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EVALUATION OF COMPRESSIVE STRENGTH OF RCC COLUMN STRENGTHENED USING FERROCEMENT WITH DIFFERENT MESH PATTERN

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Abstract- *Reinforced concrete structures often suffer damage due to overloading, natural disaster, environmental impact etc. this cause damage and failure of the structural element. The failure of the authoritative structure element like column may lead to severe damage of frame structure as it transfer the load of the super structure to the foundation. To strengthened damaged column various materials like glass fiber, aramid fiber, ferrocement, steel plates etc. can be used. In this study, short RCC column specimen tested under different percentage of ultimate load (100%, 75% & 50%), then this preloaded column specimen strengthened using ferrocement with different mesh pattern (0&45 degree) and different ferrocemnt thickness (15 mm& 25 mm). Then this strengthened column specimen retested to find its ultimate load carrying capacity. Test result shows the strengthening column using ferrocement increase its load carrying capacity.*

Keywords- *Short RCC column, Ferrocement jacketing, axial load carrying capacity*

I.INTRODUCTION

Due to natural disaster like earthquake, environmental impact etc. reinforced concrete structures damaged and deteriorated before its intended design life. Damage of the important structural element like column may lead to severe damage of the frame structure building because it is only structural element that transfer the entire load of the structure to the foundation. For repairing damaged column various strengthening techniques are used. To strengthened damaged column various material like aramid fiber, glass fiber, ferrocement etc. can be used. In developing countries, ferrocement can be an efficient restrengthening technique as its raw material are easily available. Due to uniform dispersion of reinforcement in cement mortar ferrocement strengthening effectively used to increase load carrying capacity of RCC column.

In this study, Experimental work carried out on Short RCC column specimen preloaded under different percentage of ultimate load (100%, 75% & 50%) then this preloaded column specimen strengthened using ferrocement and retested to find its ultimate load carrying capacity. from experimental study it was concluded that ferrocement confinement increase ultimate load carrying capacity of RCC column.

II.EXPERIMENTAL WORK

The following section deals with the experimental work carried out in this study.
Preliminary Investigation:
The preliminary investigation consist of testing of basic constituent material used in study for casting of column specimen as well as preparation of ferrocement mortar.
1. Cement:
Ordinary Portland cement of OPC 53 grade and conforming to IS 12269 used for casting of column specimen as well as preparation of mortar.

2. Fine aggregate:
Natural river sand having fineness modulus 2.44 and specific gravity 2.52 and conforming to zone II of IS 383 used.

3. Coarse aggregate:
Crushed aggregate of 10mm and 20 mm in proportion of 40:60 having specific gravity 2.7 used in casting of column specimen.

4. Water:
Potable water free from organic matter used for casting of column specimen as well as preparation of mortar.

5. GI wire mesh:
GI welded wire mesh having 1 mm diameter wire and 15 mm×15 mm square opening used in ferrocement jacketing of RCC column.

Fig. 1 GI wire mesh

6. Mix proportion:
For this experimental study constituent mix prepared for M25 grade of concrete having mix proportion 1:1.45:2.9 with w/c ratio of 0.45.Six concrete cubes of size 150 mm×150 mm×150mm were casted and tested at 7-days and 28-days for compressive strength determination. The average 28-days compressive strength for the same was 30.5 N/mm^2.

7. Column specimen detail:
Short RCC column having cross sectional area 150 mm ×150 mm and height 600 mm was used for experimental work. The detail of column specimen shown below:

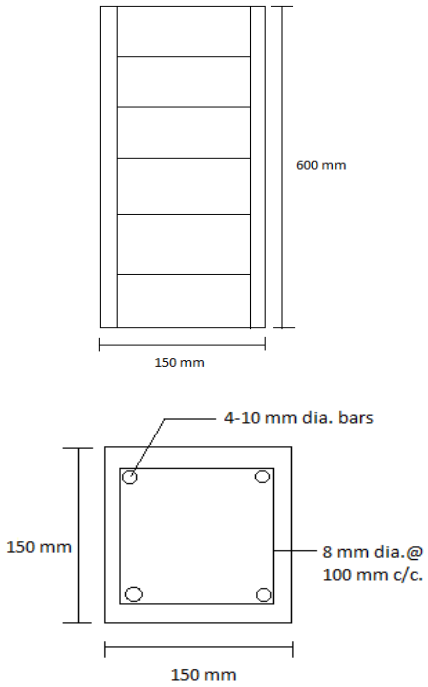

Fig. 2 column specimen detail

8. Ferrocement jacketing:
After testing, preloaded column specimen strengthened using ferrocement with mortar mix proportion of 1:2 and w/c ratio 0.4 with different ferrocement thickness (15 mm & 25 mm) and different orientation of mesh (0 & 45 degree). Then this strengthened column further cured for 14 days and retested to find its ultimate load carrying capacity.

