



AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
Structural Engineering

PERFORMANCE ASSESSMENT OF MULTI STORY STONE UNREINFORCED MASONRY BUILDINGS WITH BARREL VAULTS UNDER SEISMIC LOADS

A Thesis submitted in partial fulfillment of the requirements of the Degree of
Doctor of Philosophy in Civil Engineering
(Structural Engineering)

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Statement

This thesis is submitted as a partial fulfillment of Doctor of Philosophy in Civil Engineering (Structural Engineering), Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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THESIS SUMMARY

This thesis contains analysis details of an analytical study conducted to evaluate the unreinforced masonry structures (URM) of limestone low rise building under the seismic load and to study the effect of the wall thickness and vaults thickness on the URM load carrying capacity. These proposed structures were considered low rise building of 3 floors. The concepts of value engineering and sustainability are considered the main goals of using this type of structures.

The experimental test program was made to conduct the mechanical properties of the URM prisms and it consists of nine masonry assembly constructed with three different types of locally available stone masonry bricks, the walls were tested under compression, tensile, shear tests. The mechanical properties for these nine assemblages were calculated such as the ultimate compressive strength, ultimate tensile strength, bond strength and young's modulus. These parameters were used in the analytical analysis by Finite Element Method (FEM) programming to perform cases of study on these proposed URM buildings.

The acting stresses during the FE analysis were observed and be compared with the ultimate strength conducted from experimental tests to evaluate the ultimate capacity of the structure. The shell elements in the F.E. were chosen in the parametric study to model the proposed building for the macro-modeling technique whereas the solid elements were used in the verification process.

Keywords: Barrel Vaults, Unreinforced Masonry, Seismic, Limestone Masonry, Sustainability, URM, Low-rise Building, Abaqus.

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Contents

THESIS SUMMARY	i
ACKNOWLEDGEMENT	iii
CONTENTS	iv
LIST OF FIGURES	viii
LIST OF TABLES	xvi
CHAPTER (1)	1
1.1. BACKGROUND	1
1.2. URM CONSTRUCTION	1
1.3. AIM OF RESEARCH	2
1.4. RESEARCH OBJECTIVES	3
1.5. THESIS OUTLINE	3
CHAPTER (2)	5
2.1. GENERAL	5
2.2. MASONRY MATERIAL	11
2.3. IN-PLANE ELEMENTS URM BEHAVIOR (CALVIET AL. 1995)	13
2.3.1. IN-PLANE PIERS	14
2.3.2. IN-PLANE SPANDRELS OF URM	18
2.4. OUT-OF-PLANE BEHAVIOR OF URM WALL	19
2.5. EFFECT OF FLEXIBLE FLOOR AND ROOF DIAPHRAGMS ON URM BEHAVIOR	20
2.6. FAILURE MODES OF URM BUILDINGS	22
2.6.1. EXPERIMENTAL REDUCED-SCALE DYNAMIC TESTS ON URM STRUCTURES	23
2.7. COLLAPSE OF AN OLD MASONRY BUILDING IN THE SOUTHERN ITALY. (K. GKOUMAS 2015)	40
2.7.1. DESCRIPTION THE COMPLEXITY OF VAULTS	42
2.7.2. VAULT OF A SIMPLIFIED NUMERICAL MODELLING	44
2.7.3. NUMERICAL RESULTS FOR PREVIOUS SENARIOS	46
2.7.4. CONCLUSIONS OF THE PREVIOUS STUDY	50
2.8. ANALYSIS OF LOAD BEARING MASONRY BEAMS (T.S. ELSALAKAWY 2009)	50
2.8.1. APPROACHED FOR MODELING AND NONLINEAR ANALYSIS	52
2.8.2. NUMERICAL ANALYSIS	54
2.8.2.1. NUMERICAL REPRESENTATION AND SOLUTION PROCESS	54
2.8.2.2. MASONRY MECHANICAL PROPERTIES	55
2.8.2.3. NUMERICAL ANALYSIS	56
2.8.2.4. RESULTS OF THE NUMERICAL STUDY	56
2.8.3. EXPERIMENTAL PROGRAM	58
2.8.3.1. MATERIAL CHARACTERIZATION EXPERIMENTALLY	58
2.8.3.2. TESTING MASONRY BEAMS	61

