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A research on analysis of characteristic behavior of the M35 concrete due to addition crushed glass fibre

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ABSTRACT

Many types of research have been currently going to modify and improved the concrete properties by the addition of different types of materials. This Experimental investigation represents the Optimum use of the fibres with the concrete mixture and will help in achieving the desired results. This Experimental work shows the investigation on M35 grade due to the incorporation of glass fibres. In this Experiment, we used the glass fibres of Filament diameter 14 microns with aspect ratio 857 at various percentages like 0%,0.4%.0.8%,1.2%.1.6 by the weight of concrete on M35 grade of mix proportion (1:1.60: 2.96) with water cement ratio 0.45.

Keywords*— Concrete, GFRC, M35, Glass Fibre*

1. INTRODUCTION

It was a well stated fact that usage of concrete is most efficient in terms of zero or just little maintenance requirements. Most of the infrastructures built from concrete are set up in densely polluted urban areas, in an aggressive type of marine areas, industrial lands, and some very dangerous sub and soil water in coastal areas. Two of the features, durability and strength are considered while discussing the design formation. The relationship between durability and strength is yet another fact which is mostly adopted while designing an infrastructure. The poor and inadequate functioning of concrete (conventional), in most challenging atmospheric situations, has resulted in a need that the engineers and the researcher go for in newly formed composites of concrete. A pioneer utilization of concrete should take under consideration the area of explorations, usage of new material, shapes, and new construction techniques. Concrete is one of most commonly used material of construction, accessible in vast selection of forms which could be utilized in different construction mechanisms carrying among small and (multi-storey) buildings, dams, bridges or some huge infrastructures. The concrete technology has advanced very much with special types of cement, special additives, aggregate production, batching and mixing and placement to suit different conditions and to make the most economical concrete to suit the needs. The basic concrete comes with some imitations like the lower value of tensile strength and it easily allows strain on fracture. The reason for such low tensile strength is the presence of abundant micro cracks in the plain concrete. The micro cracks are propagated rapidly while usage which results in very low strength of the formed.

Fig. 1: Glass Fibre Reinforced Concrete

2. FUTURE SCOPE OF THE STUDY

The current research was approved to examine the nature of “’ Glass Fibre Reinforced Concrete” under compression, tension and flexure. My guide Er. Mukesh Kumar has suggested the optimum aspect ratio 857.1 of fibres and experiments were carried out for fibre content 0.4, 0.8, 1.2, 1.6 percent. it has been observed that the outcomes the fibre length, aspect-ratio and content of fibre more than 7 % has not been considered, so this can be advised that this study might be assumed to examine:

(a) Change in nature of GFRC due to fibre's facet ratio.
(b) Change in nature of GFRC due to effects of W/C ratio.
(c) To examine the nature of Triple blended Glass fibre concrete by using a mixture of minerals, for example, Flyash, micro silica and many more.
(d) To examine nature (GFC) "Glass fibre concrete" by the use of glass fibre.
(e) Change in nature of GFRC when fibre content change from 3% to 12%.
(f) GFRC's properties like tensile, compressive and flexural as well as structural changes due to change in length of fibres.
(g) Change in GFRC's durability and ductility due to the change in fibre content.

3. EXPERIMENTAL WORK

3.1 Compressive strength

According to the IS 516-1959 guidelines several specimens are used to test the compressive strength. A "Universal Testing Machine" of0capacity 100 tones are used to test these specimens which are surface dried before testing. Table 4.1 and 4.2 illustrates the GFRC and plane mortar's compressive strength for several fibre content percentages which signifies the "compressive strength" after 7 and 28 days. The "compressive strength" of plane mortar0has been obtained0as 38.76 MPa after 28 days. This strength has been obtained as 39.05 MPa, 39.34 MPa, 39.52 MPa, 40.51 MPa for 0.4, 0.8, 1.2 and 1.6 percent fibre contents respectively in the case of GFRC. It is discovered that the compressive strength of GFRC is about 1.007, 1.015, 1.02 and 1.05 times higher than the compressive strength of plane mortar as illustrated in table 1 and Plotted in figure 1.

