Comparative Study on GFRS and SFRC

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Abstract— Fibers are generally used to strengthening and also to crack resistance of concrete. In this project work, I am going to carry out test on the steel fiber and glass fiber to check the influence of fiber strength of concrete. According various research papers, it has been found that only study on steel fiber or glass fiber but not show which is most useful. Due to this experimental project work carry out. Present day various fiber are used in construction for various purpose. This research should provide optimum % fiber addition in concrete. In general construction steel reinforcement are used but we can also add some % fiber in concrete for Additional strength and less crack development. This experimental study show the comparative of steel fiber and glass fiber strength with various % fiber used in concrete.

Keywords: Steel Fiber, Glass Fiber, M20 Concrete, Compressive Strength, Flexural Strength

I. INTRODUCTION

Now day Construction industry growing with new advance technology and also with new material like various fiber. The concept of using fibers as reinforcement is not new. Fibers have been used as reinforcement since ancient times. Now present day some fibers are used mostly like glass fiber steel fibers. Various type of steel fiber available in market e.g 0.75 mm 0.6 mm Dia 30 mm and 50 mm length.i have used dramix steel fiber and glass fiber chopped type.

Steel fiber and glass fiber are main contain of my project work. they are mixed in M 20 Grade concrete in various % i.e 0.33 %, .66%, 1% . FRC composite properties, such as crack resistance, reinforcement and increase in toughness are dependent on the mechanical properties of the fiber, bonding properties of the fiber and matrix, as well as the quantity and distribution within the matrix of the fibers.

II. MATERIAL USED

A. Cement

The most common cement used is an Ordinary Portland Cement (OPC). The Ordinary Portland Cement of 53 grade (Birla OPC) conforming to IS: 8112-1989 is used. The cement has uniform colour i.e. grey with a light greenish shade and was free from any hard lumps.

B. Fine Aggregates

Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy. One of the most important factors for producing workable concrete is good gradation of aggregates. The material which passes through BIS test sieve no. 480 is termed as fine aggregate. Usually natural sand is used as a fine aggregate, at places where natural sand is not available crushed stone is used as a fine aggregate. The sand used for the experimental work was locally procured and conformed to grading zone III.

C. Coarse Aggregates

The fractions from 80 mm to 4.75 mm are termed as coarse aggregate. The material which is retained on BIS test sieve no. 480 is termed as a coarse aggregate. The broken stone is generally used as a coarse aggregate. The nature of work decides the maximum size of the coarse aggregate. Locally available coarse aggregate having maximum size of 20 mm was used in the present work.

D. Potable Water

Water is an important ingredient of concrete as it actually participates in the chemical reaction with cement. Since it helps to from the strength giving cement gel, the quantity and quality of water is required to be looked into very carefully. In present work tap water is used for both mixing and curing.

E. Steel Fiber

Steel fiber are used as reinforced material in concrete .the steel fiber of dramix brand avail in market of hooked end. The steel fiber are added in concrete with proportioned (by weight) in 0.33 %, .66%,1%.

F. Glass Fiber

Glass fiber are used as reinforced material in concrete. the glass fiber are used chopped type. The Glass fiber are added in concrete with proportioned (by weigth) in 0.33 %, .66%, 1%.

III. EXPERIMENTAL PROGRAM

To carry out testing of compressive test, flexural test following method are used.

A. Mixing

Mixing of predefined material cement, fine aggregate, coarse aggregate in mechanical mixer. All materials should be thoroughly mixed, for (2- 3) minutes, before adding the fibres. After mixing fibre, mixing continue for 1 minute.

Fig. 1: Weighing for mixing

Fig. 2: Mixing

B. Casting

After mixing done properly fresh concrete pour in cubes and specimens of Flexural strength. The size of specimens is 150 mm X 150 mm X 700mm for flexural. For compressive test used cube of 150 mm X 150mm X150mm. all cube and specimens are compact properly by manually or using tamping rod.

Fig. 3: Casting

C. Curing

After casting done properly mould are open / Deshuttering after 24 Hrs. then all cube and Specimen are cure for 7 Day and 28 days in curing tank.

D. Testing

After curing done specimens are remove from curing tank and allow for dry and then carry out test of Compressive and flexural strength for 7 day and 28 days.

Fig. 4: Flexural Strength

Fig. 5: Compressive Strength

IV. RESULT

Compressive Strength Test							
Glass fiber				Steel fiber			
Cube No	Compressive Strength (N/mm^2)	Average Strength (N/mm^2)	Fiber %	Cube No	Compressive Strength (N/mm^2)	Average Strength (N/mm^2)	Fiber %
1	16	15.8	0.33 %	1	13.64	11.03	0.33%
2	16.8			2	8.747		
3	14.6			3	10.702		
4	15	14.73	0.66%	4	20.647	19.49	0.66%
5	12.4			5	18.744		
6	16.8			6	19.084		
7	15.6	14.63	1%	7	19.22	17.64	1%
8	13.2			8	15.8		
9	15.1			9	17.887		

