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FRP-FIBER REINFORCEMENT POLYMER: A RETROFITTING TECHNIQUE *A OVERVIEW PAPER ON FRP TECHNIQUE AND MATERIALS*

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ABSTRACT

In modern era of construction industry many techniques are evaluated to providing additional strength of structure and increase the durability of RC structure. Many RC structures are located in seismically active zones and they are not sufficiently bear seismic action according to current codes and provision so many research work evaluated new technique to overcome from this kind of problems. Retrofitting technique are widely used to providing additional strength to structure and also increase the durability and life of structure. Basically retrofitting is a technique to increase the strength of exist building including stiffness, ductility, stability. There are many technique in retrofitting like Beam jacketing, Steel plate jacketing, FRP jacketing.In this paper a overview on FRP material and application of FRP.

KEYWORDS- ***FRP(fiber reinforcement polymer),Retrofitting,RC structure***

I. INTRODUCTION

Many existing structures are not designed to withstand seismic activity or earthquake. Many structure are damaged or demolished due to seismic activity to overcome with this kind of problems retrofitting are used. There are many retrofitting techniques are used to increase stiffness and strength of structure.FRP technique is one of most efficient technique which provided a great strength and also cost efficient. There are many techniques like new structure wall, Steel braces, Base isolators, Steel jackets. In this modern days FRP techniques are frequently used method of retrofitting. In this paper focuses on retrofitting of RC column, beams, beam-column joints, masonry wall and steel structures using various FRP retrofitting technique

FRP material are frequently used because it's light weight, high strength, resistance to corrosion, speed and ease of application and formed on site into different size and shape can be made them preferences

II. FRP(FIBER REINFORCEMENT POLYMER):-

FRP is define as composite material which contain polymer matrix reinforce with fibers

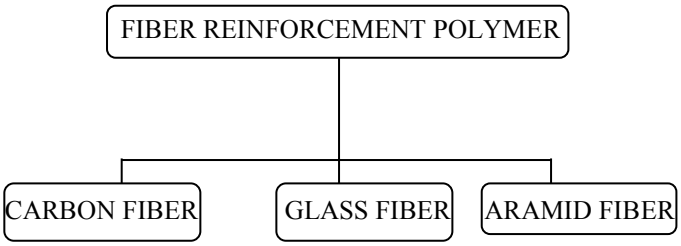
According to definition, FRP contain composite material there are many type of composite material like Metal Matrix Composites (MMC), Ceramic Matrix Composites (CMC), Polymer Matrix Composites (PMC) forms with the

type of fiber-reinforced particulate or laminar composites. Definition of FRP also contain fiber in composite materials

Fiber is basically natural or man-made substances which have more length then its width, it is used to manufacture other materials. Fibers are used in FRP to enhance strength of FRP, Fibers are required to fulfill conditions and transfer strength to the matrix constituent influencing and enhancing their properties.

III. CLASSIFICATION OF FRP:-

TABLE.1 TYPES OF FRP



A. CARBON FIBER REINFORCEMENT POLYMER:-

Carbon fiber is a polymer and also known as graphite fiber. It is very strong material that is also very light in weight. In CFRP, carbon fiber or graphite is used which is pure carbon. CFRP is known as graphite sheets which are long and thin, these sheets are pack together to form of fiber. Carbon fiber is very strong for their weight. It occurs that it is stronger than steel and also light in weight. Carbon fiber is anisotropic in nature, it is manufactured at 1700°-2800° C temperature. Carbon fiber is high strength to weight ratio, corrosion resistance, fatigue resistance, low thermal expansion, fire resistance, good tensile strength, low density. The negative side of carbon fiber is that it is very expansive and anisotropic material with low compressive strength.

