EXPERIMENTAL STUDY ON SHEAR STRENGTH OF STEEL FIBER REINFORCED CONCRETE BEAM

S.Karuppasamy , J.Sandhya Tharini

Assistant Professor, Civil Engineering, Prathyusha Engineering College, Tamilnadu, India

M.E Structural Student , Civil Engineering , Prathyusha Engineering College, Tamilnadu, India

ABSTRACT

This paper presents the results of shear or flexure tests on steel fiber reinforced concrete beams. In addition to analyzing the influence of fibers on the structural performance in situations of different ratios of shear reinforcement . The test on mechanical properties of concrete i.e compressive , tensile, flexural and shear strength being carried out, even the study of effect of higher temperature on concrete is conducted for 7, 14 and 28 days of cured specimen for both the fiber reinforced and the conventional concrete. Coarse aggregate were chosen, having a particle size mainly between 12 mm and 20 mm. In order to prevent early age cracking , additional internal curing water will be provided by SAP. The main alterations results from the use of fibers were increased shear strength, stiffness and ductility other parameters used in analyzing performance were the properties of the hardened concrete (compressive strength, tensile strength, and flexural strength.

Keyword : *steel fiber , compressive strength, tensile strength, flexural strength*

1.INTRODUCTION

Concrete is a versatile material for civil engineering construction. It has ability to get cast in any form and shape. All basic ingredients of concrete are natural origin. But the properties of concrete can be change by adding some special natural or artificial ingredients. The concrete has many advantageous properties such as good compressive strength, durability, impermeability, specific gravity and fire resistance. However the concrete has some bitter properties, like- weak in tension, brittleness, less resistance to cracking, lower impact strength, heavy weight, etc. Some remedial measures can be taken to minimize these bitter properties of concrete. The some of the bitter properties of concrete are due to micro cracks at mortar aggregate interface. To overcome this, the fibers can be added as one of the ingredients of concrete.

1.1 Methodology

- Review of literature
- Material selection
- Material collection
- Material testing
- Mix design
- Experimental testing
- Results and discussion

- Conclusion

1.2 Material Test

Material test for cement and coarse aggregate has been tested according to according to the IS codal provisions. Several test are carried out for coarse aggregate and cement are such as standard consistency of cement, Initial Setting Time, Final Setting time of cement and for coarse aggregate such as abrasion test, Impact value test , specific gravity of coarse aggregate and fineness modulus etc. The above given test results are mentioned in Table 1 .

TABLE 1 MATERIAL TEST RESULTS

S.NO	TEST	RESULT
1	Standard Consistency of Cement	30%
2	Initial Setting Time of Cement	55
3	Final Setting Time of Cement	258
4	Specific Gravity	3.15
5	Impact Value	9.56
6	Fineness Modulus	7.04

2. COMPRESSION STRENGTH TEST

For compressive strength test, cube specimens of dimensions 150 x 150 x 150 mm were cast for M40 grade of concrete. After 24 hours the specimens were demoulded and were transferred to curing tank where in they were allowed to cure for 28 days. The failure load was noted. In each category three cubes were tested and their average value is reported. The compressive strength was calculated as follows.

Compressive strength (MPa) = Failure load / cross sectional area

GRADE OF CONCRETE	DAYS OF CURING	COMPRESSIVE STRENGTH (N/mm^2)		
VOLUME OF STEEL FIBRES		0.5 %	1%	1.5%
M4O	7 days	46.67	54.27	59.73
	14 days	52.2	60.5	70.2
	28 days	60.8	68.59	75.64

TABLE 2 COMPRESSIVE STRENGTH OF CONCRETE

2.1 Split Tensile Test

For Split tensile strength test, cylinder specimens of dimension 150 mm diameter and 300 mm length were cast. The specimens were demoulded after 24 hours of casting and were transferred to curing tank where in they were allowed to cure for 28 days. These specimens were tested under compression testing machine. In each category three cylinders were tested and their average value is reported. Split Tensile strength was calculated as follows as split tensile strength:

Split Tensile strength (MPa) = 2P / π DL,

Where, P = failure load,
D = diameter of cylinder,
L = length of cylinder

GRADE OF CONCRETE	DAYS OF CURING	COMPRESSIVE STRENGTH (N/mm^2)		
VOLUME OF FIBRES		0.5 %	1%	1.5%
M40	7 days	5.73	6.36	7.47
	14 days	6.56	7.51	8.2
	28 days	7.4	8.2	9.3

TABLE 3 TENSILE STRENGTH OF CONCRETE

2.2 Flexural Strength Test

To determine the flexural strength of concrete, which comes into play when a road slab with inadequate sub-grade support is subjected to wheel loads and/ or there are volume changes due to temporary shrinking.

