

# REHABILITATION OF RC COLUMN USING FIBER REINFORCED POLYMER WRAPPING

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**Abstract** - Rehabilitation is the process of repairing or modifying reinforced concrete structures to a desired useful condition. This project describes the operational steps for the structural assessment of reinforced concrete column. It discusses his classification of composite materials reinforcing systems for strengthening reinforced concrete structures such as shop manufactured and field manufactured structures. The project reviews the materials property requirements for design of reinforcing system to strengthen the reinforced concrete structures. It discusses the fiber reinforced polymer (FRP) reinforced concrete behavior that depends on flexural, shear, or axial failure. Surface preparation procedures for rehabilitation techniques of reinforced concrete structures using bonded FRP materials are also discussed. The project describes data recording and acceptances criteria for rehabilitation of concrete column with FRP sheet. Fiber reinforced polymer (FRP) sheet are very attractive for use in civil engineering application due to their high strength to weight and stiffness to weight ratio, corrosion resistance, light weight and potentially high durability. Their application is most importance in the renewal of constructed facility infrastructure such as building bridge, pipeline, etc. Recently their use has increased in the rehabilitation concrete structures, mainly due to terrible performances characteristics, ease of application and low life cycle cost. These characteristics and success of structural rehabilitation measures have led to the development.

**Keywords:** Rehabilitation, FRP, Life cycle cost, strength, cost, failure, strength

## 1. INTRODUCTION

In framed structures the Reinforced Concrete columns are considered as a load-bearing structure component. Cost of rehabilitation for RC beams is roughly less than that of rebuilding them because in present days, there are so many buildings which collapse fully or partially due to lack of maintenance, improper construction method and material or even due to earthquake. They need repairing to make them safe. Repair is always neglected or delayed by many people in most buildings owing to lack of awareness and financial ability and so it leads to major hazards. Hence it's needed proper repair and reconstruction application. FRP is a composite material made of a polymer matrix reinforced with fibre. The fibres are usually glass, carbon, aramid, and basalt.

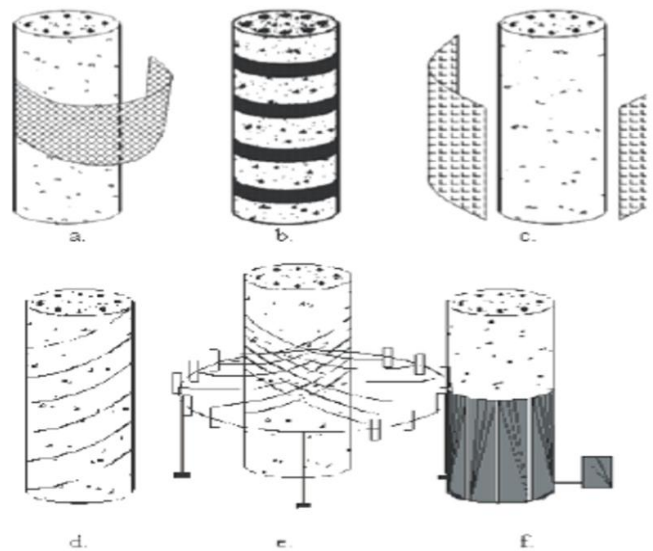


Fig. 1 FRP wrapping

During the latest decades fiber reinforced polymer (FRP) composite materials have proven valuable properties and suitable to be used in construction of new buildings and in upgrading the existing ones. These materials have covered the road from research laboratory and demonstration projects to implementation in actual structures. Nowadays the civil and structural engineering communities are about to commence the stage in which the use of FRP composites is becoming a routine similar to that of traditional material such as concrete, masonry and wood. FRP wrapping as shown in Fig.1

## 2. OBJECTIVES

- i. To increase in strength of existing as well as old and worn out building by the application of FRP so as to either achieve the expected life or to increase the life of the structure.
- ii. To check how much percentage of strength increases by using FRP sheet on concrete column.
- iii. To check the compressive strength and flexural strength and compare with plain concrete column.
- iv. To check the behaviour of column by using FRP wrapped sheet on plain concrete columns under axial loading.
- v. Water tightness and increase the quality of structure.
- vi. Increase durability and impermeability of Column.

### 3. SCOPE

- i. It may Increase the shear strength and compression strength of RC column by wrapping on failure of column.
- ii. It may increases the resultant capacity of column.
- iii. It may Increase the shear strength and compression strength of failure column by carbon sheet wrapping.
- iv. Aerospace, marine, construction industries, ballistic armor etc. place to scope or to use rehabilitation of concrete column.



