

# A REVIEW PAPER ON EXPERIMENTAL STUDIES ON GLASS FIBER CONCRETE

PROF. LISA PATEL<sup>1</sup>, MR MOHMADSAHIL M. MAZA<sup>2</sup>, MR MOHMADA AKIL S. MOMIN<sup>3</sup>,

MR SAKLEN K. MANSURI<sup>4</sup>, MR HASANALI S. RAJPURA<sup>5</sup>.

<sup>1</sup> Assistant Professor, Civil Engineering Department, GMFE, Berna, Himatnagar, Gujarat, India

<sup>2-5</sup> B.E. Civil Engineering Department students, GMFE, Berna, Himatnagar, Gujarat, India

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**Abstract** - Concrete is widely used material in construction due to its uniqueness property like to its high compressive strength and its durability. With the increasing in urbanization the use of cement is increased in construction field. Now in the ERA of urbanization there are many studies are in progress to use the best concrete material in the construction to reduce the cost construction. Increasing in the speed of urbanization there is required more strength of concrete in less time. Glass fiber is one of the best materials to use as admixture in concrete to increase the strength of concrete. The requirement of today construction is to make better quality and thinner concrete at High strength. In this experimental study the flexural and compressive nature of bond for different level of glass fiber are represented. The main aim of this project is to determine (identify) the experiment result and the durability property of GFC. Concrete mixes are prepared for M25 grade concrete. The different percentage of glass fiber added by 0.5%, 1%, 1.5% and 2% by the volume of cement in the mixer of concrete.

**Key Words:** Glass Fibre, Eco- Friendly, Compressive Strength, Split Tensile Strength

## 1. INTRODUCTION :

Concrete is one of the most widely utilized construction material. It is typically made with the mixture of Cement, Sand, Aggregate, Water and Air. It is usually associated with Portland cement as the main component for making concrete. When the Cement, Water and Air are blend it called paste. With the addition of sand in the paste it called mortar. When the aggregate are added into the mortar it called concrete. An artificial stone-like material utilized for various structure purposes. It is made by mixing bond and various aggregate, such as sand, pebbles, gravel, shale, etc. with water and permitting the blend to solidify by hydration.

Concrete is everywhere like roads, sidewalks, houses, bridge, high rises, channels, dams, trenches, atomic waste regulation. Concrete has generally high compressive strength, yet much lower elasticity. Hence it is typically strengthened with materials that are solid in strain. Concrete has low coefficient of warm expansion. The density of bond may change, yet is around 2,400 kilograms for each cubic meter. Concrete has problems like shrinkage, bleeding, higher permeability, abrasion, lower tensile strength, etc. It is noted that the strength of concrete with the mixture of cement, sand, aggregate, water and air is not sufficient in today's construction.

Admixtures are use to give special properties to fresh or hardened concrete. Admixtures may upgrade the durability, functionality or quality attributes of a given concrete mixtures. Recent papers are examined the potential use of GLASS FIBER as a admixture in the concrete.

## HISTORY OF CONCRETE :

The word concrete comes from the Latin word "concretus" [meaning compact or condensed], the perfect passive participle of "concrecere", from "con-" [together] and "crescere" [to grow]. Concrete was a new and revolutionary material. Laid in the shape of arches, vaults and domes, it quickly hardened into a rigid mass, free from many of the internal thrusts and strains that troubled the builders of similar structures in stone or brick. When the British engineer John Smeaton pioneered the use of hydraulic lime in concrete, using pebbles and powdered brick as aggregate. There are concrete structures in Finland that date from the 16th century. Producing Portland cement method was patented by Joseph Asp din on 1894.

## HISTORY OF GLASS FIBER :

Glass fibers throughout history have study with glass fibers, but mass produced of glass fiber was only made possible with the invention of finer machine tooling. In 1893, Edwaed Drummond Libby exhibited a dress at the Exposition incorporating glass fibers with the diameter and texture of silk fibers. Glass fibers can also occur naturally, as Pele's hair.

Glass wool, which is one product called "fiberglass" today, was invented in 1932-1933 by Russell Games Slater of Owens-Corning, as a material to be used as thermal building insulation. It is marketed under the trade name Fiberglas, which has become a generalized trademark. Glass fiber when used as a thermal protecting material is extraordinarily fabricated with a holding specialist to trap many little air cells, bringing about the common air-filled low-thick "glass fleece" group of items.

Glass fiber has generally practically identical mechanical properties to different fibers, for example, polymers and carbon fiber. Despite the fact that not as strong or rigid as carbon fiber, it is considerably less expensive and fundamentally less fragile when utilized in composites. Glass fibers are therefore used as a reinforcing agent for many polymer products; to form a very strong and relatively lightweight fiber-reinforced polymer (FRP) composite material called glass-reinforced plastic (GRP), also known as "fiberglass". This material contains small or no air or gas, is more dense, and is a much poorer thermal insulator than is glass wool.

## 2. LITERATURE REVIEW :

**C. Selin Ravikumar (2013) [1]:** With 0.5% expansion of fiber, the increment in the compressive strength is 13%, the increment in flexural strength is 42% and the increment in split tensile is 20% over traditional cement. With 1% expansion of fiber, the increment in the compressive strength is 35%, the increment in flexural strength is 75% and the expansion in tensile strength is 37%.

