International Journal of Civil Engineering Research.
ISSN 2278-3652 Volume 5, Number 3 (2014), pp. 281-284

http://www.ripublication.com/ijcer.htm

# Review on the Performance of Glass Fiber Reinforced Concrete

**Shrikant M. Harle**

*Civil Engineering Department, Prof. Ram Meghe College of Engineering and Management, Amravati, Maharashtra, India*

**Abstract**

Concrete is most widely used construction material in the world. Nowadays the world is witnessing the construction of more and more challenging and difficult Engineering structures. So, the concrete need to possess very high strength and sufficient workability. Researchers all over the world are developing high performance concrete by adding various fibers, admixtures in different proportions. Various fibers like glass, carbon, Poly propylene and aramid fibers provide improvement in concrete properties like tensile strength, fatigue characteristic, durability, shrinkage, impact, erosion resistance and serviceability of concrete. Because of such characteristics Fiber Reinforced Concrete has found many applications in civil engineering field. Glass Fiber Reinforced Concrete (GFRC) is a recent introduction in the field of concrete technology. GFRC has advantage of being light weight, high compressive strength and flexural strength. To improve the long term durability an Alkali resistance glass fiber reinforced concrete is also invented. The aim of the work is to study the properties of the effect of glass fibers as reinforcement in the concrete for different proportions from the research work which is already carried out by the researchers.

**Keywords**: Glass fiber, compressive strength, flexural strength, alkali resistant.

## 1. Introduction

The application of cement concrete is limited due to the characteristics of brittle failure; this can be overcome by the inclusion of a small amount of short and randomly distributed fibers such as steel, glass, synthetic and natural. Such concrete can be practiced where there is a weakness of concrete such as less durability, high shrinkage cracking, etc.

Concrete has some deficiencies such as low tensile strength, low post cracking capacity, and brittleness, highly porous, susceptible to chemical and environmental attack.

The above deficiencies of plain concrete are overcome in the new materials which have unique characteristics, which make them highly susceptible to any environment. Fiber Reinforced concrete is one of them and relatively a new composite material in which concrete is reinforced with short discrete (length up to 35 mm), uniformly distributed fibers so that it will improve many Engineering properties such as flexural strength, shear strength and resistance to fatigue, impact and eliminate temperature and shrinkage cracks.

Fibers lengths up to 35 mm are used in spray applications and 25 mm length premix applications. Glass fiber has high tensile strength (2-4 GPa) and elastic modulus (70-80 GPa), brittle stress-strain characteristics (2.5-4.8 % elongation at break) and low creep at room temperature. Glass fibers are usually round and straight with diameters of 0.005 to 0.015 mm. They can be bundled with bundle diameter of 1.3 mm.

## 2. Literature Review

Kavita Kene, et al conducted experimental study on behavior 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.

G. Jyothi Kumari, et al studied behavior of concrete beams reinforced with glass fiber reinforced polymer flats and observed that beams with silica coated Glass fiber reinforced polymer (GFRP) flats shear reinforcement have shown failure at higher loads. Further they observed that GFRP flats as shear reinforcement exhibit fairly good ductility. The strength of the composites, flats or bars depends upon the fiber orientation and fiber to matrix ratio while higher the fiber content higher the higher the tensile strength.

Dr. P. Srinivasa Rao, et al conducted durability studies on glass fiber reinforced concrete. The alkali resistant glass fibers were used to find out workability, resistance of concrete due to acids, sulphate and rapid chloride permeability test of M30, M40 and M50 grade of glass fiber reinforced concrete and ordinary concrete. The durability of concrete was increased by adding alkali resistant glass fibers in the concrete. The experimental study showed that addition of glass fibers in concrete gives a reduction in bleeding. The addition of glass fibers had shown improvement in the resistance of concrete to the attack of acids.

S. H. Alsayed, et al studied the performance of glass fiber reinforced plastic bars as reinforcing material for concrete structures. The study revealed that the flexural capacity of concrete beams reinforced by GFRP bars can be accurately estimated using the ultimate design theory. The study also revealed that as GFRP bars have low modulus of elasticity, deflection criteria may control the design of intermediate and long beams reinforced with FDRP bars.

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.

Avinash Gornale, et al studied the strength aspect of glass fiber reinforced concrete. The study had revealed that the increase in compressive strength, flexural strength, split tensile strength for M20, M30 and M40 grade of concrete at 3, 7 and 28 days were observed to be 20% to 30%, 25% to 30% and 25% to 30% respectively after the addition of glass fibers as compared to the plain concrete.

## 3. Conclusion

Though the initial cost is high the overall cost is greatly reduced because of the good properties of fiber reinforced concrete. The glass fiber reinforced concrete showed almost 20 to 25 % increase in compressive strength, flexural and split tensile strength as compared with 28 days compressive strength of plain concrete. While to improve the durability from the aspect of acid attacks on concrete the use of AR glass fibers had shown good result. So, the GFRC can be used for blast resisting structures, dams, hydraulic structures.

## References

[1] A Avinash Gornale, B S. Ibrahim Quadri and C Syed Hussaini (2012), Strength aspect of Glass fiber reinforced concrete, International journal of Scientific and Engineering research, vol,3, issue 7.

[2] A Dr. Srinivasa Rao, B Chandra Mouli K. and C Dr. T. Seshadri Sekhar (2012), Durability studies on Glass Fiber Reinforced Concrete, International Journal of civil engineering science, vol.1, no-1-2.

[3] A G. Jyothi Kumari, B P. Jagannadha Rao and C M. V. Seshagiri Rao (2013), Behavior of concrete beams reinforced with glass fiber reinforced polymer flats, international journal of research in engineering and technology, Vol.2, Issue 09.

[4] A Kavita S. Kene, B Vikrant S. Vairagade and C Satish Sathawane (2012), Experimental study on behavior of steel and glass fiber Reinforced concrete composite, Bonfring International Journal of Industrial Engineering and Management studies, Vol. 2, No-4.

[5] A S. H Alsayed, B Y.A. Al-Salloum and C T. H. Almusallam (2001), Performance of glass fiber reinforced plastic bars as a reinforcing material for concrete structures, Journal of Science and Technology.

[6] A Yogesh Murthy, B Apoorv Sharda and C Gourav Jain (2012), Performance of glass fiber reinforced concrete, International journal of engineering and innovative technology, vol.1, issue 6.