SEISMIC ASSESSMENT OF ADOBEVAULTED ARCHITECTURE IN IRAN

NedaH. SADEGHI
PhD Researcher, ISISE, University of Minho, Guimarães, Portugal
neda.hsadeghi@gmail.com

Daniel V. OLIVEIRA
Associate Professor, ISISE, University of Minho, Guimarães, Portugal
danvco@civil.uminho.pt

Mariana CORREIA
Director, Escola Superior Gallaecia, Vila Nova de Cerveira, Portugal
marianacorreia@esg.pt

HamedA. BONDARABADI
PhD Researcher, ISISE, University of Minho, Guimarães, Portugal
hamed.azizi@civil.uminho.pt

AgustínORDUÑA
Professor, University of Colima, Colima, Mexico
aord@ucol.mx

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ABSTRACT

Adobe architecture has shown poor performance during past earthquakes and can be identified as one of the most vulnerable building typology to earthquakes. On the other hand, past earthquakes prove that adobe vaulting, a typical roofing system for adobe architecture located in hot and dry areas, plays a significant role in seismic behavior of adobe buildings.

This paper reports the results from a survey carried out on 57 segmental adobe vaults in the city of Yazd, Iran, aiming at assessing the seismic behavior of adobe vaults, and performing a numerical parametric study. To this end, a reference vault is considered as representative of the sample.

Limit analysis theory implemented in Block2D software is employed to carry out the numerical analyses. Results indicate that variation in influential parameters such as span, rise and thickness of vault and also depth of infill over the vault affects the seismic performance of adobe vaults. In addition, physical properties of infill and mechanical properties of adobe have also a significant influence.

INTRODUCTION

For millennia, humans have used earth as a construction material in different forms. It is estimated that around 17% of the world's population lives in earthen buildings and among the several earth architecture techniques, the most common find worldwide is adobe, also called mud bricks or sundried earth blocks (Correia and Fernandes 2006). Adobe construction is a building solution that was and is often used to build houses in many regions of the world, such as Latin America, Africa, Indian subcontinent and other parts of Asia, Middle East and Southern Europe (Costa et al. 2013). In addition, adobe constructions are the most commonly found on UNESCO world earthen heritage sites (50%), mainly in the regions of Asia and the Pacific (68%) (Gandreau and Delboy 2012).

Adobe buildings are economical constructions, since earth is a low cost and easily available material. This construction typology is characterized by a simple building process, which allows self-construction and