# An Expeimental Study on glass Fiber Concrete

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## ABSTRACT

A fiber reinforced concrete is a revolutionary topic in the history of concrete industry. one such efforts addition of different fibers to concrete for increasing the strength aspects of concrete. Glass fibers allow the construction of very slim elements with good tensile strength. Glass-reinforced concrete (GRC) panels reduce the weight and thickness of the concrete by up to 10 times compared to conventional steel-reinforced concreteConcrete being the most important and widely used material is called upon to possess very high strength and sufficient workability properties. The grade of concrete is using M25 grade concrete and using different percentages of glass fiber to concrete . the sizes are 6mm , 12mm , 18mm glass fiber are using different type of concrete mix. The glass fiber mixing percentage is 5% ,10% ,20% per concrete in M25 grade concrete.

**keyword:** Glass Fiber, M25 mix design, compressive strength, split tensile strength

## INTRODUCTION

### General

Glass fiber is one of the most versatile industrial materials know today. Glass fiber reinforced concrete (GFRC), also known as GRC, is a composite material composed of cement , sand , water and small percentage of alkali – resistant glass fibers.Glass fiber concretes are mainly used in exterior building facade panels and as architectural precast concrete. Glass fiber size is 6mm – 20mm. Glass fiber is high strength , flexibility and resistance to environmental factors.

### Scope

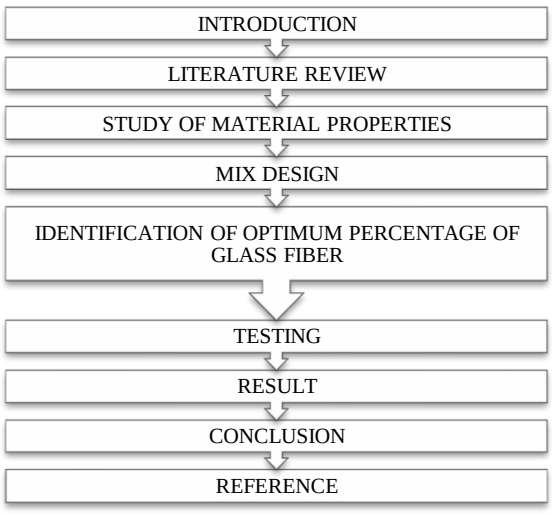
The scope of project is analyzing the objectives and experimental study of glass fiber reinforced concrete.Glass fiber allow the construction of very slim elements with good tensile strength.Important scope

of this project is increase strength and properties of concrete.Control and reduce cracks size due to early age shrinkage in concrete.Improve resistant to attacks by most chemical attacks and climate weathering conditions

**Advantages**

Glass fiber concrete has more tensile strength when compared to normal concrete. reduce crack growth and increase impact strength. fiber reinforced concrete improves resistance against freezing and thawing. ability to resist high – stress environments resistance to impact of fire and weather. glass fiber concrete require very little maintenance and easy to clean. It is does not rust and corrode resistant to fading , chalking and cracking. Limitless range of shape and low maintenance cost and requires less labors.

## METHODOLOGY




## MATERIALSCHARACTERISTICS

**Cement**

Cement is a fine, soft powder used as a binder because it hardens after contact with water. Portland cement referred as is a most important type of cement and it is a fine powder produced by grinding Portland cement clinker.OPC cement are using 53 grade cement for concrete.

**M Sand**

The full form of M sand is Manufactured Sand. This is an artificial type of sand formed by crushing rocks or granite. M sand for concreting-used in concrete. M sand for brick or block work- used for masonry or brick or block-laying works.It is used as a substitute of river sand. M-sand can be used for construction of walls with a cement to sand ratio of 1:3.

**Coarse aggregate**

Coarse aggregates are a construction component made of rock quarried from ground deposits. The usual range employed is between 9.5mm and 37.5mm in diameter Typically the most common size of aggregate used in construction is 20mm.

**Glass fiber**

Glass fibers are used primarily to reinforce polymers. GFRC is a specialized form of concrete. It's a cement-based composite material reinforced with alkali-resistant glass fibers. Control and reduce cracks size due to early age shrinkage in concrete.

**Water**

Water is the key ingredient, which when mixed with cement, forms a paste that binds the aggregate together.The amount of water in concrete controls may fresh and hardened properties in concrete including workability, compressive strength, permeability and water tightness, durability and weathering, drying shrinkage and potential for cracking.The water causes the hardening of concrete through a process called hydration.

## CHARACTERISTICSOF MATERIALS

**Cement**

| Characteristics | Value specified by IS |
|---|---|
| Specific Gravity | 3.13 |
| Consistency (%) | 35% |
| Initial Setting Time | 30 (minutes) |
| Final Setting Time | 600 (minutes) |

**M Sand**

| Characteristics | Value specified by IS |
|---|---|
| Bulk density | 1.78 Kg/m³ |
| Fineness modulus | 2.10 |
| Specific gravity | 2.34 |
| Water absorption% | 2.42 |

**Coarse aggregate**

| Characteristics | Value specified by IS |
|---|---|
| Size | 20mm |
| Shape | Angular |
| Specific Gravity | 2.74 |
| colour | grey |

**Glass fiber**

| Characteristics | Value specified by IS |
|---|---|
| Fiber length | 12mm |
| Aspect ratio | 857 |
| Specific gravity | 2.68 g/cm³ |
| Material | Alkali Resistant Glass |
| shape | straight |
| Tensile strength | 1700 mpa |
| Softening point | 860c |