Fig. 3 wrapping column using single layer wire mesh

9. Casting of column specimen:
Short RCC column specimen of size 150 mm×150 mm effective cross-sectional area and height 600 mm were casted in M25 grade of concrete in wooden mould and demoulded after 24-hours of casting and cured for 28-days. After curing all column specimen were tested in UTM of 1000 kN capacity under different percentage of ultimate load (100%, 75% & 50%). then this preloaded column specimen strengthened using ferrocement and retested to find its ultimate load carrying capacity.

10. Testing of column specimen:
After curing all column specimen were tested in UTM of 1000 kN capacity to find its load carrying capacity. First control column specimen tested up to failure to find its ultimate load carrying capacity and then other column specimen tested under different percentage of ultimate load (75% & 50%).

III. TEST RESULTS AND DISCUSSION

The experimental result obtained from testing of short RCC column 150 mm×150 mm cross-sectional area and 600 mm height tested under different percentage of ultimate load and jacketed using ferrocement jacket and retested to find its ultimate load carrying capacity.

Fig.1 testing of non-jacketed column specimen

Table 1: specimen detail and designation

Column specimen sample id	Test load (kN)	First crack load (kN)
100-11 (ultimate load)	535	400
75-11 (75% ultimate load)	401.25	300
50-11 (50% ultimate load)	267.5	197
100-12 (ultimate load)	564	394
75-12 (75% ultimate load)	423	320
50-12 (50% ultimate load)	282	198

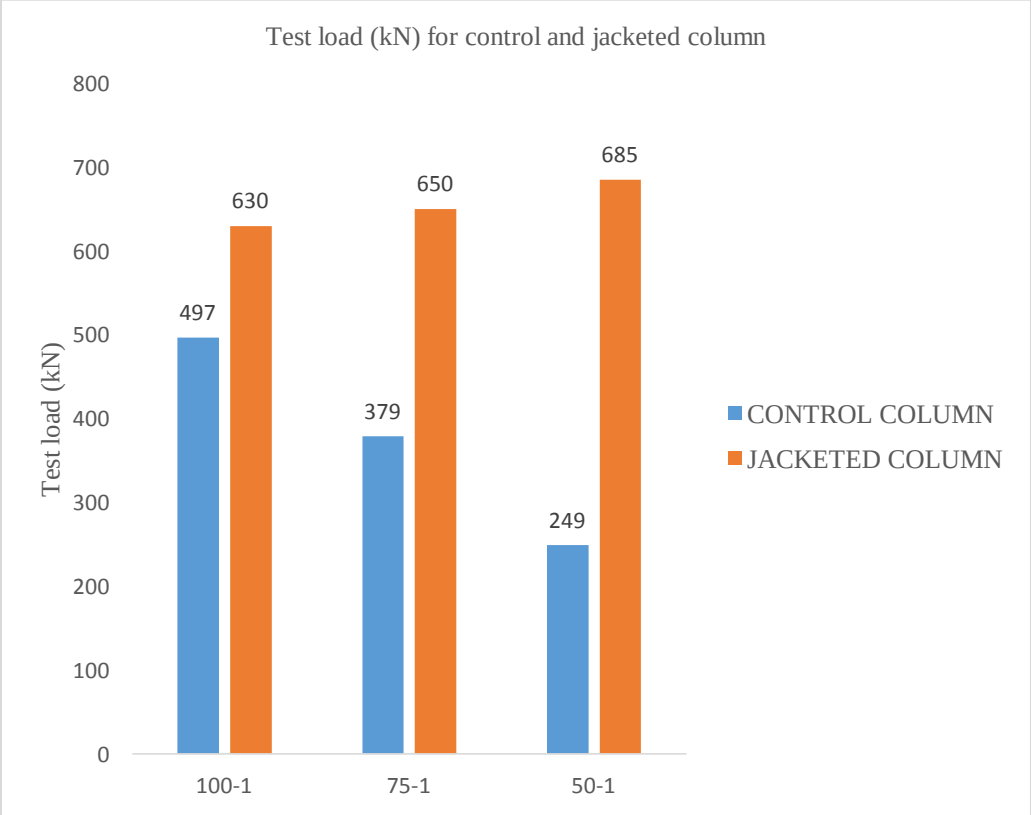

Fig. 2 Test load (kN) for control and jacketed column
(Jacketed using 15 mm thickness & 0 degree orientation of mesh)

