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The Study On Strength Characteristics Of High Strength Concrete Using Micro Steel Fiber

Vijayaragavan***, Mithraa**, Arun*, Joshua*

***Professor and Head of Department of Civil Engineering, **Assistant Professor, * Final year Student
Department of Civil Engineering, Christ Institute of Technology, Puducherry, India

*** vijayaraghavanc@gmail.com, * arunbharathy200496@gmail.com,

** mithraa.pec@gmail.com, * w.joshua12345@gmail.com

ABSTRACT:

This research paper deals with the strength improvement of M40 grade concrete by the addition of the micro steel fiber. The presence of micro steel fiber improves the physical properties of the concrete such as compression strength. The compressive strength test is carried out for the specimens using micro steel fiber and the results are analyzed. The fibers are added to the concrete in the proportions of 0%, 0.5%, 1%, 1.5%, 2%, 2.5%, 3% and 3.5% to the volume of the cement. The optimum percentage of micro steel fiber to give maximum compression strength was found to be 2.5%

KEY WORDS: Compressive Strength Test ,High Strength Concrete, Micro Steel Fiber,**I.INTRODUCTION:**

Non-corrosive material because it is copper coated and The word concrete origins from the Latin word "concretus" which means grow together. Concrete is the most widely used construction materials in the world. Nowadays there are many researches are going out to improve the performance of concrete. The high strength concrete is used in the places of high rise building storage structures, bridge etc. There are many by products, admixture and additives are added to improve the strength characteristics of concrete such as fibers, fly ash, slag, silica fume etc.,Fiber reinforced concrete [FRC] is concrete containing fibers which increases its structural integrity. It contains short discrete fibers that are uniformly distributed and randomly oriented. Fiber includes steel fiber, glass fiber, synthetic fiber and natural fibers each of which lend varying properties to the concrete. In addition, that character of fiber reinforced concrete changes with varying concrete grades, fiber material geometries, distribution, orientation and densities. In this research micro steel fiber is used to improve the physical characters of concrete. The micro steel fiber is one of the artificial fiber which is successor or of steel fiber. It is a low specific gravity and hence density is controlled similar to that of normal concrete.

II.LITERATURE REVIEW:

Khelan et al (2013), has done a research on M25 grade concrete by adding of micro steel fiber to the concrete. The steel fibers are added at an interval of 0.5% from 0% to 2% and they had found that the compressive strength of concrete increases with increase in fiber content.

The strength was increased up to 50% when 2% fiber is added to the concrete.

Khadakeet al (2013) has done an experimental investigation of M35 grade concrete by using steel fiber. The concrete contains fiber in the proportions of 0% to 1.5% at an interval of 0.5% to the volume of cement. The aspect ratio of the steel fiber was kept as 71. The hardened properties of concrete such as compressive and flexural strength are tested at 28 days. The maximum compressive strength of 35.54(/) is achieved when fiber is added at 1.5% to the volume of cement. This study shows that increase in fiber content increases the compressive strength of concrete. Vikrantet al (2012), they had conducted an experimental investigation on normal strength concrete with a grade of M25 using steel fiber in three different aspect ratios (50, 53.85, and 62.50). Steel fiber is replaced in the percentage of 0.5% only. The compression and tensile strength properties are tested at 7 and 28 days and they found that at all aspect ratios the strength is kept on increased 18% than the normal concrete.

EXPERIMENTAL DETAILS:*Materials:***3.1.1. Cement**

Ordinary Portland cement of 43 grades conforming to IS 8112:1989 was used in this study. The tests used to find the properties of cement are carried out and their values are

listed in Table 1.

SL.NO	DESCRIPTION	TEST RESULTS
1	Specific Gravity	3.158
2	Fineness	0.10%
3	Normal Consistency	30%
4	Initial Setting Time	55 min
5	Final Setting Time	320mins

3.1.2. Fine aggregate:

The aggregate passing on IS 4.75mm sieve and retaining on IS 150 microns sieve is used as a fine aggregate. The normal river sand is used as a fine aggregate. The river sand is confirming to IS 383:1987. The fine aggregate is washed and screened. The properties of fine aggregate are shown in Table 2.

SL.NO	DESCRIPTION	TEST RESULTS
1	Specific Gravity	2.63
2	Fineness Modulus	2.967
3	Water Absorption	1.06%
4	Bulk Density	1.52 /

Table 2 Properties of fine aggregate

3.1.3 Coarse aggregate:

The crushed granite stone passing on IS 20mm sieve and retaining on IS 4.75mm sieve is taken as coarse aggregate. The basic properties of coarse aggregate are given in Table 3.

SL.NO	DESCRIPTION	TEST RESULTS
1	Specific Gravity	2.88
2	Fineness Modulus	7.785
3	Water Absorption	0.95%
4	Bulk Density	1.516 /
5	Crushing Value	21.12%

Table 3 Properties of coarse aggregate

3.1.4. Water:

As water is the important constituent and it initiates hydration process. The portable water is used

for the research. The water standards are checked according to IS 456:2000.

3.1.5. Micro Steel Fiber:

Micro steel fiber a type of steel fiber is used in the study. The properties of micro steel fiber are shown in Table 4 and micro steel fiber was shown in fig. 1



Figure1

SL.NO	DESCRIPTION	TEST RESULTS
1	Diameter	0.2 mm
2	Length	13 mm
3	Aspect Ratio	65 mm
4	Tensile Strength(/)	2100 15%

Table 4 Properties of Micro steel fiber

3.2. Mix proportions:

According to IS 10262: 2009 the M40 grade mix design is prepared and the same is used for casting of

SL.NO	MATERIAL	QUANTITY(/)
1	Cement	450
2	Fine Aggregate	645.7
3	Coarse Aggregate	1222
4	Water	186
5	Super Plasticizer	2
6	W/C Ratio	0.4

Table 5 Mix proportion for M40 concrete

3.3. Testing:

3.3.1. Compressive strength test:

The compressive strength tests are carried out for cube specimens of size 100mm x100mm x 100mm by using compression testing machine. The cubes are tested for 7, 14, 28 days as per IS 516:1959. The compression testing machine is shown in Fig 2.

