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)
By

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Date: 15 MAY 2018

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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