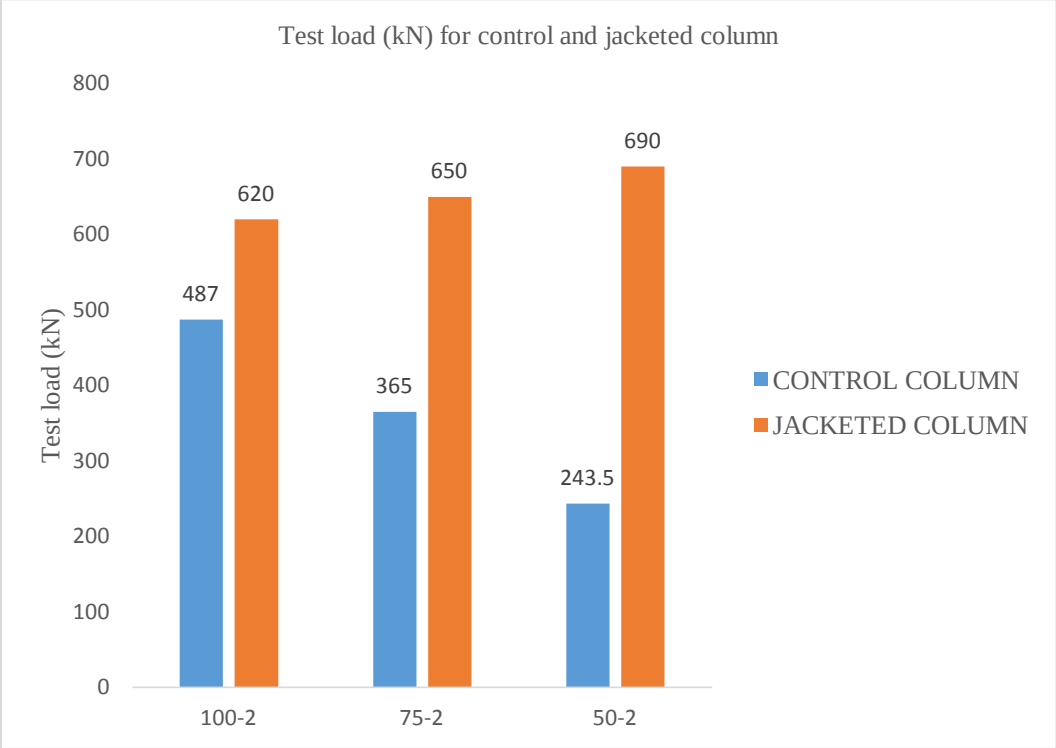

Fig. 3 Test load (kN) for control and jacketed column
(Jacketed using 15 mm thickness & 45 degree orientation of mesh)

