International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 4 Issue 3, April 2020 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Experimental Investigation on Strength of High Performance Concrete using Glass Fiber to Design a Beam

J. Sindhiya[1], K. Soundhirarajan[2]

[1]M.E Structural Engineering, [2]Head of Department of Civil Engineering,
[1,2]Gnanamani College of Engineering, Namakkal, Tamil Nadu, India

ABSTRACT

The present find out about is an experimental investigation performed on concrete composites of M35 using glass fibres, fantastic proper for marine and hydraulic structures. The measures adopted include lowering the water-cement ratio via the usage of of glass fibre preventing corrosion and holding the composite collectively against freezing and thawing. Fibres when introduced in certain share in the concrete improve the stress properties, crack resistance, ductility, flexure strength and sturdiness of simple concrete. anti crack, high dispersion, alkali resistance glass fiber have been employed in percentages various as, 0%, 10%,and 15 share with the aid of quantity of concrete. The power and durability residences of this composite, at 7 days and 28 days curing, in terms of residences like compressive strength, flexure strength and cut up tensile power and additionally Rcc beam had been designed and tested were studied.

How to cite this paper: J. Sindhiya | K. Soundhirarajan "Experimental Investigation on Strength of High Performance Concrete using Glass Fiber to Design a Beam" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-3, April 2020, pp.627-629, URL: www.ijtsrd.com/papers/ijtsrd30626.pdf

IJTSRD30626

1. INTRODUCTION

Fiber Reinforced Concrete is a composite fabric consisting of a matrix containing a random distribution or dispersion of small fibres, having a excessive tensile strength. Glass fibers weight is tons lighter than when metal is used in concrete. Good freeze-thaw resistance helps guard varying climatic stipulations at marine environments in very cold countries. Conventional concrete has the trait recognised as "brittle failure" because it has a semi- crystalline structure, which tends to shatter on impact. The glass fiber tends to preserve the fabric collectively due to the fact the fibers are dispersed randomly and lay in all instructions inside the cloth matrix. GFRC has a dramatically decreased ballistic debris profile. In this find out about , it is determined to experiment find out the sturdiness of the Glass Fibre Reinforced Concrete made using Cement for assessing its suitability for Marine and Hydraulic Constructions.

1.1. USES OF GLASS FIBERS

The glass fibers used in concrete suppressed the localization of micro cracks in to macro cracks hence tensile energy increase.

- It improves sturdiness of concrete by increasing the electricity of concrete.
- The Glass Fibers are of Cem-FIL Anti - Crack HD with modulus of elasticity 72 GPa.

The materials to be used for the experimental study are detailed as follows.

1. cement
2. fine aggregates
3. coarse aggregates
4. water & glass fibres

2. SCOPE AND OBJECTIVE

A. Objective

- To study the properties of glass fibre.
- To find out about the harden residences of concrete, in which the glass fibres are delivered in exceptional share to total weight of cement (0%,10%,15%) and 4% of glass fiber is used constantly in all mix of concrete, then the following test are to be conducted.
- Compressive Strength of concrete.
- Split tensile test of concrete.
- Flexural electricity of concrete.
- Compare the take a look at consequences with Conventional self compacting concrete.

B. Scope

Glass Fibres are typically used in concrete for the following reasons

- To manage cracking due to each plastic shrinkage and drying shrinkage.

- They additionally minimize the permeability of concrete and thus minimize bleeding of water.
- Some types of fibres also produce higher impact, abrasion and shatter resistance in concrete.
- The fineness of the fibres approves them to improve the mortar fraction of the concrete, delaying crack formation and propagation.
- This fineness also inhibits bleeding in the concrete, there by using reducing permeability and improving the floor traits of the hardened surface.

3. MATERIAL PROPERTIES

3.1. PROPERTIES OF CEMENT

It is one of the best binding materials used in civil engineering construction. It has high plastic properties. It offers high strength to masnory. It hardens is short time. It attains early setting. It is easily workable.

SL.NO	PROPERTIES	TEST RESULTS	As per IS code
1	Specific gravity	2.9	3.10-3.20
2	Normal consistency	32%	25-35%
3	Initial setting time Final setting time	20 mints 203 mints	>30 minutes should not
4	Fineness test by sieve analysis	1.9	<10%
5	Soundness test	1mm	1

Table 3.1 Physical Properties of Cement

3.2. GLASS FIBRE

The glass fiber used is alkali-resistance glass fiber which has a cut size of 12mm and a diameter of 14 microns.