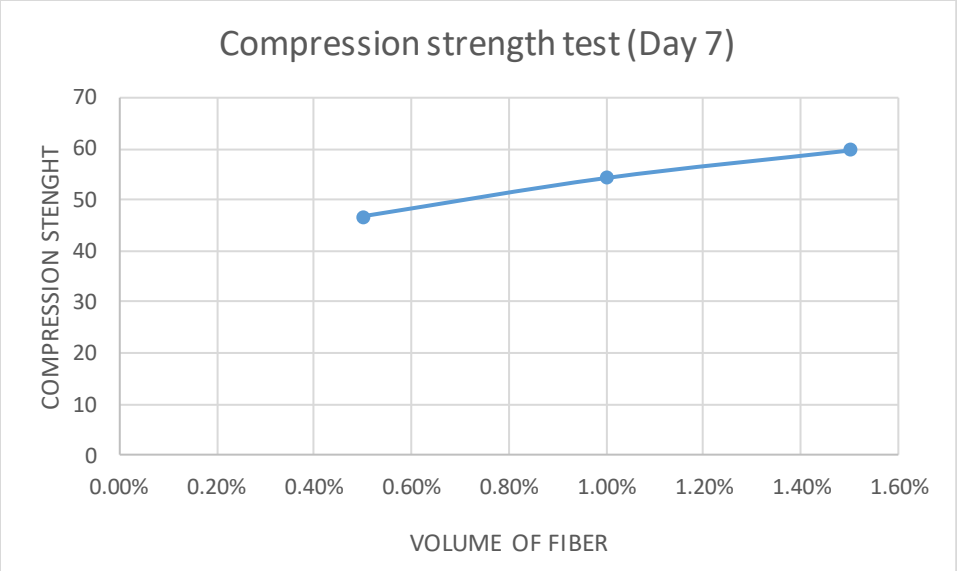
GRADE OF CONCRETE	DAYS OF CURING	COMPRESSIVE STRENGTH (N/mm^2)		
VOLUME OF FIBRES		0.5%	1%	1.5%
M40	7 days	6.6	7.1	8.6
	14 days	7.4	8.5	9.4
	28 days	8.2	9.24	10.5