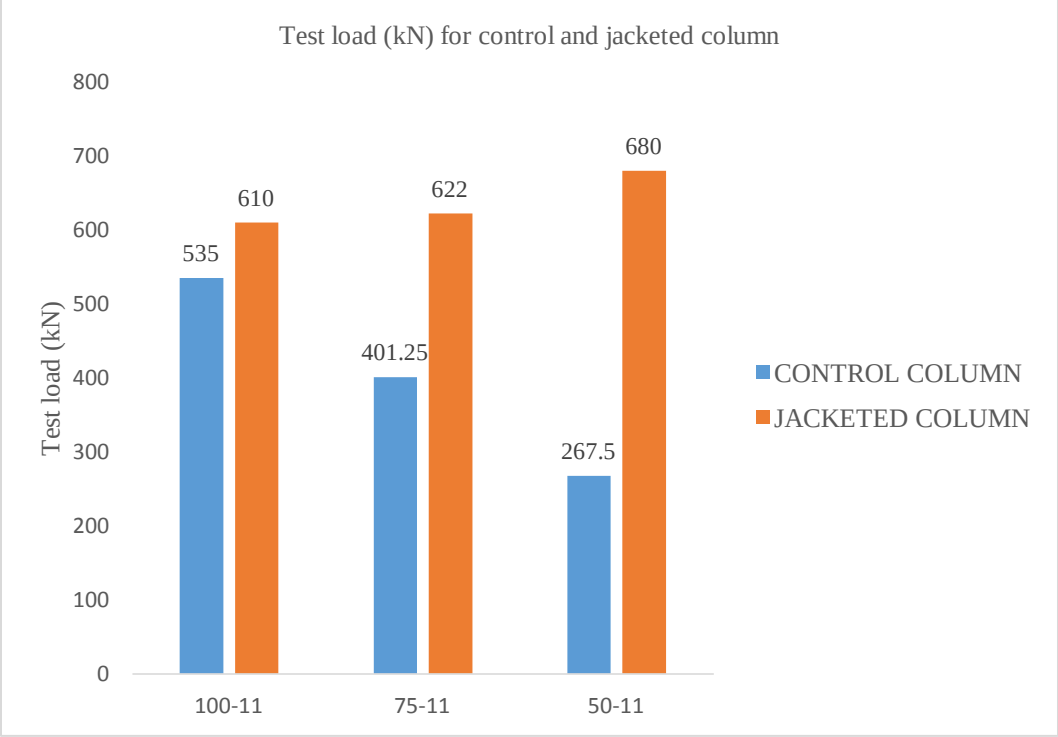

Fig. 5 Test load (kN) for control and jacketed column
(Jacketed using 25 mm thickness & 0 degree orientation of mesh)

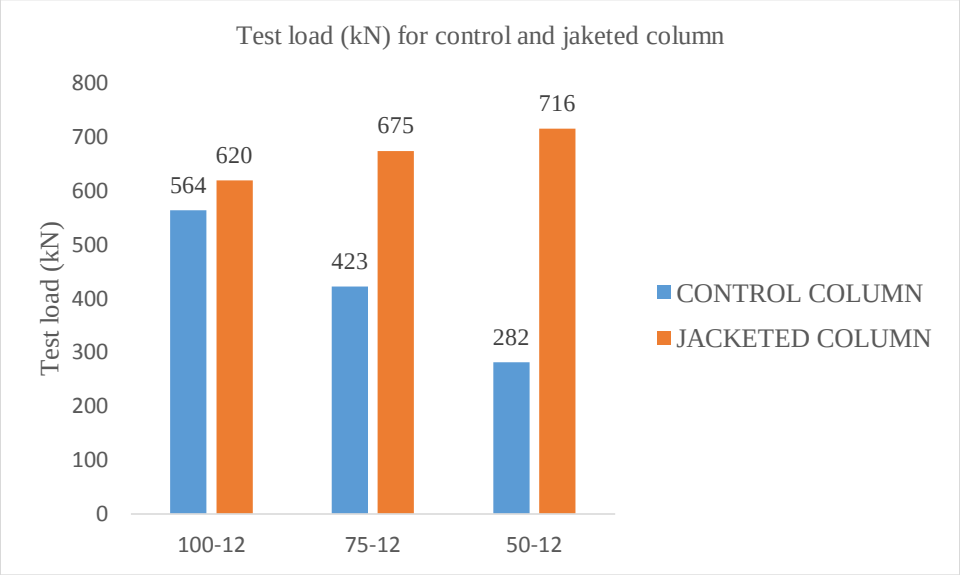

Fig. 6 Test load (kN) for control and jacketed column
(Jacketed using 25 mm thickness & 45 degree orientation of mesh)

IV. CONCLUSION

From experimental programme carried out on short RCC column the following conclusion were made:

- Ferrocement jacketing used effectively for strengthening of column to increase its load carrying capacity.
- Strengthening column using 0 degree & 45 degree orientation of mesh and 15 mm ferrocement thickness there is 26%, 30%, 37% and 27%, 33%, 41% increase in load carrying capacity respectively as compared to control column.
- Strengthening column using 0 degree & 45 degree orientation of mesh and 25 mm ferrocement thickness there is 12%, 16%, 27% and 11%, 19%, 26% increase in load carrying capacity respectively as compared to control column.
- As compared to 0 degree orientation of mesh 45 degree orientation of mesh give better result in both ferrocement thickness.

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