Shear Behavior of Structural Lightweight Concrete Beams

A Thesis
Submitted to the Faculty of Engineering
Ain Shams University for the partial Fulfillment
of the Requirement of M.Sc. Degree
In Civil Engineering

Prepared by

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B.Sc. in Civil Engineering, June 2010
Higher Institute of Engineering – El Shorouk Academy

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2017

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THESIS APPROVAL

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STATEMENT

This dissertation is submitted to Ain Shams University, Faculty of Engineering for the degree of M.Sc. in Civil Engineering.

The work included in this thesis was carried out by the author in the department of Structure Engineering, Faculty of Engineering, Ain Shams University, from 2013 to 2017.

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

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

Date: - / / 2017

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ABSTRACT

This research program was conducted to investigate the shear behavior of structural lightweight concrete beams subjected to two-point load. For this purpose, a finite element model using the computer package ANSYS Ver.10 was developed, verified, and implemented in an extensive parametric and analytical study.

All the necessary steps to create the models which are prepared to investigate the behavior of structural lightweight concrete beams in shear. The experimental results for shear of structural LWC beams presented in the literature were used to verify the analytical study. The experimental results were compared with finite element results to verify the accuracy of finite element models. All beams had a rectangular cross section of 150 mm wide and 300 mm total depth. The beam effective depth was set to 275 mm. The clear span of the tested beams was fixed for all beams to be 2000 mm but the total length of beams was 2300 mm. All beams were tested under two-point load.

A total of twenty-four beams (all beams are simply supported) were analyzed. The analyzed beams were chosen to investigate the effect of various parameters including using structural lightweight concrete instead of ordinary concrete, variation of shear reinforcement, and variation of cross section of the beams. The breadth, depth, and length of the analyzed beams were 150, 300, and 2000 mm, respectively. Based on the analysis of results obtained from finite element modelling of simply supported reinforced-concrete beams, several conclusions are drawn as follow.

Insignificant enhancement in the ultimate load occurred when using structural lightweight concrete instead of ordinary concrete. Providing longitudinal shear reinforcement in reinforced concrete

beam increases its ultimate capacity in shear. Using longitudinal shear reinforcement instead of stirrups reduces its ultimate capacity in shear. Increasing in the ultimate load occurred when using flanged section instead of R-section. Reduction in the stiffness occurred when using lightweight concrete instead of ordinary concrete. Providing longitudinal shear reinforcement in reinforced concrete beam increases the stiffness of beams. Using longitudinal shear reinforcement instead of stirrups has minor effect on the stiffness of beams. Increasing in the stiffness of beams occurred when using flanged section instead of R-section.

Acknowledgment

I would like to thank ALLAH for his blessings all the way till I finished this research and throughout my life.

I wish to express my deep appreciation and gratitude to my supervisors for their great effort in solving all the problems during this research and for their valuable advice and encouragement,

Prof. Dr. Ayman Hussein Hosny khalil

Ass. Prof. Sherif Kamal Elwan

In addition, I would like to thank my colleagues for their help and advice during this research.

Finally, but of great importance, I wish to express all the meanings of love, gratitude and appreciation to my family (my father, my mother, my wife, my brother and my sister) for their support and continuous prayers for me till finishing this thesis.

Ashraf Freeg Saad Ragab

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