# PERFORMANCE-BASED DAMAGE ASSESSMENT OF STRUCTURAL WALLS

***A Thesis***

Submitted to the Faculty of Engineering
Ain Shames University for the Partial Fulfillment
of the Requirements of The Degree of Master of Science
In Civil Engineering

**Prepared by**

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B.Sc. in Civil Engineering, August 2010
Higher Technological Institute – Tenth of Ramadan City

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**2015**

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**(STRUCTURE ENGINEERING)**

By

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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 2010 to 2015.

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

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# ABSTRACT

The main objective of the research reported in this thesis is to investigate the behaviour of reinforced masonry shear walls subjected to quasi-static loading. To achieve the aforementioned goal and better understanding of masonry shear walls behaviour, a large number of reinforced masonry shear walls is needed to experimentally tested under cyclic loading. Laboratory testing of full-scale masonry shear walls can be impractical due to space limitation, construction, and financial restriction.

Hence, the need for analytical model emerged to analyze a lot of reinforced masonry shear walls. A nonlinear program CANNY is selected to model reinforced masonry shear walls. To check the validity of the nonlinear program, it is required to compare the results of RM walls tested experimentally before with the results of the same walls modeled with the nonlinear program CANNY. The nonlinear program CANNY obtained results is found in good agreement compared with experimental results. Thus, the program is capable of simulating the response of reinforced concrete masonry shear walls under lateral loading.

The subsequent phase of model verification entailed in conducting parametric study. Parametric study was performed to investigate the different parameters that affect the behaviour of reinforced masonry shear walls. The parameters which were varied in this analysis include: Axial compressive stress, vertical reinforcement ratio ($\rho_v$) and the height/length ($h_w/\ l_w$) aspect ratio. The axial compressive stress varied from zero to 2.25 MPa, vertical reinforcement ratio varied from 0.31% to 1.3%, and aspect ratio varied from 1.5 to 3.95.

The behaviour of rectangular reinforced masonry shear walls is investigated by evaluating flexure strength, lateral displacement and drift at ultimate, yield and 15% strength degradation. For each mentioned parameters displacement ductility and idealized displacement ductility at 15% strength degradation are obtained. Analytical results showed that by increasing the vertical reinforcement and axial compressive stress, ultimate and yield flexure strength increase. On the contrast, the lateral displacement and drift at maximum load, at first yield, and 15% degradation in strength decrease with this increase. Lateral displacement at maximum load had insignificant effect with vertical reinforcement ratio. Based on results the displacement ductility at 15% strength degradation and idealized displacement ductility decreased with the increase of vertical reinforcement and axial compressive stress. Although the displacement ductility at maximum load increased by increasing axial compressive stress and vertical reinforcement ratio. The aspect ratio had a great effect in all parameters and this effect appeared in all charts includes vertical reinforcement and axial compressive stress.

# DEDICATION

It is a great pleasure to dedicate my

M.Sc. Thesis

To the most persons I love in my life

*My Father, My Mother*

# ACKNOWLAGEMENT

**All praise and gratitude be to ALLAH with the blessings of whom the good deeds are fulfilled.**

I am eager to take this opportunity to thank everyone who helped me during my work in this research and special mention my thesis committee members.

I am particularly indebted to **Prof. Dr. OSAMA HAMDY**, Professor, of Concrete Structure, Ain Shams University, for his valuable help, caring, advice and encouragement as supervisor of this project

I would like to express my great debt for help beyond measure to **Dr. MARWAN TAREK SHEDID**, Assistant Professor, of Concrete Structure, Ain Shams University, for his excellent guidance, endless support, encouragement, valuable advice he has given me during this research. His comments and suggestions during the preparation of this thesis are sincerely appreciated.

I would also like to gratitude **Dr. HUSSEIN OSAMA OKAIL**, Assistant Professor, of Concrete Structure, Ain Shams University, for providing his assistance, patience and guidance during my work in this research.

Acknowledgements also extended to the staff of the Higher Technological Institute, $10^{th}$ of Ramadan City, for their help and cooperation. I am also, very grateful to Dr. MORCOS FARID in Structural Department for continuous guidance, motivation and help.

Last, but certainly not the least, I take this opportunity to express the profound gratitude from my deep heart to my beloved parents, grandparents, and sisters for their continuous support, lover, prayer, and encouragement throughout my life. I cannot imagine my life without them.

# TABLE OF CONTENTS

**CHAPTER THREE – NONLINEAR BEHAVIOUR OF REINFORCED CONCRETE MASONRY SHEAR WALLS**

**CHAPTER FOUR – PARAMETRIC STUDY**

# LIST OF FIGURES