Figure.3.2 Glass fibre

Physical Properties	Value
Length	12mm
Aspect ratio(l/d)	58
Specific gravity	2.68
Softening point	3.6%
Moisture	0.3% max
Electrical conductivity	Very low
Chemical resistance	Very high
Tensile strength	700 Mpa

Table 3.2 properties of glass fibre

4. EXPERIMENTAL WORKS

Concrete used to be organized by a combine proportions of M35 grade concrete. The different percentage of fibres like 0, 10, 15 were adopted in the experimental programmed. Glass fibres had been introduced in the mix by volume of concrete. The entire mix was homogeneously mixed with calculated amount of water and plasticizer. The compressive energy take a look at specimens had been of dimensions one hundred × 100 × 100mm.The split tensile electricity check specimens have been of dimensions 150mm diameter × 300mm length. These specimens were forged and tested after 7 days and 28 days of curing as per IS specification.

Figure.3.3 Casting and Curing of Specimens

S.NO	SPECIMEN	GLASS FIBER AS %	NO OF SPECIMEN		TOTAL
			7 D	28D	
1	CUBE (100mmx100mmx100mm)	0	3	3	18
		10	3	3	
		15	3	3	
2	CYLINDER (150mmx300mm)	0	3	3	18
		10	3	3	
		15	3	3	
3	PRISM (100mmx100mmx500mm)	0	3	3	18
		10	3	3	
		15	3	3	
4	RCC BEAM (700mmx100mmx100mm)	0	3	3	18
		10	3	3	
		15	3	3	

Table 3.3 Details Of Test Specimens

4.1. DESIGN A BEAM

The layout of beam is got from concrete RCC beam of diameter 700x100x100mm. The trying out is finished after curing for 28 days.

Figure 3.4 Testing Setup For Beam

The concrete mixes have been crammed in the beam moulds after laying the reinforcements with the required cover and compacted effectively by way of the use of damping rod. The beams dimensions 700mm x 100mm x 100mm have been casted for each layout mixes. The beam is equipped with extensometer having gauge size now not much less than 10.2 cm and not more than 1/2 the size of the specimen. On getting rid of the beam from the water and while it is nevertheless in the wet condition, the extensometers are connected at the ends, in such a way that the gauge factors are symmetrical about the centre of the specimen and in nose are nearer to either end of the specimen. The specimen

is immediately positioned in the Compression Testing Machine and precisely centered. The load is applied continually and without shock at a rate of one hundred seventy kg / sq cm / min. The extensometer readings corresponding to the load increments were noted.

5. RESULTS AND DISCUSION

5.1. COMPRESSIVE STRENGTH TEST RESULT

SI.NO	%of Fibers	Compressive Strength(N/mm²)	
		M35 Concrete	
		7 D	28D
1	0	45.05	50.33
2	10	50.11	52.10
3	15	55.85	59.69

Table.5.1 COMPRESSIVE STRENGTH OF M35

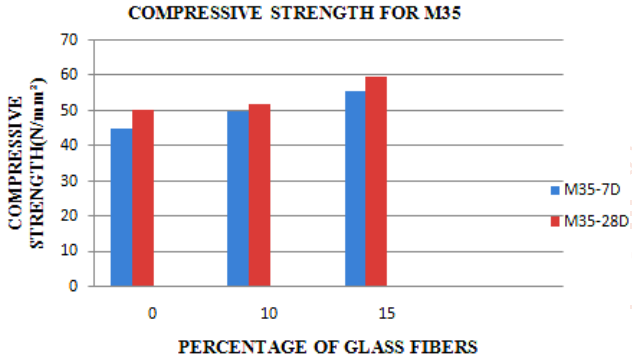

Figure 5.1 COMPRESSIVE STRENGTH TEST GRAPH

5.2. SPLIT-TENSILE STRENGTH TEST RESULTS

SI.NO	%of Fibers	Split Tensile Strength(N/mm²)	
		M35 Concrete	
		7 D	28D
1	0	2.54	3.08
2	10	2.94	3.37
3	15	3.05	3.38

