CONFINEMENT OF COLUMNS UNDER ECCENTRIC LOADING

A Thesis Submitted in Partial Fulfillment of the Requirement for the Degree of

MASTER OF SCIENCE

in

Civil Engineering

(Structural Engineering)

by

Al-husin Usri Yasin

Faculty of Engineering, Fayoum University

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To my Parents

Abstract

Reinforced concrete columns are sometimes subjected to biaxial bending as a result of their positions in a structure. A typical example is the corner column in flat slab or columns resisting earthquake or wind loads. In some cases, the architectural or mechanical design requires a limited cross section of columns. So confinement of columns was investigated because it helps in increasing columns carrying capacity.

In this research, three-dimensional finite element models were developed to analyze the mechanism and the behavior of concrete columns subjected to biaxial bending using the finite element method (FEM). Numerical results are verified with test results.

The study was extended to reinforced concrete columns with variable parameters such as concrete strength values, eccentricities, spacing between stirrups, and stirrups shapes subjected to axial compression with biaxial bending moments.

The conclusion was shown, among which is that when the distance between stirrups changes from 20cm to 12.5cm the gain in capacity increase more than twice when the same distance changes from 12.5cm to 5cm. Also there is a small difference in load carrying capacity in columns when using stirrups for inner rebars. The effect of concrete strength and the effect of the eccentricity of load are also shown.

Key Words: Reinforced Concrete Columns, Confinement, Finite Element Analysis, Stirrups, Biaxial Bending.