



Experimental Studies On Mechanical Properties Of Glass Fibre Reinforced Concrete

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ABSTRACT

Concrete plays a vital role in construction field. As we know it is strong in compression but brittle and weak in tension. In order to overcome this problem, we generally use steel, but now day's different fibres are available in market. Glass fibre reinforced concrete (GRC) is a material made of a cementitious matrix composed of cement, sand, water and admixtures in which short length glass fibres are dispersed. Concrete has several desirable properties like high compressive strength, stiffness and durability. But by the use of alkali resistance glass fibre the above properties increase up to certain proportions. In the present experimental investigation, the glass fibre has been used to study compressive strength and tensile strength on M₂₅ grade concrete. In this study we choose four percentages of glass fibre as 0%, 0.02%, 0.06%, 1% by concrete weight.

Keywords: Tensile strength, Compressive strength, Alkali resistance glass fibre, Portland pozzolana cement.

Introduction

Plane concrete possesses very low tensile strength, limited ductility and little resistance to cracking. Internal micro cracks are inherently present in the concrete and its poor tensile strength is due to such micro cracks, eventually leading to brittle fracture. In the past to improve the tensile properties of concrete some fibres such as steel applied in concrete mixture. Addition of small closely spaced and uniformly dispersed fibres to concrete would act as crack arrester and would substantial improves its static and dynamic properties. Glass fibres used in this project are of length 20 mm length and 14 microns dia.

Depending on the type and severity of external loads, a composite laminate may exhibit gradual deterioration in properties but usually does not fail in a catastrophic manner. Mechanisms of damage development and growth in metal and composite structure are also quite different. Other important characteristics of many fibre-reinforced composites are their non-corroding behaviour, high damping capacity and low coefficients of thermal expansion.

Glass-fibre-reinforced concrete architectural panels have the general appearance of pre-cast concrete panels, but differ in several significant ways. For example, the GFRC panels, on average, weigh substantially less than pre-cast concrete panels due to their reduced thickness. Their low weight decreases load superimposed on the building's structural components making construction of the building frame more economical.

Literature

Kavita Kene, et al conducted experimental study on behaviour of steel and glass Fiber Reinforced Concrete Composites. The study conducted on Fiber Reinforced concrete with steel fibers of 0% and 0.5% volume fraction and alkali resistant glass fibers containing 0% and 25% by weight of cement of 12 mm cut length, compared the result.

[2] Yogesh Murthy, et al studied the performance of Glass Fiber Reinforced Concrete. The study revealed that the use of glass fiber in concrete not only improves the properties of concrete and a small cost cutting but also provide easy outlet to dispose the glass as environmental waste from the industry. From the study it could be revealed that the flexural strength of the beam with 1.5% glass fiber shows almost 30% increase in the strength. The reduction in slump observed with the increase in glass fiber content.

[3] Gowri and M. Angeline Mary, this study, the present trend in concrete technology is towards increasing the strength and durability of concrete to meet the demands of the modern construction world at lower cost. These factors can be achieved in concrete by adding natural or synthetic fiber. The strength parameters of concrete such as compressive strength and tensile strength were studied by varying the percentage of fiber from 0.025% to 0.075% of the weight of concrete.

[4] S. S. Pimplikar conducted an experiment as the Glass-fiber reinforced concrete (GRC) is a material made of a cementitious matrix composed of cement, sand, water and admixtures, in which short length glass fibers are dispersed.

IV. METHODOLOGY

Workability

Slump cone test is used for finding workability.

Tensile strength

Cylinder used for finding tensile strength of concrete is 150mm in dia and 300mm height. Universal testing machine is for finding the tensile strength. These cylinders tested for 7, 14 and 28 days.

Compressive strength

15*15*15 cm moulds are used for finding compressive strength. They are tested under universal testing-machine.

