Strength Characteristics of Glass Fibre Concrete

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Abstract – Effects of using fibre have been increasing due to its excellent performance in concrete. Glass fibre plays an eminent role in construction industry. Ordinary concrete has certain constraints to achieve strength more than M40 and due to rate of hydration cracks develop. Massive growth of construction industry needs special concrete such as glass fibre concrete. To overcome these problems in this work Glass fibre were added to concrete the percentage varied from 0% to 0.3%. Mix design for M40 Grade of concrete was done as per IS 10262:2009,Strength test such as compression strength test, split tensile strength and flexural strength test were done, addition of 0.3% showed good strength when compared to other two combination.

Index Terms – Class, Fibre, Concrete, Compression.

1. INTRODUCTION

Concrete possess low ductility and limited strength even micro cracks develop before starting work. Fiber matrix plays a vital role in eliminating these problems.

Fibre reinforced concrete is a composite material consists of Portland cement, aggregate and fibres. Fibres have good ductility, toughness, elongation and fracture resistance property. Glass fibres have numerous advantages and application. Advantages of glass fiber are high thermal resistance, good sound insulation, good heat resistance, corrosion resistance, high tensile strength,etc. Application of glass fiber Applications of include swimming pools, hot tubs, septic tanks, water tanks, roofing, pipes, cladding, casts, surfboards, and external door skins. Contribution of glass fiber to the construction industry is high due to its tensile strength.

Glass fiber has excellent physical properties such as high tensile strength youngs modulus, shearstrength, etc. Apart from strength properties it has good durability properties**.** The following point is considered as an objective of this work. To study the strength characteristics of fibre reinforced concrete members.

2. MATERIALS

CEMENT

Cement is the most important ingredient in concrete. For this work OPC 43 Grade was used. Specific gravity was found to be 3.15

COARSE AGGREGATES

Aggregates are important constituents of concrete. It gives a structure to the concrete and reduces shrinkage. Aggregate occupy 70 to 80 percent of volume of the concrete. Size of aggregate used in this work is 20mm

FINE AGGREGATE

For this present investigation, river sand was used as fine aggregate. The sand was washed and screened at site to remove deleterious materials and tested as per the procedure given in BIS: 2386-1968

WATER

Water confirming to the requirements of BIS: 456-2000 is found to be suitable for making high strength concrete. It is generally stated that water fit for drinking is fit for making concrete

GLASS FIBRE

Glass fibres from local industry is procured and used in this work. Specific gravity was found to be 2.9. M40 Grade of concrete was done in ratio 1:1.65:2.92 with water cement ratio 0.38.

3. EXPERIMENTAL INVESTIGATIONS

COMPRESSIVE STRENGTH TEST

The cube compressive strength results at the various ages such as 7 days and 28 days for different addition levels such as 0%, 0.20%, 0.30%

For cube compression testing of concrete, 150mmX150mmx150mm cubes were casted. All the cubes were tested in saturated condition, once wiping out the surface moisture. For each mix combination, three cubes were tested at the age of 7 days and 28 days of curing as per IS Code. Glass fibre results were shown in Table 1. 28 days compression strength difference are shown in fig 1

Table 1 Compressive Strength of GFRC at 7 and 28 days

PERCENTAGE OF GLASS FIBRE	AVERAGE COMPRESSIVE STRENGTH IN N/mm²	
	@7 DAYS	@28 DAYS
0	33.36	48.42
0.20	33.77	49.86
0.30	35.44	52.13

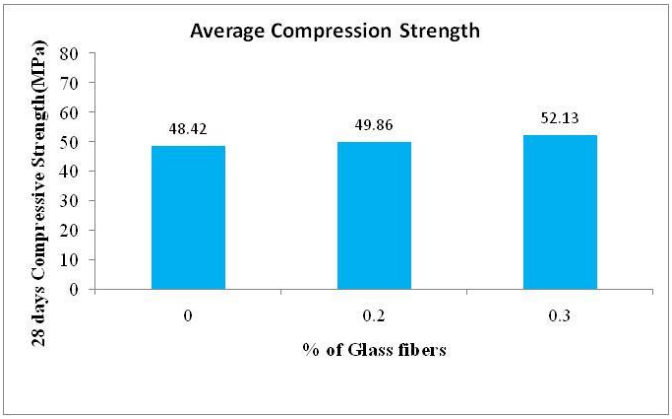

Fig 1 shows compression strength after 28days curing

SPLIT TENSILE STRENGTH TEST

This is an indirect test to determine the tensile strength of cylindrical specimens. Tests for Splitting tensile strength were carried out on cylinder specimens of size 150 mm diameter and 300 mm length confirming to IS 10086:1982 at the age of 28 days curing as per IS Code. Split tensile strength results were tabulated in Table 2. 28 days tensile strength difference are shown in fig 2