Table 1: Compressive strength after 7 Days

Mix designation	Percentage of glass fibre	Compressive load (KN)	Compressive strength (N/mm^2)	Average compressive strength (N/mm^2)
MX0	0	545 557 568	24.22 24.75 25.24	24.73
MX1	0.4	570 554 565	25.33 24.62 25.11	25.02
MX2	0.8	562 578 556	24.98 25.68 24.71	25.12

Table 2: Compressive strength after 28 Days

Mix designation	Percentage of glass fibre	Compressive load (KN)	Compressive strength (N/mm^2)	Average compressive strength (N/mm^2)
MX0	0	868 872 876 874	38.58 38.76 38.93 38.84	38.76
MX1	0.4	878 884 877	39.02 39.29 39.42	39.05
MX2	0.8	883 886 882	39.24 39.37 39.20	39.34
MX3	1.2	892 894 915	39.64 39.73 40.67	39.52
MX4	1.6	918 922	40.80 40.98	40.82

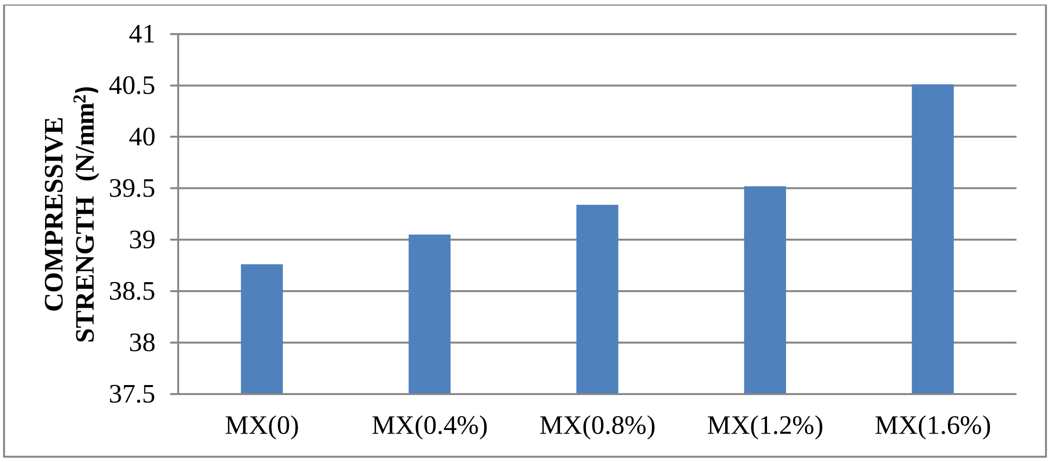

Fig. 1: Compressive strength after 28 days

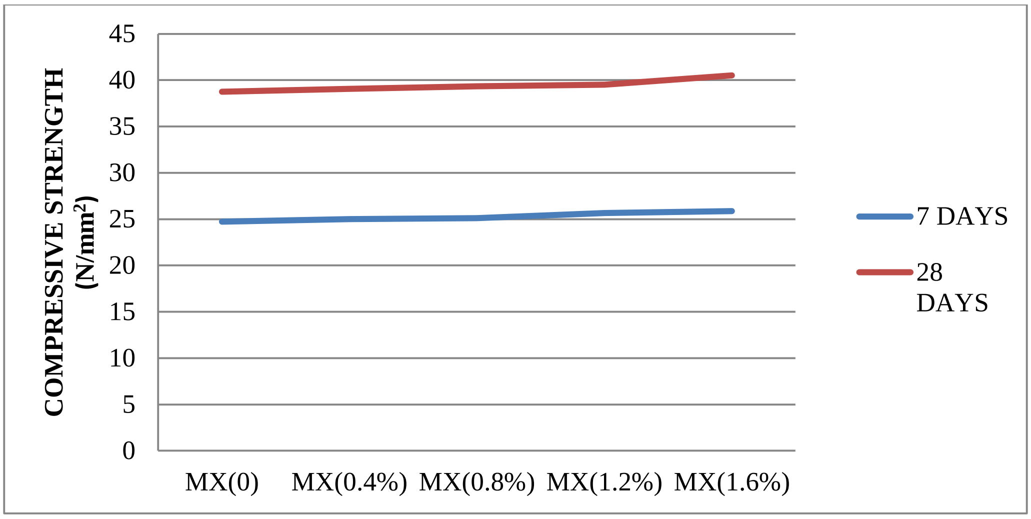

Fig. 2: Variation of compressive strength at different ages

3.2 Flexural strength

The two-point load is used for performing the beam test of 150mm×150mm×700mm for the flexural strength of GFRC and plane mortar due to the reason that supports are having lesser span. The beam's effective length is 640 mm in this flexural strength. Table 4.3 and 4.4 illustrates the GFRC and plane mortar's flexural strength for several fibre content percentages which