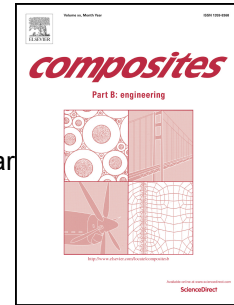


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A new strengthening technique for increasing the load carrying capacity of rectangular reinforced concrete columns subjected to axial compressive loading

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1 **A NEW STRENGTHENING TECHNIQUE FOR INCREASING THE LOAD CARRYING**
2 **CAPACITY OF RECTANGULAR REINFORCED CONCRETE COLUMNS SUBJECTED**
3 **TO AXIAL COMPRESSIVE LOADING**

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15 **Abstract**

16 In this work, a new technique for the efficient confinement of reinforced concrete (RC) columns of
17 rectangular cross-section is described and its effectiveness is assessed experimentally. This technique
18 is based on the concept of applying strips of carbon fiber reinforced polymer (CFRP) wet layup sheets
19 with a certain prestress level using a mechanical device. The influence of the cross-section aspect
20 ratio of columns on the axial stress-strain response, strain field in the CFRP and strength increase
21 provided by the different adopted strengthening configurations was investigated. All specimens had a
22 height of 1100 mm, and three cross-sections were considered: 120×120 mm², 240×120 mm² and
23 480×120 mm², representing cross-section aspect ratios (large/small edge) equal to 1, 2 and 4,
24 respectively. Four types of columns were tested: conventional RC columns (reference columns), fully-
25 wrapped columns, partially-wrapped columns, and columns strengthened according to the new
26 technique. All columns were subjected to axial compression loading until failure. The experimental
27 results show that the cross-section aspect ratio has a significant effect on the confinement
28 effectiveness that CFRP strengthened systems can provide to RC columns of rectangular cross-
29 section. The maximum axial strength and axial strain at the peak load of all columns significantly
30 decrease when the cross-section aspect ratio increases. Based on the obtained experimental results, it
31 is shown that the proposed technique is more efficient in terms of increasing the load carrying
32 capacity of rectangular RC columns than CFRP-based conventional strengthening techniques.

33
34 **Keywords:** Confinement, RC columns of rectangular cross-section, CFRP, Prestress application,
35 Axial compressive loading tests, Analytical model

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