Table 2 Split Tensile Strength of GFRC At 7 and 28 days

PERCENTAGE OF GLASS FIBRES	AVERAGE SPLIT TENSILE STRENGTH OF GFRC AT 7 DAYS (N/mm²)	AVERAGE SPLIT TENSILE STRENGTH OF GFRC AT 28 DAYS (N/mm²)
0	2.65	4.05
0.20	2.83	4.26
0.30	2.98	4.56

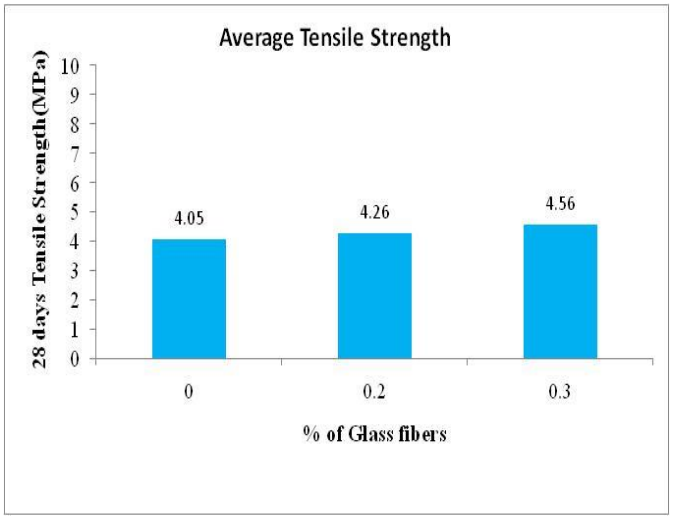

Fig 2 shows Tensile strength after 28days curing

FLEXURAL STRENGTH TEST

Prism of size 150mmx150mmx700mm were cast as per IS 516:1959 and cured for 7 days and 28 days respectively .Three point loading was done, results were tabulated in Table 3. 28 days Flexural strength difference are shown in fig 3

Table 3 Flexural Strength of GFRC at 7 and 28 days

PERCENTAGE OF GLASS FIBRES	AVERAGE FLEXURAL STRENGTH OF GFRC AT 7 DAYS (N/mm²)	AVERAGE FLEXURAL STRENGTH OF GFRC AT 28 DAYS (N/mm²)
0	4.22	6.32
0.20	5.17	7.96
0.30	5.80	8.97

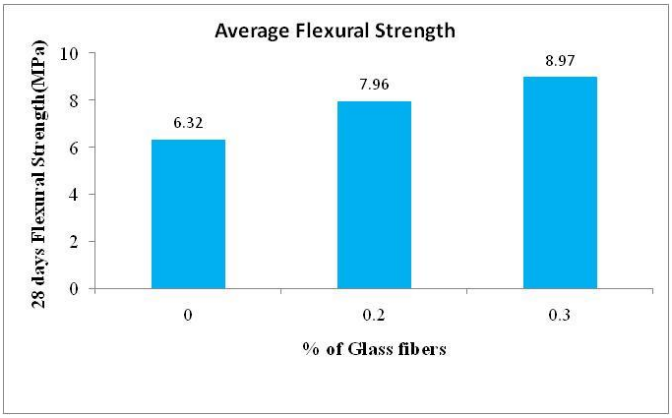

Fig 3 shows Flexural strength after 28days curing

4. CONCLUSION

Based on the experimental results by using fibres, namely glass the following conclusions are drawn.

1. Glass fiber increases the strength property of concrete
2. Volume of fiber for 0.3% addition gives more strength than 0.2% and control concrete
3. Using of glass fiber is eco friendly and gives more ductile strength
4. 0.2% addition of glass fiber gives more strength than control concrete
5. Compression strength, tensile strength and flexural strength was found to be excellent for 0.3% addition of glass fiber both for 7days and 28 days curing.

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