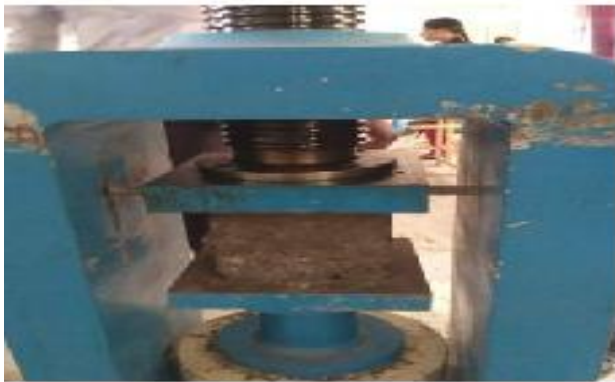


Fig 2 Compression Testing Machine

IV.RESULTS AND DISCUSSION:

In this section the compressive strength of all specimens are listed below:

4.1. Compression test results:

The compression strength result for concrete of grade 40 Mpa for various fiber percentage of Micro steel fiber were obtained at 7, 14, 28 days respectively. The compressive strength of the specimens was given in Table 6 and the compressive strength is shown in Fig 3

The compressive strength of concrete specimens ranges from 43.5 Mpa to 65.6 Mpa at 28 days.

The compressive strength development is obtained to addition of the micro steel fiber. The compressive strength of concrete is increased with increase of micro steel fiber percentage up to 2.5%.The compressive strength is reduced beyond the 2.5% of micro steel fiber in the specimen. The maximum compressive strength of specimen 65.6 Mpa is obtained at 2.5% of micro steel fiber.

Fiber Content	Compression Strength (Mpa)		
	7 Days	14 Days	28 Days
0%	27.5	35.6	43.5
0.50%	32.25	37.2	48.4
1%	33.5	39.9	50.1
1.50%	36.5	43.1	55.6
2%	37.6	46.3	59.8
2.50%	39.55	54.8	65.6
3%	38.35	51	60.5
3.5	30.28	45.5	56.1

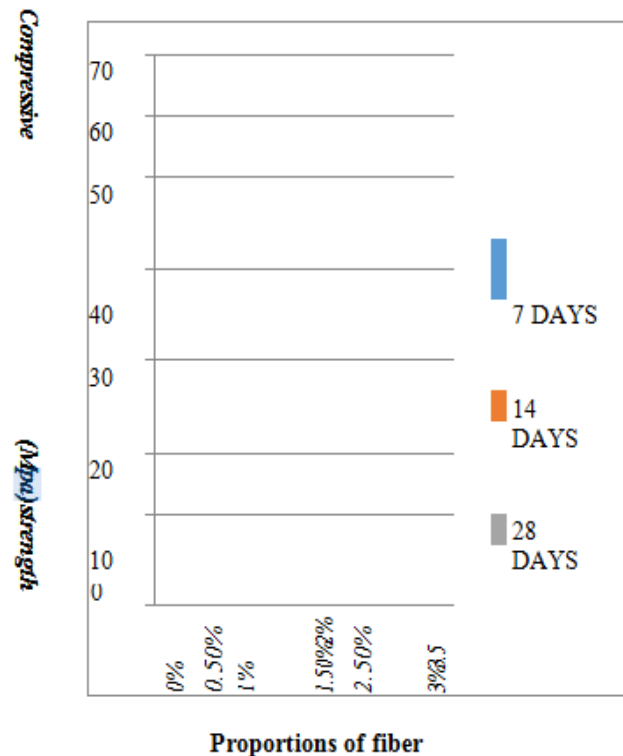


Fig 3 Compressive Strength of M40 grade concrete

V.CONCLUSION:

In the present study, the effects of micro steel fiber on concrete is being studied and the following conclusions are drawn based on the test result.

- Addition of micro steel fiber of M40 grade concrete were increased compressive strength by 33% when compare to the nominal concrete.
- The compressive strength of concrete is increased with increase of micro steel fiber percentage up to 2.5%.The compressive strength is reduced beyond the 2.5% of micro steel fiber in the specimen at 28 days.
- The maximum compressive strength of specimen 65.6 Mpa is obtained at 2.5% of micro steel fiber.

VI. REFERENCES:

- 1) Khelan parikh et al, "Effects of micro steel fiber on compressive strength of concrete containing silica fume" Indian journal of applied research, volume 3 issue 5 may 2013.
- 2) Vikrant Vairagade, Kavita S. Kene, Dr. N. V. Deshpande, Investigation Of Steel Fiber Reinforced Concrete On Compressive And Tensile Strength International Journal of Engineering Research & Technology pp 1-7Vol. 1 Issue 3 May – 2012.
- 3) KhadakeKonapure C.G An Experimental Study Of Steel Fiber Reinforced Concrete With Fly Ash For M35 Grade International Journal of Engineering Research and Applications (IJERA) pp 950-954 Vol. 3, Issue 1 January -February 2013.
- 4) IS 10262:2009 Code for mix design of concrete.
- 5) IS 456:2000 Code for reinforced concrete design.