TABLE 4 FLEXURAL STRENGTH OF CONCRETE

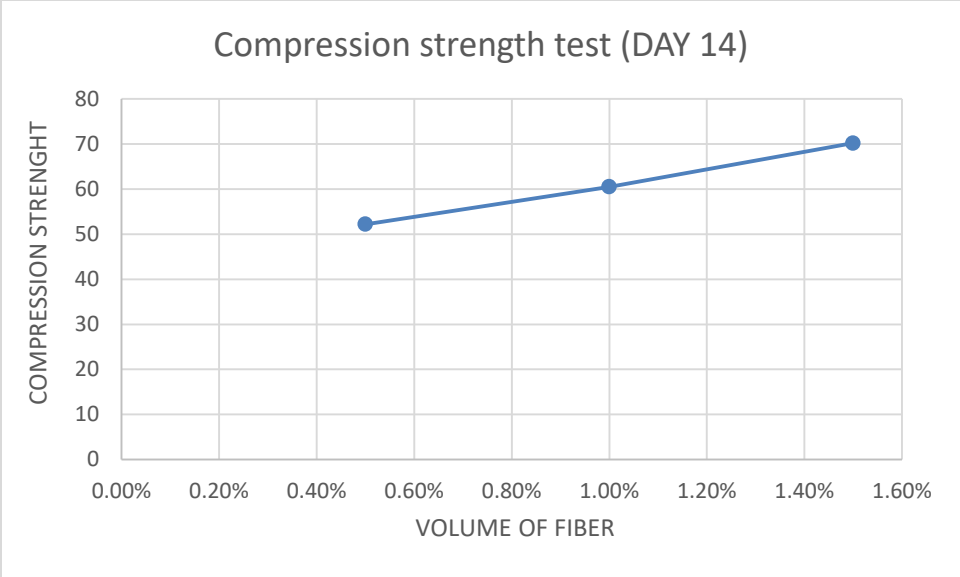
3. EXPERIMENTAL RESULTS

COMPRESSIVE STRENGTH RESULTS

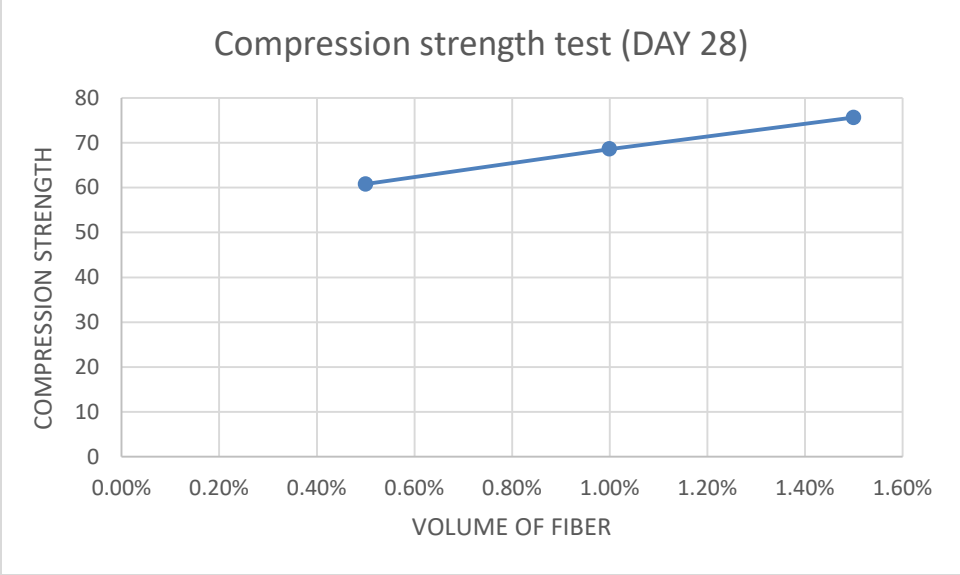
Compressive strength test for 7 days



GRAPH 1 Compressive test for 7 days

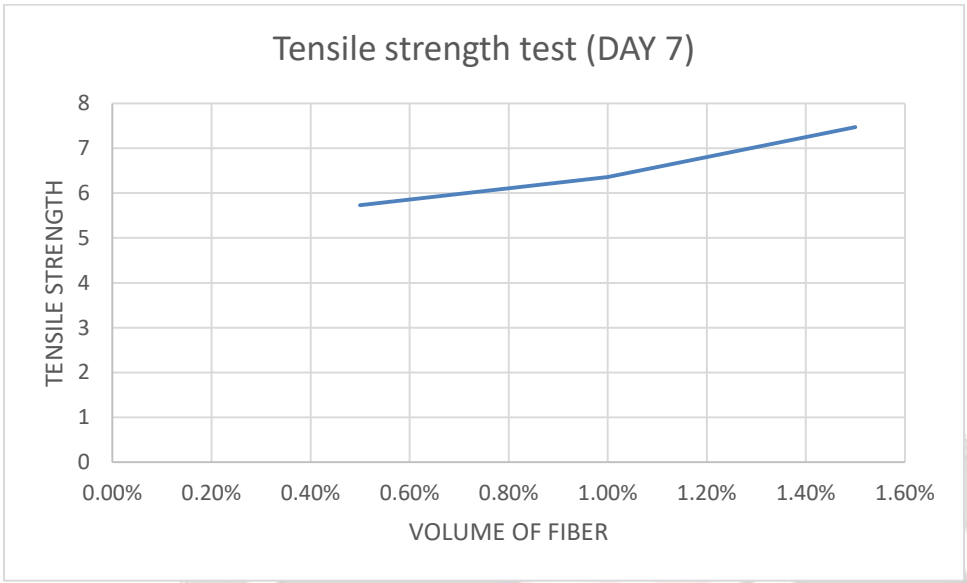


GRAPH 2 Compressive test for 14 days

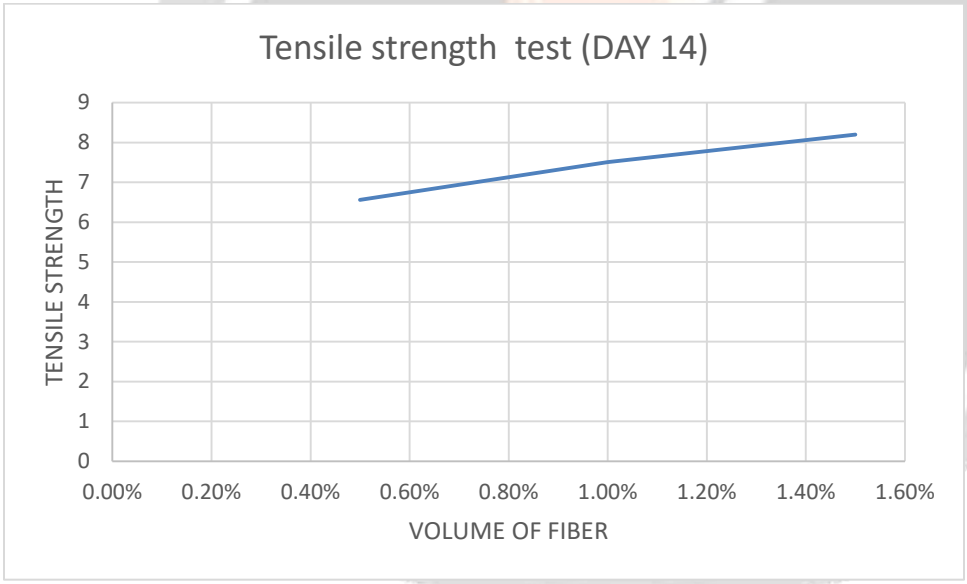


GRAPH 3 Compressive test for 28 days

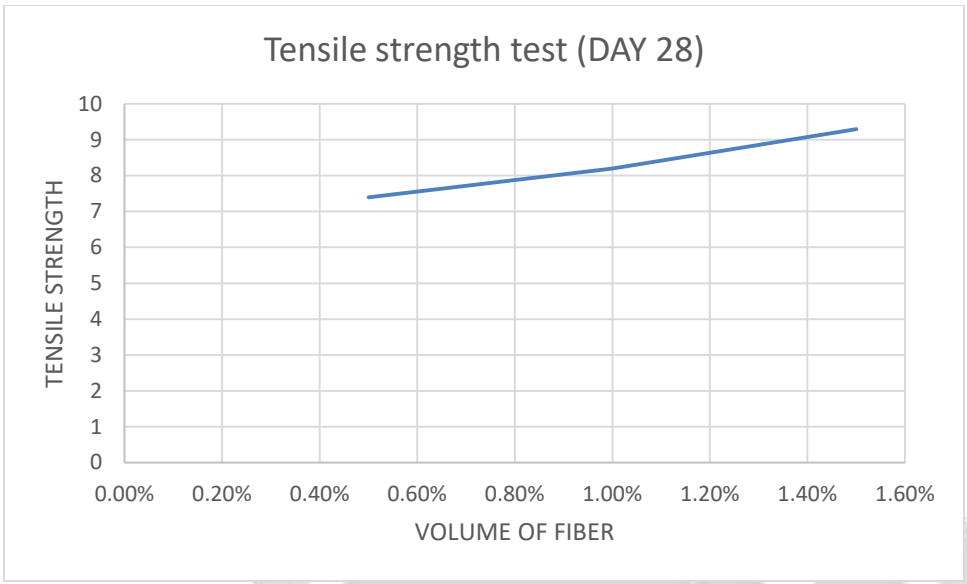
TENSILE STRENGTH RESULTS



GRAPH 4 Tensile strength for 7 days

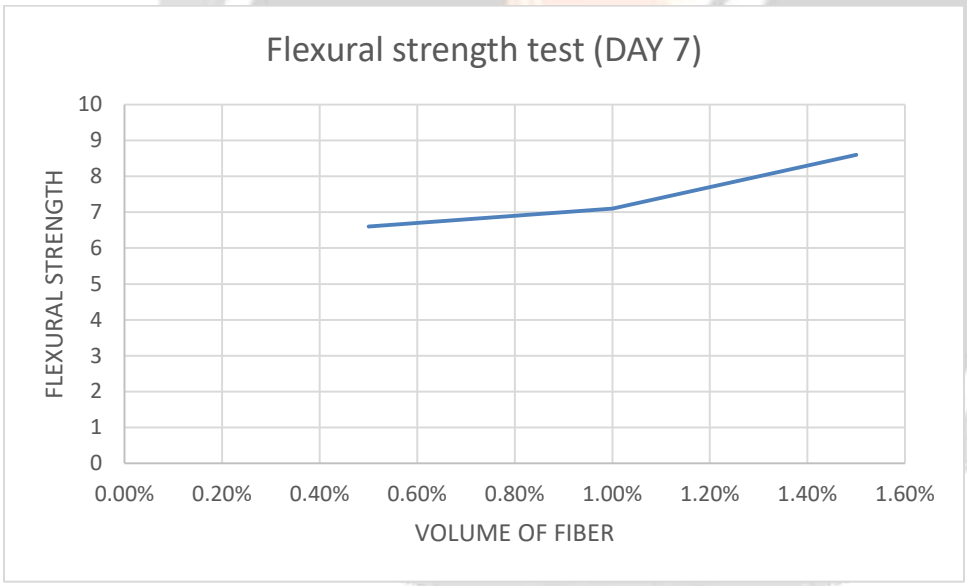


GRAPH 5 Tensile strength for 14 days

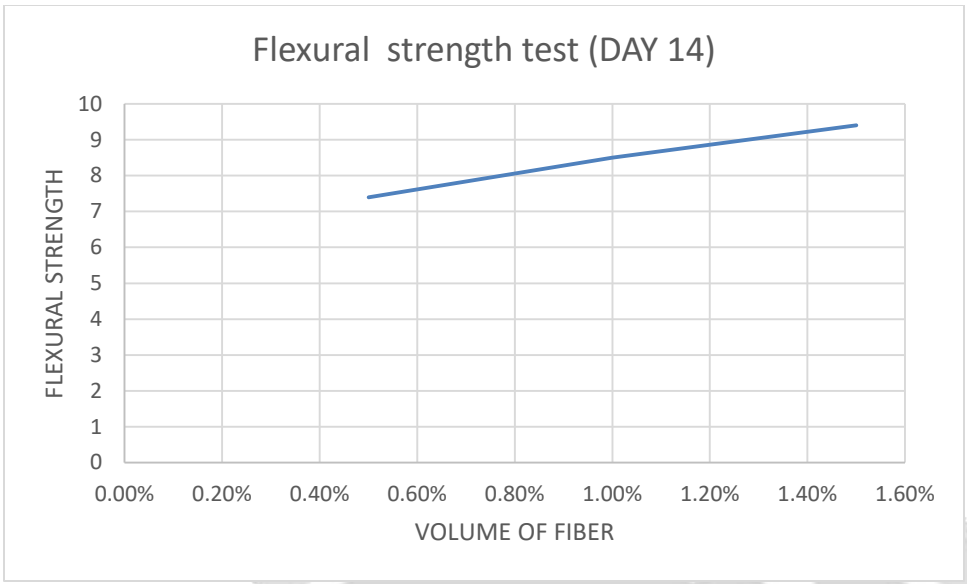


GRAPH 6 Tensile strength for 28 days

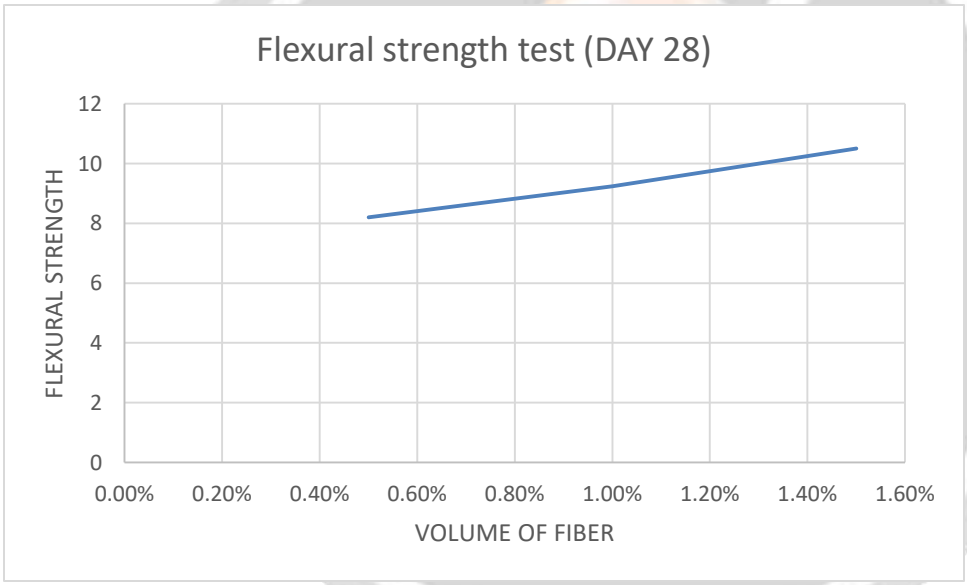
FLEXURAL STRENGTH RESULTS



GRAPH 7 Flexural strength for 7 days



GRAPH 8 Flexure strength for 14 days



GRAPH 9 Flexure strength for 28 days

3.1 ANALYSIS

