AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL ENGINEERING DEPARTMENT

Shear Behavior of Reinforced Lightweight Concrete T-Beams

A Thesis
Submitted in partial fulfillment for the
requirements for the degree of

MASTER OF SCIENCE
In
Civil Engineering (Structures)

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STATEMENT

This thesis is submitted to Faculty of Engineering, Ain Shams University, Cairo Egypt, for the degree of Master of Science in Structural Engineering.

The work included in this thesis was carried out by the author in the Department of Structural Engineering, Ain Shams University, from July 2014 to March 2018.

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

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Abstract of the M.Sc. Thesis Submitted by

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Title of the thesis:

SHEAR BEHAVIOR OF REINFORCED LIGHTWEIGHT CONCRETE T-BEAMS

ABSTRACT

Many factors affect the shear behavior of lightweight concrete with polystyrene foam particles (LWC) was experimentally and numerically evaluated in this study. Polystyrene foam is used as lightweight aggregate to produce lightweight structural concrete with unit weight 1800 kg/m3. Also, thesis has experimental and theoretical phases. The experimental program consisted of two phases; namely, determining the LWC mechanical properties and testing six LWC beams. The mechanical properties incorporated the compressive and tensile strength of concrete as well as its elastic modulus. The second phase included testing the LWC beams under two concentrated loads to failure load.

This research program evaluates the shear behavior of lightweight reinforced concrete beams. A total of six reinforced concrete beams (one beam with a rectangular section and five beams with T-beams) were tested under static load conditions. The main variables in the study were flange width and shear span to depth ratio.

Research findings indicate that shear strength of T-beans is higher than the shear strength of the rectangular beams, but presence of flange or increasing it for beams having the same shear span to depth ratio does not significantly have an effect on stirrups contribution, while decreasing shear span to depth ratio for beams having the same flange width have an effect on stirrups contribution.

The thesis also presents a numerical model that evaluates the applicability of finite element method for lightweight concrete T-beams, The analysis was extended to include detailed comparison with the experimental result, also more results estimated from the numerical program and explained in the finite element results after verification the results.

Keywords: LWC behavior, Concrete type, Beam, Foamed concrete, Lightweight, Shear behavior.

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