Prediction of axial compressive strength of reinforced concrete circular short columns confined with carbon fiber reinforced polymer wrapping sheets

Omar Ahmed Farghal and Hesham Mohamed Ahmed Diab

Abstract:

External confinement of concrete columns by means of carbon fiber reinforced polymer (CFRP) sheets can be considered as an efficient technique for their structural strengthening. An experimental research program including 18 circular short column specimens were tested under axial compression load, to investigate the gain strength of reinforced concrete (RC) columns confined with CFRP sheets. The parameters studied were both the volume and configurations of CFRP sheets, the size of cross-section, the percentage of main reinforcement, and the volume of internal stirrups. On the basis of the obtained results, mathematical models (Egyptian code and American Concrete Institute code) proposed to predict the axial compressive strength of non-slender RC column strengthened by means of CFRP sheets are evaluated. These codes showed an underestimation in predicting the axial compressive strength of RC strengthened columns. This, from the authors’ point of view, is attributed mainly to the fact that the proposed models overlooked the amount of internal stirrups when calculating the strength of strengthened columns. Therefore, modifications in the studied models were considered. The modifications take the effective lateral confining pressure due to presence of internal steel stirrups into account. The modified codes showed an acceptable approach to the experimental results.

Keywords:

Carbon fiber reinforced polymer (CFRP) sheets, wrapping, confinement

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