2.8.3.3. NUMERICAL VERIFICATION.....	62
2.8.4. APPLICATIONS FOR NEW CONTEMPORARY MASONRY CONSTRUCTION.....	63
2.9. VAULTED SYSTEMS IN SAINT FREDIANO’S CHURCH	65
2.9.1. INTRODUCTION.....	65
2.9.2. A TRUSSES MACRO-ELEMENT FOR VAULTED SYSTEMS (VET).....	66
2.9.3. SAINT FREDIANO’S CHURCH.....	71
2.9.3.1. DESCRIPTION OF THE VAULTED SYSTEMS OF ST. FREDIANO'S CHURCH AND VET IDENTIFICATION.....	72
2.9.3.2. MODAL AND SENSITIVITY ANALYSIS.....	76
2.9.4. TIME-HISTORY ANALYSIS.....	79
2.9.5. SUMMARY OF VET TECHNIQUE.....	82
2.10. A FULL-SCALE URM TWO-STROEY CAVITY WALL BUILDING (GRAZIOTTI ET AL. 2017)	82
2.10.1. INTRODUCTION.....	83
2.10.2. SPECIMEN GEOMETRY.....	84
2.10.3. APPLYING A SQUENCE OF INCREMENTAL DYNAMIC TESTS.....	88
2.10.4. CONCLUSIONS.....	89
CHAPTER (3).....	91
3.1. INTRODUCTION.....	91
3.2. LIMESTONE	91
3.2.1. LIMESTONE BRICKS CHARACTERIZATION.....	92
3.3. EXPERIMENTAL TESTS PROGRAM.....	93
3.3.1. TEST OF COMPRESSIVE STRENGTH.....	95
3.3.2. TENSILE STRENGTH.....	107
3.3.3. SHEAR (BOND) STRENGTH.....	116
3.4. COMMENTS.....	121
CHAPTER (4).....	123
4.1. APPROACES FOR COMPUTITIONAL MODELING OF MASONRY STRUCTURES..	123
4.1.1. MICRO-MODELING APPROACH.....	124
4.1.2. MACRO-MODELING APPROACH (HOMOGENIZATION).....	124
4.2. USING ABAQUS AS A COMMERCIAL F.E. PROGRAM.....	126
4.2.1. ABAQUS SOFTWARE PROCESS.....	127
4.2.2. ABAQUS ANALYSIS PROCEDURE.....	128
4.2.3. MATERIAL USED FROM ABAQUS LIBERARY TO MODEL MASONRY.....	131
4.3. THE SOLID ELEMENT USED IN ABAQUS FOR THE VERIFICATION.....	135