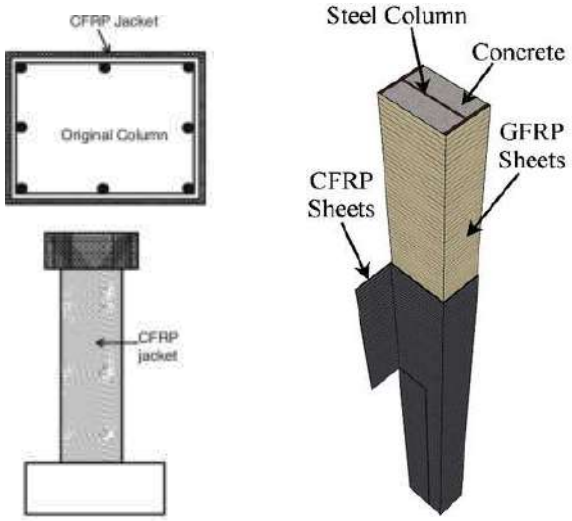


Fig. 1. CFRP jacketing on column

B. GLASS FIBER REINFORCEMENT POLYMER :

Glass fiber are mainly very fine glass fiber, it is manufactured by combining a mixture of fine sand cement polymer(acrylic polymer),water, admixture and alkali resistant(AR) glass fiber. Glass fiber reinforce polymer panels or slabs are much thinner then traditional created panels or slabs. In GFRP glass fiber content is high than tensile strength will be high and if polymer content is high than the CFRP becomes flexible and resist to cracking. In GFRP AR(alkali resistance) fibers act as the principle tensile load carrying members, the polymer and concrete matrix bind the fibers together and its helps to transfer the load from one fiber to another fiber

- CASTING GFRC:-
  - SPRAY-UP:- In this technique long glass fibers are used on which fluid concrete mixture are sprayed on the fibers. It is similar like shortcrete, in this technique a specialized spray gun are use to apply fluid concrete on long glass fiber, by this technique CFRC become very strong due to high fiber load and long fiber length
  - PREMIX:- In this technique shortcrete fibers are premix in fluid concrete, which can be poured in mould of desire shape and size

GFRC have high tensile strength, high heat resistance and durable, economical compare to other FRP, fire resistant, low electrical conductivity

Fig. 2. GFRP jacketing on column and GFRP sheet

C. ARAMID FIBER REINFORCEMENT POLYMER:-

Aramid fibers are artificially manufactured high performance fibers, which is made by rigid polymer chains. These molecules are interlinked by hydrogen bond which is strong that transfer mechanical stress very efficiently. Basically aramid is came from aromatic polyamide, most communally aramid fiber are known as Kevlar or twaron in suppliers. Kevlar also divided in sub category with various combinations of modulus and surface finishing which suit various application like Kevlar-29,Kevlar-49,Kevlar-100,Kevlar-119,Kevlar-129. Aramid fibers are anisotropic in nature and contain yellow colour.

Aramid fibers are high in strength and low in weight, It has good resistance to abrasion and resist impact also, It have

high tensile modulus, It have good in tension applications but low in compressive strength

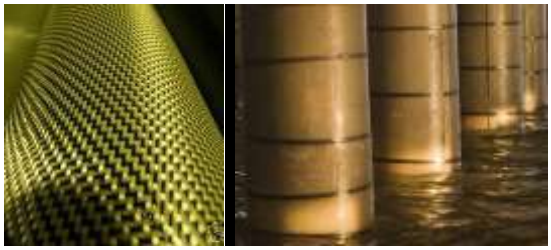


Fig. 3. AFRP sheets and AFRP jacketing

IV. TYPES OF REINFORCING FIBERS:-

A. CONTINUOUS FORM FIBER:- This reinforcing fibers are called as continuous because it is long and parallel to each other, Continuous fibers are processed into the composite fiber, They are unidirectional and run longitudinally.

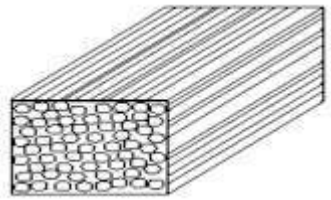


Fig. 4. Continuous fiber

B. WOVEN FORM FIBER:- Woven type fibers are manufactured when more than one fiber orientation is required. Woven fiber are produced by interlacing of warp fiber(0°) and weft fiber(90°) in a regular pattern. Woven form fiber provided multi-directional strength

Fig. 5. Woven fiber

C. CHOPPED FORM FIBER:- Chopped form fibers are also called as random form fiber, It is small and discontinuous arranged fiber or called as fiber glass

Fig. 6. Chopped fiber

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