AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL ENGINEERING DEPARTMENT

PUNCHING SHEAR BEHAVIOR OF LIGHTWEIGHT FOAMED CONCRETE SLABS

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

MASTER OF SCIENCE
In
CIVIL ENGINEERING (STRUCTURES)

by

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STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Civil Engineering (Structural).

The work included was carried out by the author at reinforced concrete unit lab in 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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Punching Shear Behavior of Lightweight Foamed Concrete Slabs

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ABSTRACT

The main objective in this thesis is to experimentally study and investigate the Punching Shear Behavior of Self-Compacting Lightweight Concrete (LWC) Slabs. LWC was obtained through the use of polystyrene foam as a partial aggregate's replacement to reduce the concrete dry unit weight from 23.0 kN/m^3 to 18.5 kN/m^3. Nine medium scale RC slabs were statically tested to failure under concentric punching loading. The concrete type, slab's thickness, amount of shear reinforcement and loaded plate area were the test parameters. A comprehensive presentation of the experimental procedures, testes and results is undertaken in the thesis, followed by a general discussion of the obtained results. Finally, the punching shear capacities were obtained from the test results and compared with the calculated values from the available codes' equations.

Key results showed that the use of LWC in RC slabs resulted in most pronounced post-cracking structural degradations, including reduced stiffness until failure and reduced capacity but increased deformability relative to the normal density concrete (NDC) slabs.

The LWC slab's degradations were overcompensated through increased thickness, where increased capacity was achieved, but at the price of deformability reductions.

Increasing loaded plate area or providing shear studs as shear reinforcement resulted in considerably improved structural behavior and increased post-yielding stiffness of slabs' responses as well as increased failure loads and increased failure deflections relative to LWC slab.

KEYWORDS: LWC slabs; Punching Shear behavior; Shear Reinforcement; Slab thickness; Loaded area.

ACKNOWLEDGEMENT

First of all, I thank GOD who guided and helped me to finish this work in the proper shape.

I would like to express my deepest gratitude and appreciation to my supervisors, Prof. Dr. Eng. Amr Salah El-Dieb, Prof. Dr. Eng. Amr Ali Abd-Elrahman and Associate Professor Dr. Eng. Amr H. A. Zaher for their consistent guidance, interest, patience and encouragement during the period of the research. Their valuable comments and suggestions during the research program and their efforts in reviewing the manuscript are greatly appreciated.

Also, I would like to thank the staff of the Reinforced Concrete Laboratory and the staff of the Properties and Strength of Materials Laboratory at Ain Shams University, for their assistance during the experimental program.

Finally, I am deeply indebt to my mother for her spiritual support and continuous encouragement towards the completion of this thesis.

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