V.RESULTS AND DISCUSSIONS

Quantities of materials required for mix per 1 cum of ordinary concrete and glass-fibers. Grade of concrete	Cement in (kg)	Coarse aggregate(kg)	Fine aggregate(kg)	Water (kg)	w/c ratio	%of glass fiber
M25	394.32	1151.78	705.93	197.16	0.5	0% 0.02% 0.06% 1.00%

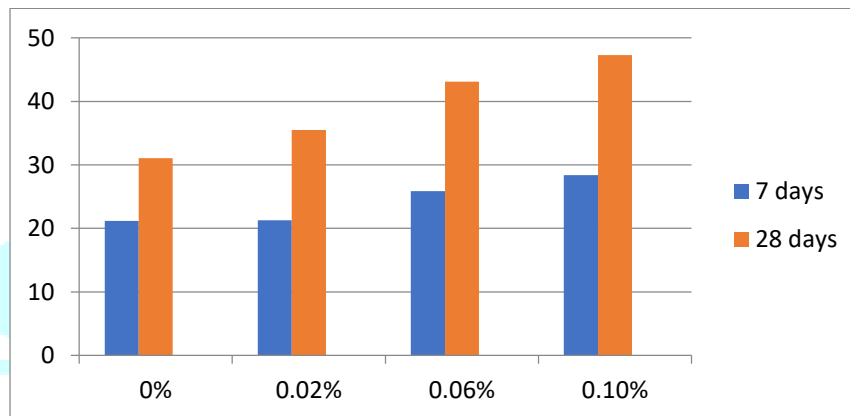
Table 2. Tensile strength of concrete for different percentages of glass fiber

Grade of concrete	Curing days	Tensile strength (N/mm ²) for 7 and 28 days	
		Without glass fiber	With glass fiber
M ₂₅	7 days	3.22	3.96
	28 days	3.90	4.52

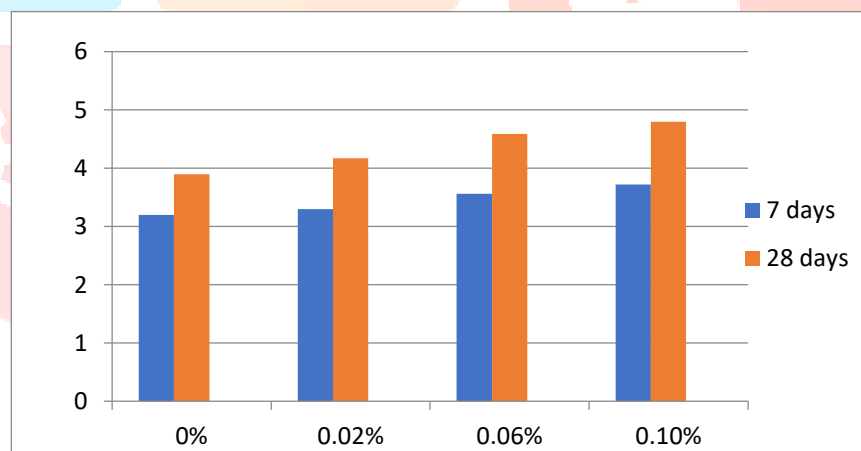
Table3. Compressive strength of concrete for different percentages of glass fibre

Grade of concrete	Curing days	Compressive strength (N/mm ²) for 7 and 28 days	
		Without glass fibre	With glass fibre
M ₂₅	7 days	21.19	32.01
	28 days	31.07	41.8

Comparison of compressive strength of normal concrete to GFRC



Comparison of tensile strength of normal concrete to GFRC for 7 and 28 day



VI.CONCLUSION

- By this experimental investigation we come to know by the addition of alkali resistance glass fibre to concrete it increases both compressive and tensile strength.
- The addition of glass fibre shows a continuous increase of compressive strength from 32.01% to 41.8% for M₂₅ grade concrete for 28 days.
- In the same manner with addition of glass fibre the tensile strength increases from 3.96% to 4.52% at 28 days for M₂₅ grade concrete.

VII. REFERENCES

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