Fig. 2 BEFORE COLUMN WRAPPING



Fig. 2 AFTER COLUMN WRAPPING

### 4. PROPOSED METHODOLOGY PROCEDURE FOR CARBON WRAPPING SHEET

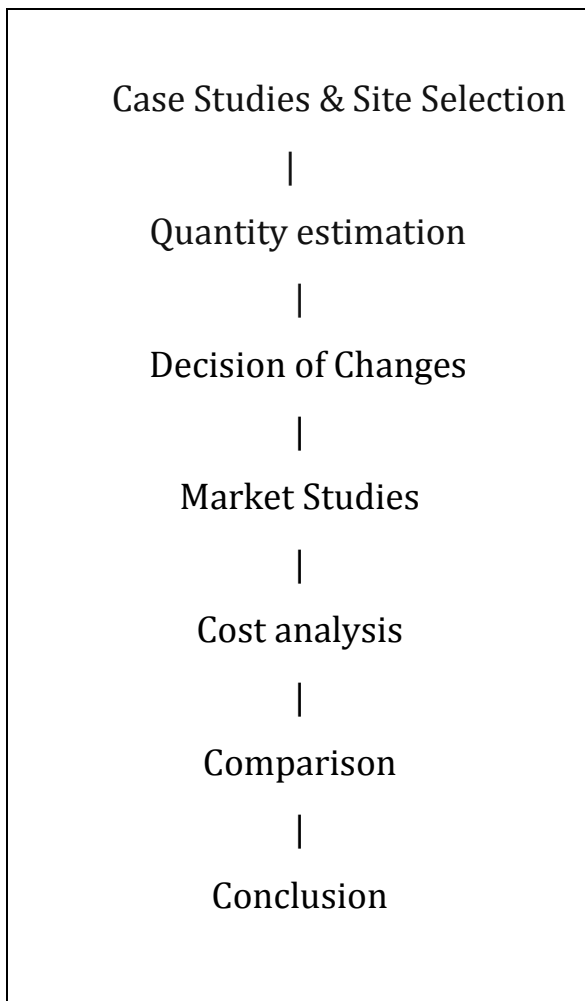
- i. Prepare M30 grade of concrete and fe500 steel having column size 200mm x200mm x600mm
- ii. Taking the strength of concrete column after 28 days in UTM and vibration testing machine
- iii. After failure of RCC column apply epoxy primer. The primer that comes into two components was mixed with a drill equipped with an agitator.
- iv. Nitoprime 25 is a two component solvent containing primer consisting of modified epoxy resin based primer.
- v. Nitoprime Primer is applied on failure RC column and then applies the carbon laminate sheet on RCC column.
- vi. After harden the primer and proper bonding between column and carbon wrapping sheet then check for compression by using UTM.



(iv) Wrapping of FRP fabric (v) Rolling to remove air bubbles

Fig. 3

## 5.0 FLOWCHART OF METHODOLOGY



## 6.0 ADVANTAGES OF FRP WRAPPING

- It increases the resultant capacity of column.
- Amount of work is less as foundation strengthening does not require.
- It increases the shear strength of column.
- It also increases confinement of concrete in columns
- FRP does not increase significant weight of column.
- Saves construction time (curing)

## 6.1 LIMITATION OF FRP

- Greater Reduction of workability
- High cost of material.
- Generally fiber does not increase the flexural strength of concrete. And cannot replace moment resisting or structural steel reinforcement.
- High cost because of its control production issue as well as the cost of material is high.
- Corrosion of steel fiber.

- Increase specific gravity of the concrete. This means that the concrete is heavier than normal concrete in case of some fiber.
- Tremendous change in concrete strength.

## 7.0 DEVELOPMENT OF MODELS

This paper present of experimental study to evaluate the effectiveness of using FRP Wrapping for repair and seismic upgrading of rectangular RC Column the factor affecting the performance of FRP wrapping of rectangular column in axial and lateral load consider the thickness of FRP jacketing technique to improve the performance of strengthen rectangular column.

- 1) Removing the cover concrete and roughing surface post installation of transverse reinforcement after that wedding of transvers reinforcement of T shaped column
- 2) Jacketing with prefabricated steel sheet cutting to shape of steel plate after that installation of steel plate and extraction of external pressure using cable and cross device wedding to complete jacketing process
- 3) Filling the holes with anchorage region with epoxy resin placement of carbon fiber anchor fanning out of fiber anchor over CRPF sheet local jacketing with CRPF.
- 4) Complete the procedure of rehabilitation of RC Rectangular T shaped column using FRP wrapping.

## 7.1 DESIGN BASED ON PROJECT WORK

- 1) Also in this paper column jacking is carried out as per recommendation of Indian standard first of all load carried as rehabilitation of RC column such as seismic load, live load, dead load , moment and their size find out
- 2) Then it may reinforced concrete jacketing improve column flexural strength
- 3) Also this proper technique for upgrading Reinforced concrete circular column have been studied with application of composite material.
- 4) Also seen that the overall performance of column significantly improve after jacketing.
- 5) Repair are neglected or delayed by many people in most of building owing to lack of awareness and finical ability and so lead to major hazard then it show strengthened by jacketing.
- 6) Proper advance technology and management, feasibility, economy, development and sustainability for carrying out method of repair rehabilitation and retrofitting and directly for the execution of work

## 8.0 EXPECTED OUTCOME

- 1) It may increase the resultant capacity of RC column.
- 2) It may increase the shear strength of RC columns.
- 3) It may increase the axial load bearing capacity of column.

## 9.0 CONCLUSION

1. Using FRP polymer, it increases the resultant capacity of column.
2. It increases the shear strength of column.
3. It also increases confinement of concrete in columns.
4. FRP does not increase significant weight of column.
5. It reduces construction time (curing).

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