

# A Review on Carbon Reinforced concrete

A.Manikanta, Bimalendu Dash, G.Mohan Sai

<sup>1</sup>Student, <sup>2</sup>Asstiant professor, <sup>3</sup>Student

<sup>1,2,3</sup>Civil Engineering Department,

<sup>1,2,3</sup>GMR Institute of Technology, Rajam, India

**Abstract**—Concrete is a major part to construct a engineering structure. To construct a building, we have to take a good grade and strong concrete. In now a day, all the structures are constructed by the normal concrete. Normal concrete is a good concrete for the construction but to overcome the disadvantages of the normal concrete we must do the research on a special concrete. That type of concrete has the better properties than the normal concrete. Suppose, we can choose the carbon fibre reinforced concrete. This concrete is made up with the adding of carbon fibre reinforced polymer. We must add the sea sand and sea water to gain the binding strength between the aggregates and the cement and the sand. To know the activity of these property we must test the concrete made from the carbon. The properties of both the concrete are compared by the results of the laboratory tests and the site tests. The tests are done to know which concrete is doing better job in the construction. The other components we must add are resins, some chemicals like NaCl. Mechanical properties like compressive strength, modulus of rupture, toughness have high influence on the concrete.

**Index Terms**— Concrete, carbon reinforced, binding strength, Modulus of rupture.

## I. INTRODUCTION

The carbon fibre reinforced concrete is made up of adding the carbon fibre reinforced polymer to the normal concrete. The carbon fibre reinforced concrete is a good concrete for the construction of the structure. Along with the carbon fibre, the sea sand and sea water are added to the normal concrete. It will increase the strength of the concrete and the bonding between the aggregates and the cement. Resins and basalt are added to the CFRP will decrease the alkali components. If the carbon fibre is added in higher quantities, it will increase the tensile strength of concrete. To decide which is the best concrete in both the normal concrete and carbon fibre reinforced concrete, the tests have to done on both the concrete. The tests will be done on the concrete to decide which concrete is best in the performance. The effects of the properties on the concrete will also decide by the tests only. It is used in concrete for the effect of passive and active protection of the corroded steel reinforcement in reinforced concrete.

Passive protection means the anti-corrosion behavior of the carbon fibre reinforced concrete. Active protection means the effect to protect the steel reinforcement. The active protection was found by testing the steel potential, linear polarization, electrochemical impedance spectroscopy.

Carbon fibre reinforced concrete is used for retrofitting concrete structures. Corrosion of common reinforcing materials, steels in sea water sea sand concrete along with the carbon fibre reinforced polymer. Carbon fibre has high durability for the construction structure. Durability performance of carbon fibre reinforced polymer in alkaline and Marine environment. This carbon fibre reinforced concrete will increase the flexural strength and the compressive strength.

## CARBON FIBER

Carbon fiber is a carbon filament consists of carbon atoms, the filaments together bound with polymer resin with the means of heat under certain pressure. It is a highly spreadable light weight material.

Carbon fiber is manufactured by heating the filaments below 400 c. The filaments are placed in carbonize treatment, the fibers are heated to about 800c in an environment without oxygen to remove the impurities of carbon.

Fibers are graphitized and it stretches the fibers between 50 to 100 percent elongation and heated under the temperature of 1100c to 3000c. It results in the desired tensile strength. The surface treatment and epoxy sizing are last steps for the manufacture of the carbon fiber.

## FIBER REINFORCED CONCRETE

Fiber reinforced concrete is a concrete is a concrete containing the fiber as the material which increases its structural integrity. Tensile strength increases, and air voids and water voids will be reduced. Fiber like glass and graphite have excellent resistance to creep. Fibre reinforced concrete is a composite material

## II. TESTS HAD TO BE DONE

Compressive strength test, splitting tensile strength test, flexural strength test, modulus of rupture test, toughness test etc. Had to be done on concrete made by the carbon polymer.

## ELEMENTS TAKEN TO MADE CONCRETE

Normal concrete, carbon fiber reinforced polymer, sea sand, sea water, chemicals like NaCl, basalt.

#### EXPERIMENTAL PROCEDURE

The carbon fiber reinforced concrete is made up of adding the carbon fiber reinforced polymer to the normal concrete. The carbon fiber reinforced concrete is a good concrete for the construction of the structure. Along with the carbon fiber, the sea sand and sea water are added to the normal concrete.

#### TESTS FOR PROPERTIES OF CFRC

Tests done for this concrete are compressive strength, toughness, splitting tensile strength, flexural strength, modulus of rupture.

##### 1) COMPRESSIVE STRENGTH

Compressive strength is the strength to resist the load applied on the structure. It decides the durability of the structure. The strength of the concrete is tested by compressive strength test. The compressive strength result is range from 0.5mpa to 0.8mpa. compressive strength decreases when the additive is added after 3 to 7 days.

After 72 hours, curing was 8 to 10 Mpa. The difference between the reference and modified concrete is 3mpa. The compressive strength is increased with the time increased. 40 percentage of the compressive strength by the measurement of the concrete after 3 days.

