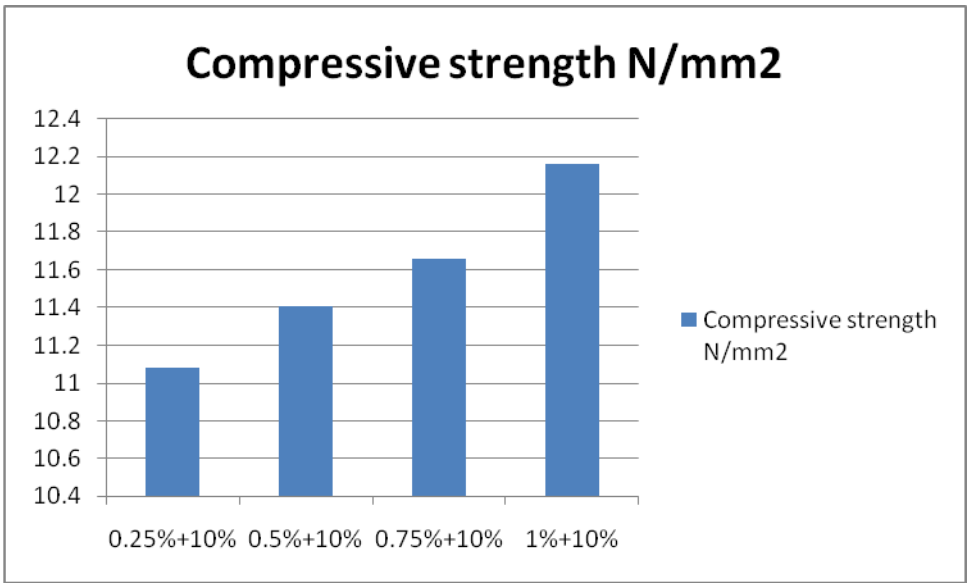
Details	Specimen		
Date:	Sample 1	Sample 2	Sample 3
Weight(kg)	14.78	15	14.9
Ultimate load(KN)	22.5	23	22.5
Minimum flexure area(mm2)	24	23	22
Length	500	500	500
Breadth	100	100	100
Depth	100	100	100
Flexure Strength(kN/MM2)	11.25	11.5	11.5
Average Flexure strength(kN/mm2)	11.41		

Table: 10% replacement of alccofine with 0.75% steel fiber.

Details	Specimen		
Date:	Sample 1	Sample 2	Sample 3
Weight(kg)	15.2	15.7	15.65
Ultimate load(KN)	24	23	23
Minimum flexure area(mm2)	22	22	24
Length	500	500	500
Breadth	100	100	100
Depth	100	100	100
Flexure Strength(kN/MM2)	12	11.5	11.5
Average Flexure strength(kN/mm2)	11.66		

Table: 10% replacement of alccofine with 1% steel fiber.

Details	Specimen		
Date:	Sample 1	Sample 2	Sample 3
Weight(kg)	15.4	15.74	16
Ultimate load(KN)	24.5	24	24.5
Minimum flexure area(mm2)	23	24	22
Length	500	500	500
Breadth	100	100	100
Depth	100	100	100
Flexure Strength(kN/MM2)	12.25	12	12.25
Average Flexure strength(kN/mm2)	12.16		



28 DAYS FLEXURE STRENGTH OF BEAM TESTING RESULTS

PARTICULAR	AVG FLEXURE STRENGTH OF BEAM (KN/M^2)
Beam containing Alccofine of 10% without Steel fiber	10.75
Beam containing Alccofine of 10% and Steel fiber of 0.25%	11.08
Beam containing Alccofine of 10% and Steel fiber of 0.5%	11.41
Beam containing Alccofine of 10% and Steel fiber of 0.75%	11.66
Beam containing Alccofine of 10% and Steel fiber of 1%	12.16

4 CONCLUSIONS

- The study says that there will be increase in compressive strength of cement by replacing the alccofine 1203 hence the significance of increase in addition of steel fiber with different ratio.
- There is rapid gaining strength for 7 days because of less percentage of alccofine added to the cement property.
- There is a difference percentage used in steel fiber are 0.25%,0.5%,.0.75%,1%.
- As partially adding of Alccofine with cement it reduces the cement quantity and adding of steel fiber can increase the life.
- The Alccofine dosage shall be at 10% for better gain in compressive strength.
- Addition of alccofine and steel fiber it cost to be more.

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