BEHAVIOR OF HIGH STRENGTH REINFORCED CONCRETE COLUMNS UNDER CENTRIC AND ECCENTRIC LOADS

BY

Heba Mustafa Mahmoud Mohamed

A thesis submitted to the
Faculty of Engineering; Cairo University
in partial fulfillment of
the requirements for the M.Sc. Degree
in
STRUCTURAL ENGINEERING

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Under the supervision of

Prof. Dr.\ Hany Mohamed El-Hashimy
Professor of concrete structures
Structural Engineering Department
Faculty of Engineering
Cairo University

Dr.\ Nasser F. H. EL-Shafey
Assc. Professor
Structural Engineering Department
Faculty of Engineering
Cairo University

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Approved by the
Examining Committee

_____
Prof. Dr. Ahmed Sherif Essawy, External Examiner
……

_____
Prof. Dr. Magdy El-Sayed Kassem, Internal Examiner
……

_____
Prof. Dr. Hany Mohamed El-Hashimy, Thesis Main Supervisor
……

_____
Assc. Prof. Dr. Nasser F. H. El-Shafey , Member
……

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2016

Engineer's Name: Heba Mustafa Mahmoud Mohamed
Date of Birth: 22/9/1981
Nationality: Egyptian
E-mail: Heba_mustafa@hotmail.com
Phone: 01288477557
Address: 3 El-Salam St., El-Thalathiny St.
Omrania, Giza, Egypt.

Registration Date: 1/10/2012
Awarding Date: / / 2016.
Degree: Master of Science
Department: Structural Engineering
Supervisors: **Prof. Dr. Hany Mohammed El-Hashimy (Thesis main advisor)**
Assc. **Prof. Dr. Nasser F. H. El-Shafey (Member)**

Examiners: **Prof. Dr. Ahmed Sherif Essawy (External examiner)**
Professor of Concrete Structures, Ain Shams University
Prof. Dr. Magdy El-Sayed Kassem (Internal examiner)
Prof. Dr. Hany Mohammed El-Hashimy (Thesis main supervisor)
Assc. **Prof. Nasser F. H. El-Shafey (Member)**

Title of Thesis:

Behavior Of High Strength Reinforced Concrete Columns Under Centric And Eccentric Loads

Key Words:

High Strength Concrete, High Strength columns, High strength concrete columns under Centric and Eccentric Loads, Nonlinear Finite element analysis of high strength concrete columns.

Summary:

Interest in structural engineering is more growingly focused on using high performance and high strength structural materials. Concrete is eventually among the most world widely used in construction. Use of high strength concrete (HSC) is mainly attractive in the design of columns and vertical carrying members. The supplemented gain in compressive strength leads to a satisfactory diminution of the cross-sections; as such members are mainly subjected to centric & eccentric forces introduced by the gravity loads and wind pressure/seismic forces. This thesis presents an analytical investigation about the behavior of squared, columns made of variable strength concrete; under axial and eccentric loads. The research program included 34 columns; all have a squared cross-section (200x200) mm and 3000 mm height. They were arranged to enable investigating the following parameters: concrete characteristic strength (f_{cu}); ranging between 25 & 100 N/mm^2) - Longitudinal reinforcement ratio (μ); ranging between 1.13 and 2.26 % - Transverse steel volumetric ratio (μ_{vst}); ranging between 0.321% and 0.57%. The load eccentricity/depth ratio (e/t) ranged between 0.0, 0.125, 0.25 and 0.75. The study includes non-linear finite element models prepared for the columns and structurally analyzed using an available nonlinear finite element program appropriate for presenting the non-linear behavior of concrete and steel. Concrete cracking was also included in the analysis. The effect of the above parameters on column ultimate load, mid–height, lateral displacement, and columns cracking patterns is reported and discussed.

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