

1. TITLE OF THE PROJECT:

“Behavior of Columns with Rectangular Cross Section Shape Modified to Elliptical Cross Section Using FRCM”

2. NAME OF THE COLLEGE AND DEPARTMENT:

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4. KEYWORDS:

Retrofitting, Square Column, Ellipticalization, FRCM, Confinement.

5. INTRODUCTION:

The process of Rehabilitation of reinforced concrete (RC) structures may be a time-consuming and expensive procedure. As a result, the construction industry constantly searching for alternative techniques that are more convenient and less expensive. The externally bonded (EB) systems, which wraps the deteriorated structures with composite materials, are one of the approaches that have emerged in recent decades. For wrapping concrete, fiber-reinforced polymers (FRP) are the most often utilised materials. However,

wrapping with fiber-reinforced cementitious matrix (FRCM) was proposed as an alternative due to many limitations of the epoxy-based adhesives associated with FRP materials and also ellipticalization of the column is an ideal method for increasing the strength, stiffness, ductility, improves the structural components ability to carry more weight and confinement system.

6. OBJECTIVES:

The main aim of the project is to investigate the load-bearing capacity and failure modes along with confinement efficiency of Fibre Reinforced Cementitious Mortar (FRCM) strengthening systems for the reinforced concrete column by shape modification.

The objectives of the project are:

- To study experimentally the efficiency and load-bearing capacity of RC rectangular columns shape modified to elliptical shape using FRCM.
- To observe the failure modes of RC rectangular columns shape modified to elliptical shape using FRCM.
- To check the confinement efficiency of the shape-modified elliptical column compared to the rectangular column by corner radius and the number of FRCM layers.
- To evaluate the behavior of columns using FRCM by varying the number of layers retrofitted by the proposed method.

7. METHODOLOGY:

Materials: cement, aggregates, steel reinforcement, FRCM materials, strain gauges.

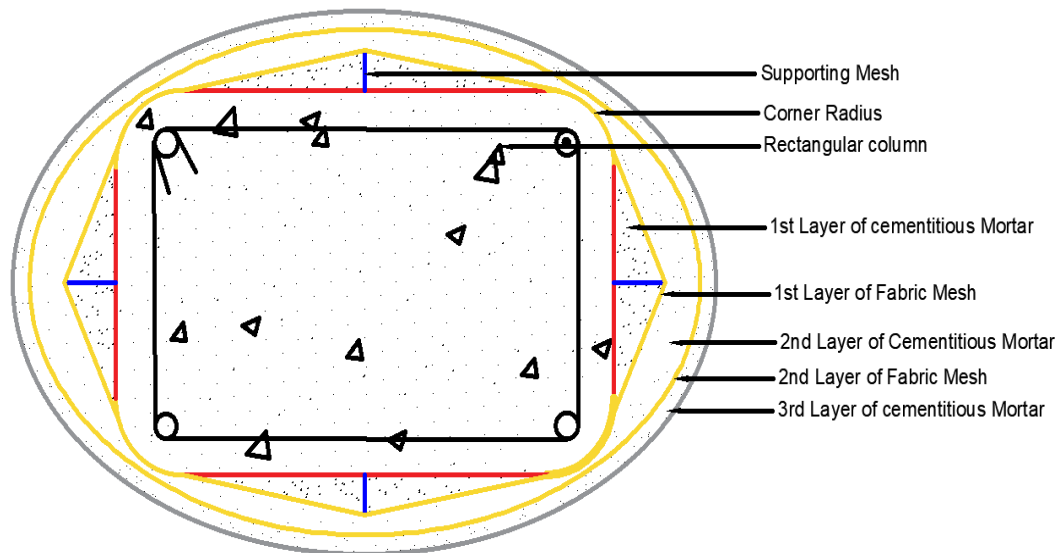
Method:

The conversion of rectangular column to elliptical column is usually incorporated in the previous literature by using precast segments or additional Micro concreting, and then FRP wrapping has been implemented, so that effectiveness of the confinement was maximum, but due to the presence of organic resin (epoxy) in FRP has significant drawbacks such as high temperature resistance, release of toxic gases, low substrate compatibility and inaccessible on wet surface.

In order to overcome all these limitations, the new methodology has been implemented in the present study, in which FRCM will be adopted for converting the shape modification by providing corner radius along with the meshing as one of the reinforcing material, which can be done in two or three layers and correspondingly FRCM will be applied to obtain shape modification.

The detailed methodology of the proposed study is presented below:

1. Casting of rectangular columns.
2. Curing of RC columns.
3. Drilling of holes on all four faces of the columns at required points.
4. Installing of supporting mesh into drilled holes.
5. Application of first layer of cementitious mortar on all four faces of column to resemble octagonal shape.
6. Wrapping of FRP fabric mesh around the column.
7. Application of second layer of cementitious mortar .
8. Wrapping second layer of FRP fabric mesh to rectangular columns to achieve elliptical shape.
9. Application of final layer (third layer) of cementitious mortar.



Rectangular Column Shape Modified to Elliptical Shape using FRCM

Details of Work Carried out:

Material properties testing, Formwork , Bar bending

To Be carried out:

Casting, Curing, Shape Modification, Testing

8. RESULTS AND CONCLUSION:

It is observed that all the materials properties lies in the range as specified in the Indian standards.

9. SCOPE OF FUTURE WORK:

- Further investigation on various structural elements other than columns
- Comparison of various FRCM materials for further test carries out in present study.
- Calibration of bond slip relation.
- Further study on aspect ratio of the elliptical cross-section columns.