##### 2) TOUGHNESS

Toughness test is done to know how much the concrete structure is tough and strong. Toughness is the property of the concrete and it effect the structure. It decides the durability of the structure. Toughness is 30 percentage and 50 percentage by the effect of the additives increases

Toughness of carbon fiber reinforced concrete is low because of their large diameters of these fiber. The methylcellulose, silica fumes and latex on the degree of dispersion of short carbon fiber in cement paste.

##### 3) FLEXURAL STRENGTH

Flexural strength related to the flexibility of the material. The flexural strength of these carbon fiber reinforced concrete is high. Flexural strength is also known as modulus of rupture or bend strength. It is a stress in a material just before it yields in a test of flexural strength The transverse bending test in which a specimen having either a circular or rectangular cross section is bent until fracture using a three point flexural test.

The flexural strength will be controlled by the strength of these intact fibers. The yield load is very high that is 75.07kn by the flexural strength. The ultimate load is 154.63kn by the flexural strength.

##### 4) TENSILE STRENGTH

Tensile strength is the ability of a material to withstand a pulling force. It is measured in units of force per cross sectional area. The tensile strength results to 400 Mpa. The tensile strength of a material is the amount of tensile stress force can take before failure.

#### III. EFFECTS OF PROPERTIES

Carbon fiber reinforced concrete is made up with the adding of carbon fiber reinforced polymer with the normal concrete. Epoxy resin is used in the carbon polymer. They are helps in binding between the fiber and the normal concrete. The electrical conductivity, mechanical properties like resistance will change with the vary of compressive stress value end stress strain changes to good value. Thermo sensitive properties and mechanical properties will give good result in the tests of properties will help to bear the load of the structure.

Along with the carbon fiber, the sea sand and sea water are added to the normal concrete. It will increase the strength of the concrete and the bonding between the aggregates and the cement. Resins and basalt are added to the CFRP will decrease the alkali components. If the carbon fiber is added in higher quantities, it will increase the tensile strength of concrete.

Segregation resistance is increased by decreasing the carbon content. So, we must take care about the proportion of the carbon content and the other components used in the normal concrete. The added carbon fiber is made from the polymer called POLYACRYLONITRILE and RAYON. The toughness of carbon fiber reinforced will effect the binding between the carbon fiber and concrete. Environmental effects like humidity and the temperature can greatly influenced by the usage of carbon fiber.

The average toughness of CFRP is tested after curing done i.e. after 28 days. The toughness range is varied from 2474N-mm to 3500N-mm.

The flexural strength of concrete is increased by using CFRP. This will range from 7.70mpa to 8.5mpa. It will greatly be influenced by the usage of the carbon polymer.

#### IV. Advantages

The strength is high in the columns, beams, slab, etc. to bear the load. The durability of the structure is increases. The stability and immunity are increases by using the carbon fiber reinforced concrete.

Carbon fiber reinforced polymer used is humidity, saline water, high alkalinities will increase the strength. The mechanical behaviour will be good.

The thermal expansion will lower by using the carbon fiber reinforced concrete. The expansion of the material will low by the effect of temperature by using carbon fiber reinforced concrete. This will result in resistance to corrosion. Type of resin used for production, carbon fiber reinforced concrete oxidises in temperature.

#### V. Disadvantages

The brittleness of carbon fiber reinforced concrete, if the carbon polymer proportion is not good. The other draw backs are the high repair cost. Each damaged fiber cannot be repaired, it may need repair quite often. Carbon fiber reinforced concrete possesses unique qualities needed in several technical areas. It has several drawbacks that restrict the scope of its application significantly.

#### VI. APPLICATIONS

The carbon fiber reinforced concrete is applicable to construct the several structures. Carbon fiber is a flexible material which give more strength, when combined with polymer, can be moulded into the shape of a structure that is very stronger as compared to the structure constructed with the normal concrete. The resultant concrete is stronger and lighter Ghana today's steel and aluminium materials.

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#### VIII. CONCLUSION

This paper shows on the experimental research and procedure of the carbon fiber reinforced concrete. The tests like the compression test, toughness test, modulus of rupture gave the better result than the normal concrete. By doing several tests the results of the tests will decide that carbon fiber reinforced concrete is better than normal concrete. The properties of the concrete will be changed to influence the concrete. This concrete will have more applications in the civil engineering point of view. This type of concrete is the better in giving higher strength.

- **COMPRESSIVE STRENGTH**
- The test is to determine the compressive strength of the special concrete and it will give the result about the range of some range.
- **TOUGHNESS**
- The test is to determine the toughness of this concrete and it gives the result in the range of 2474N-mm to 3500N-mm.
- **FLEXURAL STRENGTH**
- The flexural strength test done on the carbon fiber reinforced concrete and it gives the result about the range of 7.7 to 8.5 mpa.
- The tests give the better result by the tests done on the properties of the carbon fiber reinforced concrete.
- The result decides that the considered concrete is a good and better concrete.

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