Table 1: Compressive Strength Test on 7 Days

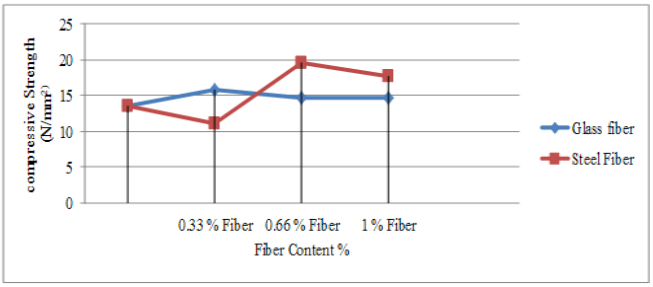

Fig. 6.: Graphical Represntation of 7 days Compressive Strength Test

A. Flexural Strength on 7 Day:

7 Day Flexural Strength Test					
Glass Fiber			Steel Fiber		
Specimen No	Average Flexural Strength	Fiber %	Specimen No	Average Flexural Strength	Fiber %
1	32.64	0.33 %	1	31.19	0.33 %
2			2		
3			3		
4	34.56	0.66 %	4	38.66	0.66 %
5			5		
6			6		
7	35.32	1%	7	41.93	1%
8			8		
9			9		

Table 2: Table 2. Flexural Strength Test on 7 Days

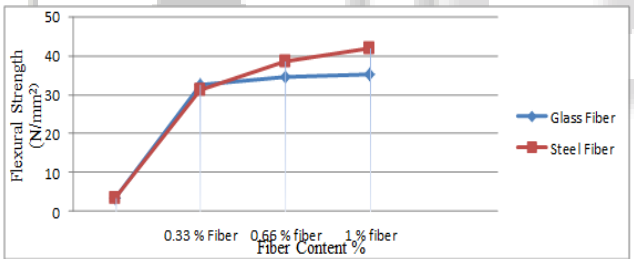

Fig. 7: Graphical Represntation of 7 days Flexural Strength Test

B. Compressive strength on 28 day:

Compressive Strength Test							
Glass fiber				Steel fiber			
Cube No	Compressive Strength (N/mm²)	Average Strength	Fiber %	Cube No	Compressive Strength (N/mm²)	Average Strength	Fiber %
1	22.76	22	0.33 %	1	31.31	31.18	0.33%
2	21.76			2	35.51		
3	21.50			3	26.87		
4	22.54	24.43	0.66%	4	32.52	32.85	0.66%
5	24.12			5	31.40		
6	26.63			6	34.62		
7	26.51	23.60	1%	7	35.74	32.11	1%
8	24.12			8	29.17		
9	20.17			9	34.43		

Table 3: Compressive Strength Test on 28 Days

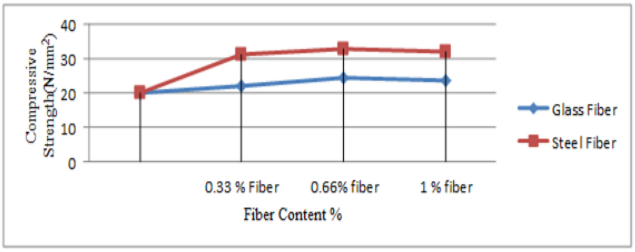

Fig. 8: Graphical Represntation of 28 days Compressive Strength Test

C. Flexural strength on 28 day:

Flexural Strength Test							
Glass fiber				Steel fiber			
Specimen No	Flexural Strength (N/mm²)	Average Strength	Fiber %	Specimen No	Flexural Strength (N/mm²)	Average Strength	Fiber %
1	32.07	32.55	0.33 %	1	37.52	39.19	0.33%
2	33.04			2	40.62		
3	32.55			3	39.42		
4	37.00	35.23	0.66%	4	44.59	43.76	0.66%
5	35.04			5	41.62		
6	33.64			6	45.08		
7	31.23	35.13	1%	7	45.73	49.89	1%
8	38.77			8	50.59		
9	35.38			9	53.35		

Table 4. Flexural Strength Test on 28 Days

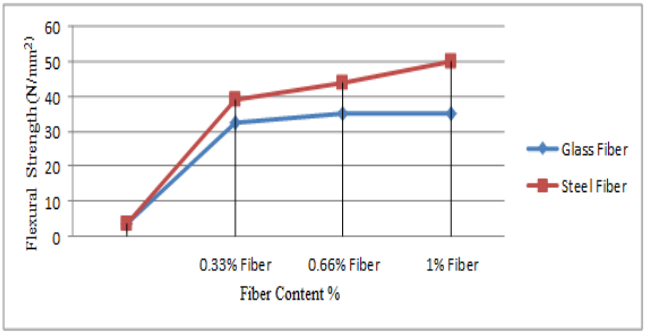

Fig. 9: Graphical Representation of 28 days Compressive Strength Test

V. CONCLUSION

1) To Core objective of the research was to investigate the effect of Glass Fiber and Steel fiber on the properties of Concrete. The investigation discovered Increase the compressive strength and also flexural strength.
2) Up to 0.66 % steel or Glass Fiber added in concrete was found increase compressive and flexural strength

3) Nominal quantity of Glass or Steel Fiber added give best strength.
4) As per result percentage of steel fiber up to 0.66% increase compressive strength but after increase % of fiber compressive strength decrease.
5) As per result percentage of Steel fiber increase Flexural strength are also increase.
6) As per result percentage of Glass fiber up to 0.66% increase Flexural strength but after increase % of fiber Flexural strength decrease.

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