



Cairo University

EFFECT OF DESIGN PARAMETERS ON COLUMN SHORTENING IN TALL CONCRETE BUILDINGS

By

Eslam Abd El-Nabi Ahmed Hemayed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Structural Engineering

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Title of Thesis:

Effect of Design Parameters on Column Shortening in Tall Concrete Buildings

Key Words:

Column shortening; creep; shrinkage; differential shortening; steel stress

Summary:

In tall concrete buildings, the vertical elements: columns, shear walls, and cores undergo elastic shortening and time dependant axial shortening caused by creep and shrinkage. In this study, a computer program was developed and verified to calculate column axial shortening based on the ACI 209R-92 model. The developed program was used to investigate the effects of different design parameters on column shortening. The results showed that increasing the column design reinforcement ratio increases both before-floor-casting and after-floor-casting column shortening. In particular, compared to 1% ratio, increasing the column reinforcement ratio to 2%, 3%, and 4% increases the before-floor-casting column shortening by 5% to 11%, 9% to 22%, and 13% to 32%, respectively. Besides, compared to 1% ratio, increasing the column reinforcement ratio to 2%, 3%, and 4% increases the after-floor-casting column shortening by 7% to 9%, 14% to 17%, and 20% to 27%, respectively. However, the effect of column aspect ratio has a minor effect on column shortening. Nevertheless, increasing the rate of construction results in a significant increase in the after-floor-casting shortening but greatly reduces the before-floor-casting shortening of columns. In addition, the results showed that increasing the design concrete strength increases the column shortening.

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