**Jayeshkumar Pitroda (2013) [2]:** The addition of glass fiber into the concrete mixture possibly enhances the compressive strength at 28 days. The 0.1% expansion of glass fiber into the concrete shows better outcome in mechanical properties and solidness. It utilizes less cement

than comparable cement and also often utilizes critical amounts of reused materials (as a pozzolan), GFC qualifies as economical.

**Vinay Kumar Singh (2014) [3]:** At the point when the primary crack happens in the matrix, the solid fiber get the heap. That help is more stronger than the matrix, so the following crack must happen somewhere else. Additional crack includes just new breaks, promptly captured, instead of making first crack proliferate. Disappointment creates as a progressive, as - plastic yielding. The addition of fibers into the concrete mixer improves the compressive strength at 28 days yet there is 60% increment in flexural strength with the addition of 0.7% fiber in concrete.

**J. D. Chaitanyakumar (2016) [4]:** The addition of these Fibers into concrete can significantly expand the compressive for sanitation, beautifying non recoverable shape work and different items. It is material made from extremely fine fibers of glass. Fiber glass is a lightweight, greatly strong, and robust material. Despite the fact that Its mass strength and weight properties are also very favorable when compared to metal, and it very well may be effortless shaped utilizing forming forms. Glass is the most established, and most commonplace, execution Fiber.

**Chandramouli K. and Srinivasa Rao P. (2010) [5]:** Glass Fibers improve the strength of the material by expanding the power required for distortion and enhance the sturdiness by expanding the vitality required for break proliferation. The benefit of pre-stressing on innovation using steel reinforcement as high tensile steel wires have helped in defeating the insufficiency of concrete in pressure but the ductility size of compressive strength. This might be credited to the reality Fibers suppress the confinement of miniaturized into full micro cracks and therefore the obvious tensile strength of the network increases. It was seen that the expansion of glass Fibers, the compaction factor of 0.93 to 0.97 was kept up for all evaluations of cement.

## 3. DESCRIPTION OF MATERIAL TESTING :

The Different type of materials are used in now days were cement, Fine aggregate, coarse aggregates, in addition of Glass Fiber material. The aim of studying of various properties of material is used to give better durability for construction and give more strength of concrete. The various type of material used in fiber reinforced marble powder concrete are given below:

#### PORTLAND CEMENT :

Portland cement referred as (Ordinary Portland Cement) is the most important type of cement. The OPC is classified into three grades, namely 33 Grade, 43 Grade and 53 Grade depending upon the strength of 28 days. The concrete abused for the examination is 53 grade normal Portland bond of IS: 8112-1989. The particular gravity of bond is 3.15. Cement joint the total into a strong mass by great nature of its setting and solidifying properties when mixed with water. Cement gives quality to concrete on setting and solidifying. Cement fills up voids existing in the sand and makes the solid watertight.

#### FINE AGGREGATE :

The material or sand which passed through I.S. Sieve No. 480 (4.75mm) is termed as fine aggregate per IS: 383-1970. Fine aggregates are to make concrete dense, and filling voids of coarse aggregates, it also decreases the shrinkage of cement and makes an economical mix. In our project, we use fine aggregate as 4.75 mm. The source for fine aggregate used is from natural river bed. The fine aggregate used which have fineness modulus of 3.1, specific gravity of 2.56. Fine aggregates contribute the maximum to the covering up of surface zone in concrete.

#### COARSE AGGREGATES :

The aggregate which is passing through 75mm IS sieve and retain on 4.75mm IS sieves are known as coarse aggregates. The maximum particle size of coarse aggregate is 75 mm and minimum particle size of coarse aggregate is 4.75 mm. In our project, we use coarse aggregate as 20-25mm. Coarse aggregates, like fine aggregates, must comprises of sound tough idle particles to make the solid and climate safe.

#### GLASS FIBER :

Glass Fiber Concrete (GFC) is a recent use in the civil engineering construction. So, it has been widely used in many countries since its introduction two decades ago. This item has preferred of being light weight and accordingly decreasing the general expense of development, eventually getting eco-friendly in construction. Glass fibers have maximum tensile strength and tensile modulus but have brittle stress-strain characteristics and low creep at room temperature. Glass fibers are usually round and straight with diameters from 0.005 mm to 0.015 mm. They can be also combine together to produce the number of glass fibers with diameter up to 1.3 mm.



### 3. CONCLUSIONS

In this project we observed from the experimental results the increase in compressive strength, split tensile strength for M25 grade of concrete at 7,14 & 28 days are observed at 0.5%, 1% & 1.5% utilize the glass fiber product to increasing the strength. Also glass fiber eco-friendly and economical.

### REFERENCES

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- [2] J.D.Chaitanyakumar, G.V.S. Abhilash, P.Khasim Khan, G.Manikantasai, V.Taraka ram. Assistant Professor and Research Scholar, Civil Engineering Department, B.V.M. Engineering College, Vallabh Vidyanagar-Gujarat-India
- [3] Vinay Kumar Singh, Dilip Kumar Research scholar, Department of Civil Engineering, M.M.M.U.T. Gorakhpur Assistant Professor, Department of Civil Engineering, M.M.M.U.T. Gorakhpur
- [4] J.D.Chaitanya kumar<sup>1</sup>, G.V.S. Abhilash<sup>2</sup>, P.Khasim Khan<sup>3</sup>, G.Manikanta sai<sup>4</sup>, V.Taraka ram<sup>5</sup>. 1-Assistant professor, 2, 3, 4, 5 - B. Tech Students, Department of Civil Engineering, KL University, Green fields, Vaddeswaram-522502, Guntur (D. t), A. P, India
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