



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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Investigation of the Behavior of Reinforced Concrete Beam-Column Joints

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

DOCTOR OF PHILOSOPHY
In
CIVIL ENGINEERING (STRUCTURES)
By

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This thesis is submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Civil Engineering (Structures).

The author carried out the work at the faculty of engineering reinforced concrete laboratory, Ain Shams University. No part of this thesis was submitted for a degree or a qualification at any other university or institution.

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Ain Shams University
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ABSTRACT of Ph.D. THESIS

Thesis Title: INVESTIGATION OF THE BEHAVIOR OF
REINFORCED CONCRETE BEAM COLUMN JOINTS

Submitted By: Ehab Hedib Ramadan

Supervisors: Prof. Dr. Ayman H. Hosny Khalil

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ABSTRACT

The beam-column joint is a very critical part of reinforced concrete framed structures. Joints ensure continuity of a structure and transfer forces that are present at the ends of the members. In reinforced concrete structures, failure in a beam often occurs at the beam-column joint, making the joint one of the most critical sections of the structure system.

The joint behavior was dependent on several factors related to their geometry, amount and detailing of reinforcement, relative stiffness between beam and column, concrete strength, loading pattern, and the column acting axial load. This study aimed to understand better reinforced concrete beam-column joints' behavior under the effect of three different factors: column shape, transverse beam position, and transverse reinforcement of joints.

An experimental program consists of testing three full-scale beam-column Joints with different eccentric-beam column connections with the same reinforcement were cast to study the effect of beam transverse position. Also consist of four full-scale beam-column Joints, with the same column moment of inertia to study the effect of Column shape. Another three full-scale beam-column Joints were cast to study the effect of transverse reinforcement of joint. All Joints were cast from normal strength concrete grad 35 Mpa and tested under same test setup conditions under fixed load at the column to and quasi-Static load (Cyclic load) at beam end. Parameters such as ultimate load, displacement, steel strain, energy dissipation capacity, stiffness degradation, and crack behavior of concrete were examined.

An analytical study using a non-linear finite element analysis software program (ANSYS) was conducted. The ultimate specimen capacity and load-displacement behavior of tested specimens were predicted and compared to the measured values of the experimental.

The results show that the concentric beam position is the best transverse position for the beam in the joint, also is better in the displacement, energy dissipation capacity, stiffness degradation, and strength decay. The results show that all joints exhibited the same failure mode at interaction face between beam and column for column shape effect. Rectangular column (with the same width of a beam) and squared column shape were higher than the regular rectangular and circular columns in loading capacity, displacement, stiffness degradation, and strength decay. For transverse reinforcement of joint, the results showed that increase transverse reinforcement in joint cause increasing cumulative energy dissipation, stiffness degradation rate, and strength decay rate for reinforced beam-column Joint.

Keywords: Column, Joints, RC structures,

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