Table.5.2 SPLIT TENSILE STRENGTH OF M35

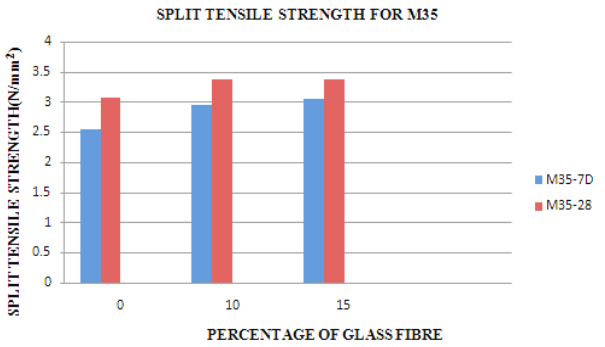

Figure.5.2 SPLIT TENSILE STRENGTH TEST GRAPH

5.3. FLEXURAL STRENGTH TEST RESULTS

SI.NO	%of Fibers	Flexural Strength (N/mm²)	
		M35 Concrete	
		7 D	28D
1	0	5.43	5.43
2	10	5.58	6.15
3	15	5.71	6.25

Table.5.3 FLEXURAL STRENGTH OF M35

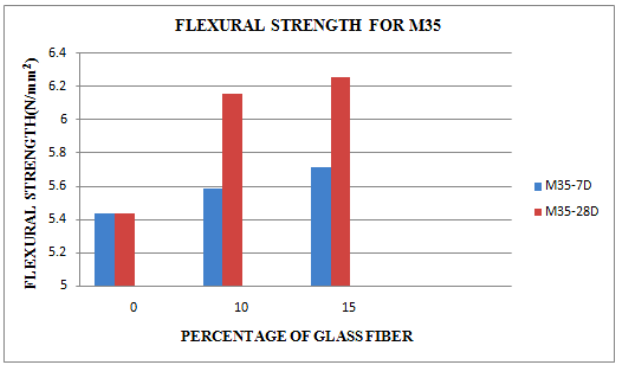

Figure5.3 FLEXURAL STRENGTH TEST GRAPH

6. CONCLUSION

In this study, it is concluded that the range of Glass Fibre Concrete made an first-rate preference for marine and hydraulic shape constructions, as compressive energy and tensile power will increase with extend in share of glass fibre with appreciate to quantity of concrete. Also since, the deterioration determined for chloride resistance is determined to be very less.

As this composite will increase tensile energy it may also limit the place of metal reinforcement required, minimizing the deterioration in marine environments and hydraulic structures. If any due to corrosion of metal reinforcements. As tensile, flexural and compressive energy will increase with extend in share of glass fibre with appreciate to quantity of concrete, marine and hydraulic structural factors can be supplied with greater concrete cowl supported through glass fiber, which makes it tough for factors that purpose deterioration to attain the floor of metal reinforcements, stopping corrosion and growing the existence of concrete in these environments.

REFERENCE

[1] Deshmukh S. H. , Bursary J. P , Zende A. M. (2012), "Effect of Glass Fibres on Ordinary Portland cement Concrete" IOSR, Journal Of Engineering, June 2012, Vol.2(6) pp: 1308-1312.

[2] Neel Shah, Dr. Indrajit, N. Patel (2013) "Tensile Strength of High Performance Concrete Using Supplementary Cementing Material and Glass Fiber", Indian Journal of Applied Research, July 2013 ,Volume 3, Issue 7, pp 257-259.

[3] Philipp Lober, Klaus Holschemacher, "Structural Glass Fiber Reinforced Concrete for Slabs on Ground", World Journal of Engineering and Technology, 2014, 2, 48- 54.

[4] Rama Mohan Rao. P, Sudarsana Rao. H, Sekar. S, "Effect of Glass Fibres fly ash based Concrete", International Journal of Civil and Structural Engineering, Volume 1, No 3, 2010, pp 606-612.

[5] "Strength and Workability Characteristics of Fly Ash Based Glass Reinforced High Performance-Concrete"(2008) by Dr. H. SudarsanaRao, International Journal of Engineering Science and Technology (IJEST), Vol.3 No. 8 August 2011, pp 6266- 6277.

[6] P. Bhuvaneshwari, (2013) "Strength characteristics of glass fiber on bottom ash based concrete", International Journal of Science, Environment and Technology, Vol.2, No 1, 2013, 90 – 102.