



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 5, May 2023

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

# Experimental Analysis of FRP Columns

Mahesh Sawant, Nagesh Shelke

P.G. Student, Department of Civil Engineering, Dr. D Y Patil School of Engineering and Technology, Charholi (BK),  
Pune, Maharashtra, India

Associate Professor, Department of Civil Engineering Dr. D Y Patil School of Engineering and Technology,  
Charholi(BK), Pune, Maharashtra, India

**ABSTRACT:** Structures with the passing of time, they lose their strength because of various factors like improper maintenance, corrosion of steel reinforcement, poor construction exposure to harmful environments and improvement in design guidelines. These structural elements become statically unsafe. Enhancement of performance of such RC structural elements can be done by increasing strength and strength of structural elements can be increased by process of Retrofitting. Fiber reinforced polymer application is a very effective way to repair and retrofitting structures, FRP composites systems of retrofitting provide economically viable substitute to conventional repair systems and materials. RCC structures name as Repair, Rehabilitation and Retrofitting. Experimental investigations on the flexural behavior of RC beams retrofitted using carbon fiber reinforced polymer (CFRP) fabrics are carried out. Externally reinforced concrete beams with epoxy-bonded CFRP sheets were tested to failure using a point load concentrated static loading system.

As per the report of the rebound hammer test and core compressive test performed on columns at the 2<sup>nd</sup> and 3<sup>rd</sup> Floor levels, it was observed that total 56 numbers of columns have inadequate compressive strength as compared to their original design grade which was M40. Hence these columns require structural strengthening to achieve the required strength. This proposal report comprises a structural strengthening scheme, design calculation, and construction methodology for the Columns.

**KEYWORDS:**CFRP, Strengthening of column, Retrofitting.

## I. INTRODUCTION

Orchid City Centre Mall is a commercial building located at Mumbai Central, Mumbai, Maharashtra. The building is an RCC-framed Structure. Years later the building experienced a fire at the 2<sup>nd</sup> and 3<sup>rd</sup> Floor levels. Further to the incident, the fire-affected areas were structurally assessed, the investigation includes the visual, non-destructive & destructive testing of the structural members in the fire-affected areas.

The Column Strengthening At Orchid City Center Mall, Mumbai Central, Mumbai. The Building proposed IT Complex. It has come across strengthening requirement. The reason of strengthening is load increment in base columns due to additional 4 floor has been proposed at top. Hence, it has been proposed to strengthen the column for rectifying its enhanced capacity need. All the loads, materials grade and reinforcement details were provided by the Client and based on that design of strengthening retrofitting of the columns has been prepared. M/s DGC Infrastructure Pvt Ltd has carried out the strengthening design calculation for columns.

## II. RELATED WORK

Structural members require strengthening due to wide variety of reasons such as change in loading on the structure, deterioration due to aging, revisions in Codal provisions, design deficiencies and faulty construction practices. It can be corrected by the following

methods: -

- Concrete jacketing/Section enlargement.
- Steel plate bonding
- FRP composite system.
- Grouting.

➤ Strengthening using CFRP for Compression Member:

Strengthening using FRP composites are one of the most recent methods being adopted nowadays owing to the various advantages it possesses. The main advantages in the use of CFRP composites is its light weight, high tensile strength, non-corrosiveness, non- magnetic properties and its advantage in being easy to install,

Here in case of Compression members it increases the load carrying capacity of the members without adding additional load on the structure. Strengthening wing FRP doesn't increase the dead load on the structure unlike in cases of RCC jacketing where the dead load of the structure and size of the structural member increases.

III. METHODOLOGY

1. Surface Preparation
2. Primer Application
3. Putthi Application
4. Saturant 1<sup>st</sup> Coat
5. Carbon Fiber Wrapping
6. Saturant 2<sup>nd</sup> Coat
7. Sprinkling Quartz Sand

IV. EXPERIMENTAL RESULTS

Sample ID	Avg. Load	Avg. strength
Plain	439.5	24.88
300GSM	818.9	46.36
400GSM	876.67	49.63
600GSM	1527	86.45

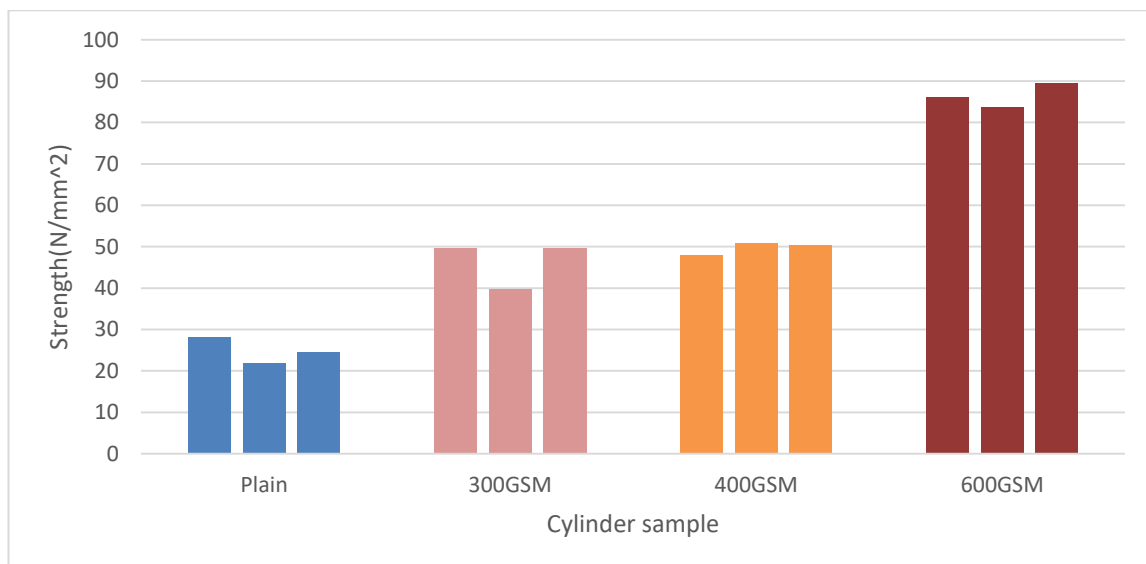


Fig. 1. Different Cylinder Sample

From above graph it is seems that 600GSM sample gives maximum strength as compare to another sample. Plain sample of M30 grade at 70days with various

V. CONCLUSION

We From experimental work and testing of specimen following conclusions have been concluded:

- i. After 70 day concrete attaining highest compressive strength when 600GSM carbon fibre rapping increase compressive strength of 61.57 N/mm<sup>2</sup> as compare to plain concrete column casting.
- ii. After 70 day concreteconcrete attaining highest compressive strength when 600GSM carbon fibre rapping increase compressive strength of 40.09 N/mm<sup>2</sup> as compare to300GSM column cylinder.
- iii. After 70 day concreteconcrete attaining highest compressive strength when 600GSM carbon fibre rapping increase compressive strength of 36.82 N/mm<sup>2</sup> as compare to400GSM column cylinder
- iv. Further I conclude that 600GSM is giving maximum strength as compare to all other type of casting.

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**INNO SPACE**  
SJIF Scientific Journal Impact Factor  
**Impact Factor: 8.423**



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