**TESTING**

## COMPRESSIVE STRENGTH FOR GLASS FIBER

**Compressive strength after 7 days for cube**

| S. No | Mix Description | Compressive strength ($N/mm^2$) | Average Compressive($N/mm^2$) |
|---|---|---|---|
| 1 | Conventional mix | 11.45 | 14.175 |
| | | 16.9 | |
| 2 | 5 % | 23.18 | 22.925 |
| | | 22.67 | |
| 3 | 10 % | 25.78 | 25.875 |
| | | 25.97 | |
| 4 | 20 % | 24.20 | 24.050 |
| | | 23.90 | |

**Compressive strength after 28 days for cube**

| S. No | Mix Description | Compressive strength ($N/mm^2$) | Average Compressive($N/mm^2$) |
|---|---|---|---|
| 1 | Conventional mix | 25.60 | |
| | | 25.78 | |
| 2 | 5 % | 31.85 | |
| | | 31.90 | |
| 3 | 10 % | 35.78 | |
| | | 35.98 | |
| 4 | 20 % | 32.56 | |
| | | 32.90 | |

## SPLIT TENSILE STRENGTH FOR GLASS FIBER

**Table Split tensile strength of cylinder for 7 days**

| Mix (%) | Split tensile strength(N/mm2 ) after 7 days | | AverageSplit tensile strength(N/mm2 ) |
|---|---|---|---|
| | Specimen 1 | Specimen 2 | |
| 0 | 2.54 | 2.56 | 2.55 |
| 5% | 2.59 | 2.36 | 2.47 |
| 10% | 2.89 | 2.59 | 2.74 |
| 20% | 2.50 | 2.40 | 2.45 |

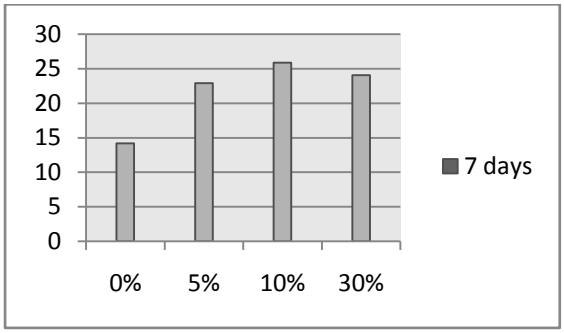
**Split tensile strength of cylinder for 28 days**

| Mix (%) | Split tensile strength(N/mm2 ) after 28 days | | AverageSplit tensile strength(N/mm2 ) |
|---|---|---|---|
| | Specimen 1 | Specimen 2 | |
| 0 | 3.12 | 2.90 | 3.01 |
| 5% | 2.80 | 2.90 | 2.85 |
| 10% | 3.90 | 3.79 | 3.85 |
| 20% | 3.52 | 3.60 | 3.56 |

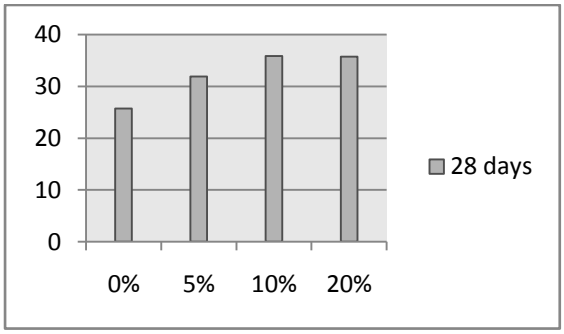
## RESULT

## COMPRESSIVE STRENGTH FOR GLASS FIBER

### Compressive strength after 7 days for concrete




### Compressive strength after 28 days for concrete

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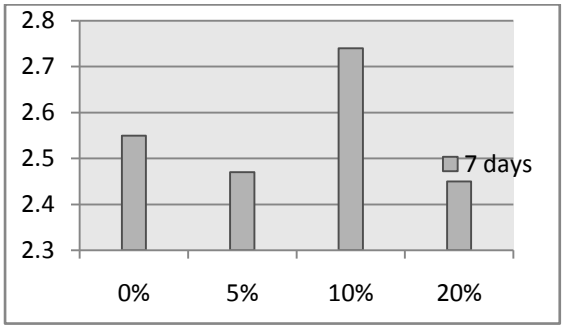
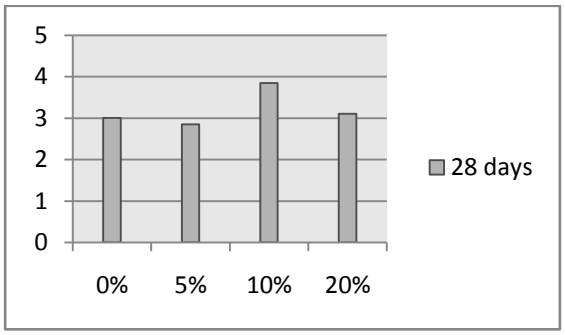



### Split tensile strength of cylinder for 28 days




## CONCLUSION

In this project, an experimental study has been conducted on concrete by varying the percentage of Glass Fiber as 0%, 5%, 10% and 20% respectively to study the increase in the compressive strength of concrete.

## COMPRESSIVE STRENGTH

After adding 10% Glass Fiber in the mix, there is an increase in the strength of cube after 7 days As compared to concrete without replacement .After 28 days there is enormous increase in strength as compared to the control mix. The optimum strength of cube is gain at 10% replacement for all 7 and 28 days respectively

## SPLIT TENSILE STRENGTH

After adding 10% Glass Fiber in the mix, there is an increase in the strength of cylinder after 7 days as compared to concrete without replacement and after

28 days there is enormous increase in strength as compared to the control mix.

The optimum strength of cylinder is gain at 10% replacement for all 7 and 28 days respectively.

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