represents the flexural strength after 7 and 28 days. The flexural Strength has been obtained as 3.76 MPa, 4.18 MPa, 4.79 MPa, 5.20 MPa and 5.75 MPa respectively for GFRC with 0, 0.4, 0.8, 1.2 and 1.6 per cent of fibre content after 28 days. It was discovered that GFRC flexural strength with 0.4, 0.8, 1.2, 1.6 per cent of fibre content is:

Table 3: Flexure strength after 7 Days

Mix designation	Percentage of glass fibre	Compressive load (KN)	Compressive strength (N/mm^2)	Average compressive strength (N/mm^2)
MX0	0	12.8 10.75	2.42 2.03	2.21
MX1	0.4	11.55 14.15 13.45	2.18 2.68 2.54	2.51
MX2	0.8	12.25 15.65 15.78	2.32 2.96 2.98	2.91
MX3	1.2	14.86 16.35 15.45 17.55	2.81 3.09 2.92 3.32	3.11
MX4	1.6	17.65 18.2 19.55	3.34 3.44 3.70	3.49

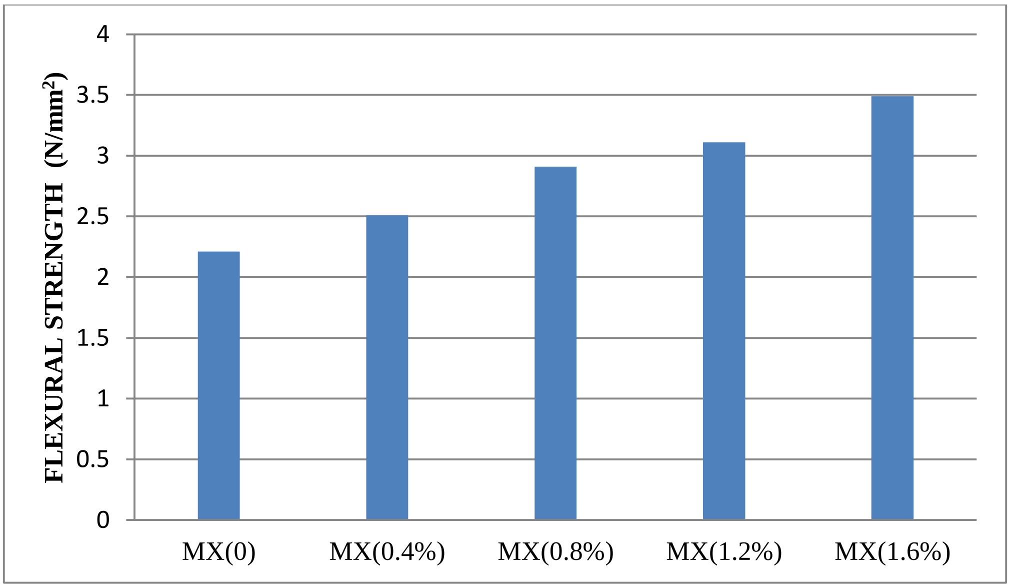

Fig. 3: Flexural strength after 7 days

Table 4: Flexure strength after 28 Days

Mix designation	Percentage of glass fibre	Compressive load (KN)	Compressive strength (N/mm^2)	Average compressive strength (N/mm^2)
MX0	0	21.50 18.45 19.75	4.07 3.49 3.74	3.76
MX1	0.4	23.75 22.15 20.35	4.50 4.19 3.85	4.19
MX2	0.8	25.10 26.60 24.25	4.75 5.03 4.59	4.79
MX3	1.2	27.40 26.20 28.80	5.19 4.96 5.45	5.20
MX4	1.6	27.90 30.55 32.65	5.28 5.78 6.18	5.75

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