



Simple Strengthening Techniques for Non-engineered Buildings against Seismic Actions

Marina Traykova

University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria

Christos Giarlelis

Equidas Consulting Engineers, Greece

Andreas Lampropoulos

School of Environment and Technology, University of Brighton, UK

Stephanos Dritsos

Department of Civil Engineering, University of Patras, Greece

Jon Moseley

Consulting Engineer, Greece

Contact: marina5261@abv.bg

Abstract

It is estimated that non-engineered construction accounts for more than half of the buildings in most of the cities of the developing world. These buildings account for most of the collapses and fatalities during earthquakes. To address this problem, the possible solutions are either to limit their construction in highly seismic zones or strengthen the existing ones. Lack of integrity of a building's structural elements, improper detailing of a building's structural elements and low quality of construction materials are typical problems found in many of these structures due to misconceptions, lack of guidelines and skilled technicians. In this work, some of the most popular strengthening techniques for non-engineered buildings based on different case studies from various countries are presented. General conclusions and recommendations, which may serve as guidelines for future rehabilitation works, are drawn.

Keywords: Non-engineered buildings, seismic upgrade, seismic strengthening.

1 Introduction

Non-engineered (NE) buildings are those that have been spontaneously and informally constructed in various countries without any or with little intervention by qualified architects and engineers in their design and supervision [1]. NE buildings are constructed from locally available materials including field stone, fired brick, concrete blocks,

adobe or rammed earth, wood and, in certain cases, even with reinforced concrete. These types of buildings are prevalent in rural areas of countries with a high seismic risk such as Turkey, Iran, Afghanistan, Pakistan, India, Nepal and China, as well as countries in Latin America. As a result, they account for most of the collapses and fatalities during earthquakes since, usually, no measures have been taken against earthquakes