



Ain Shams University
Faculty of Engineering

**Dowel action effect on the shear capacity of reinforced concrete
beams**

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STATEMENT

This thesis is submitted to Ain Shams University in partial fulfilment of the requirements for the degree of Master of Science in Structural Engineering.

The work included was carried out by the author at Reinforced Concrete Laboratory of the Faculty of Engineering, Ain Shams University.

No part of this thesis has been submitted for a degree or a qualification at any other university or institution.

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ABSTRACT

TITLE: “Dowel Action Effect on the Shear Capacity of Reinforced Concrete Beams”

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If the longitudinal reinforcement of a beam is loaded by a component of a force acting perpendicular to the reinforcement bars this is called dowel action.

Shear capacity of reinforced concrete beams depends on Concrete strength, Stirrups volume and Presence of longitudinal steel which can lead to a better reinforcement distribution in order to develop new economical design.

Since most of codes and especially Egyptian code do not take into consideration the effect of dowel action of longitudinal bars on the shear capacity of reinforced concrete beams and due to lack of study of the dowel action effect on the shear capacity of reinforced concrete beams therefore we need more studies and research in this field.

The main objective of this thesis is to examine, experimentally and theoretically, effect of cross section area of longitudinal steel on the shear capacity of reinforced concrete beams, effect of location and distribution of longitudinal steel on the shear capacity of reinforced concrete beams and effect of Concrete Strength on the shear capacity of reinforced concrete beams under two eccentric concentrated load, from

zero up to failure load (causing combined bending, torsion and shear stresses).

The experimental program consisted of testing eight medium scale models of reinforced concrete beams. All the specimens had a clear span of 2.00 m and a total length of 2.30 m. The cross section dimensions were 150×300 mm. All the tested beams had the same bottom reinforcement of 2 ϕ 16 and variable additional reinforcement. Stirrups were 5 ϕ 6/m in all beams except specimen B6 which is without stirrups to examine the effect of the dowel action.

All beams were simply supported and symmetrically loaded with two concentrated loads with distance 500 mm from the support and consequently, the shear force is one-half the total applied load.

The analytical program considered in this study includes performing nonlinear finite element models using ABAQUS v6.7 program, taking into consideration the non-linear stress-strain curve of the concrete and steel. These models are performed to simulate the beams behaviour and to extend study of the behaviour of such beams. The FE results were compared to those obtained from the experiments and the results agreed in a satisfactory way.

Finally, design guidelines, analysis of test results of RC beams and recommendations were presented.

Keywords: Dowel action, Longitudinal bars, Shear Strength, Reinforced Concrete beams, nonlinear finite element models, Confinement effect.

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