As per IS codal provision , tests like compression test, Split tensile test and Flexural test are successfully carried out and the strength is also achieved by adding different proportions of steel fibre.

Several literature review has been studied according to that varying proportion of steel fiber is added and result is also achieved. Test results are mentioned in graph1 , graph 2 , graph 3, graph 4, graph 5, graph 6 , graph 7, graph 8 , graph 9 the results are properly measured and measured.

4.CONCLUSION

The present Experimental investigation was used to study the Compression and flexural strength of Fly ash concrete with steel fibers with the three proportion. Steel fibers of different aspect. From the experimental investigation it was found out . The addition of steel fiber into the concrete significantly increases the strength properties of concrete. From the experiments conducted it was found out that optimum content of fly ash with trail 3

As the aspect ratio increases flexural strength of concrete also increases. Flexural strength can be increased to 60% to 70% with the addition of steel fibers with fly ash. It is concluded that cement in concrete can be replaced up to 20% to 30% by fly ash with incorporation of steel fibres, to improve its compression and flexural strength characteristics.

5. REFERENCES

[1] Falah A. Almottiri," Physical properties of steel fiber reinforced cement composites with fly ash", Jordan Journal of Civil Engineering (Vol 5), 2011.

[2] Shende.A.M. Pande.A.M. "Comparative study on steel fiber reinforced cum control concrete under flexural and deflection.", International Journal on Applied Engineering and Research, 2011.

[3] Khadake S.N., KonapureC.G,"An investigation of steel fiber reinforced concrete with fly ash", International Journal on Civil and Mechanical Engineering, 2012.

[4] Shende.A.M. Pande.A.M. "Experimental Study on Steel Fiber Reinforced Concrete for M-40 Grade", International Refereed Journal of Engineering and Science (Vol 1), 2012.

[5] Prof. Jayeshkumar Pitroda.et.al, "Experimental investigations on partial replacement of cement with fly ash in design mix concrete", International Journal of Advanced Engineering Technology (Vol3), 2012.

[6] Yu-Chen Ou.et.al, "Compressive behavior of steel fiber reinforced concrete with a high reinforcing index", ASCE, 2012.

[7] Khadake S.N., Konapure C.G, "An experimental study on steel fiber reinforced concrete with fly ash for M35 grade." IJERA (Vol 3), 2013.

[8] K.Ramesh.et.al.,"Experimental investigation on mechanical properties of fly ash concrete and fly ash fiber reinforced concrete", IJERA (Vol 3), 2013.

[9] Amit Rana, "Some studies on steel fiber reinforced concrete", IJETAE (Vol 3), 2013.

[10] R. Madheswaran, "Experimental study on hardened concrete by using steel fibers with mineral admixture", IJCIET (Vol 5), 2014.