4.3.1. SOLID ELEMENT OVERVIEW.....	135
4.3.2. SOLID ELEMENT FORMULATION.....	140
4.3.3. FIRST AND SECOND ORDER SOLIDS.....	144
4.3.4. CHOOSING BETWEEN FULL OR REDUCED INTEGRATION ELEMENTS.....	144
4.3.4. FULL OR REDUCED INTEGRATION ELEMENTS.....	144
4.3.5. BRICKS/QUARILATERALS AND TETRAHEDRA/TRIANGLE.....	146
4.3.6. NAMING CONVENTION OF SOLID ELEMENT IN ABAQUS.....	147
4.3.7. SOLID ELEMENT C3D8R USED IN THE MODEL VERIFICATION.....	148
4.4. THE F.E. MODEL VERIFICATION PROCEDURE.....	148
4.4.1. VERIFICATION STRATEGY	148
4.4.2. FIRST PATH OF VERIFICATION	148
4.4.3. SECOND PATH OF VERIFICATION	154
4.5. CONCLUSION.....	159
CHAPTER (5).....	160
5.1. DESCRIPTION OF THE PROPOSED URM MASONRY BUILDING IN THIS THESIS	160
5.2. TYPES OF THE APPLIED LOADS.....	163
5.3. MATERIAL CHARACTERIZATION	165
5.4. SHELL ELEMNT USED IN THE F.E. MODELING	165
5.5. PARAMETRIC STUDY	166
5.5.1. RUN 1-WALL THICKNESS= 250mm -VAULT THICKNESS=130 mm- $t_{wall}/L_{room} = 0.0625 - t_{vault}/t_{wall} = 0.52 - t_{vault}/L_{room} = 0.0325$	167
5.5.2. RUN 2-WALL THICKNESS= 300mm -VAULT THICKNESS=130 mm- $t_{wall}/L_{room} = 0.075 - t_{vault}/t_{wall} = 0.433 - t_{vault}/L_{room} = 0.0325$	175
5.5.3. RUN 3-WALL THICKNESS= 350mm -VAULT THICKNESS=130 mm- $t_{wall}/L_{room} = 0.0875 - t_{vault}/t_{wall} = 0.371 - t_{vault}/L_{room} = 0.0325$	181
5.5.4. RUN 4-WALL THICKNESS= 400mm -VAULT THICKNESS=130 mm- $t_{wall}/L_{room} = 0.10 - t_{vault}/t_{wall} = 0.325 - t_{vault}/L_{room} = 0.0325$	188
5.5.5. RUN 5-WALL THICKNESS= 450mm -VAULT THICKNESS=130 mm- $t_{wall}/L_{room} = 0.1125 - t_{vault}/t_{wall} = 0.288 - t_{vault}/L_{room} = 0.0325$	194
5.5.6. RUN 6-VAULT THICKNESS=260 mm- WALL THICKNESS= 400mm- $t_{wall}/L_{room} = 0.10 - t_{vault}/t_{wall} = 0.65 - t_{vault}/L_{room} = 0.065$	206
5.5.7. RUN 7- VAULT THICKNESS=390 mm- WALL THICKNESS= 400mm- $t_{wall}/L_{room} = 0.10 - t_{vault}/t_{wall} = 0.975 - t_{vault}/L_{room} = 0.0975$	213

CHAPTER (6)..... 222
6.1. SUMMARY 222
6.2. CONCLUSION..... 223
6.3. RECOMMENDATIONS 225
REFERENCES..... 226

LIST OF FIGURES

Figure (2-1):	Charleston fire station	10
Figure (2-2):	URM building subjected to earthquake excitation	11
Figure (2-3):	Typical masonry pier	12
Figure (2-4):	A typical perforated in-plane wall	14
Figure (2-5):	Different crack patterns for the URM piers	15
Figure (2-6):	Crack observed in the spandrel of Wall B	19
Figure (2-7):	Crack observed in the spandrel of Wall B	25
Figure (2-8):	Crack observed in the spandrel of Wall B	26
Figure (2-9):	Layout and dimensions of the tested models (units in cm).....	28
Figure (2-10):	Floor and Roof systems of the tested models (units in cm).....	29
Figure (2-11):	Distribution of displacements along the top floor (Locations: 2, 4 the in-plane walls, 3 center of the out-of-plane wall)	31
Figure (2-12):	Window wall and out-of-plane wall of the tested structure S1.....	33
Figure (2-13):	Configuration of perforated in-plane walls.....	34
Figure (2-14):	Tested single-story URM building	37
Figure (2-15):	Final crack pattern in the dynamical tested specimen	41
Figure (2-16):	Final crack pattern in static tested specimen.....	42
Figure (2-17):	Modeling Techniques for Masonry Structures.	45
Figure (2-18):	Layout of the vault complex	46
Figure (2-19):	Layout of the building complex with the considered modeling elements.	48
Figure (2-20):	Geometry of the FEM model.	49
Figure (2-21):	Deformed configuration after 0.9 sec for scenario S1 (L=10m).....	50
Figure (2-22):	Deformed configuration after 0.9 sec for scenario S2 (L=7.1m).	51
Figure (2-23):	Deformed configuration after 0.9 sec for scenario S3 (L=5m).....	51
Figure (2-24):	Control points for the force time-histories: A, in the collapsed wall, and, B, in the undamaged wall.	52
Figure (2-25):	Force time history on the collapsed wall.	53
Figure (2-26):	Force time history on the undamaged wall.	54
Figure (2-27):	Modeling techniques for masonry structures: (a) detailed micro modeling; (b) simplified micro-modeling and (c) macro- modeling	56
Figure (2-28):	Typical dimensions of the studied masonry beams.	61