Comparison of Mesh Type Seismic Retrofitting for Masonry Structures

N.A.A.C Nissanka, R.L.S Priyankara and N. Sathiparan

Department of Civil and Environmental Engineering
Faculty of Engineering
University of Ruhuna
SRILANKA

E-mail: sakthi@cee.ruh.ac.lk

Abstract: *The tremendous loss of life that resulted in the aftermath of recent earthquakes in developing countries is mostly due to the collapse of non-engineered building structures. It has been observed that these buildings cannot withstand the lateral loads imposed by an earthquake and often fails, in a brittle manner. This underscores the urgency to find simple and economic solutions to reinforce these buildings. Different conventional retrofitting techniques are available to increase the strength and/or ductility of unreinforced masonry walls. Recent years, several researches work on mesh type retrofitting for masonry structures to delay or prevent the collapse of buildings and reduce the number of lives lost during devastating earthquake events. This paper reviews and discusses the state-of-the-art on seismic retrofitting of masonry walls with emphasis on the mesh type retrofitting techniques include retrofitting procedures, cost, improvement in structural performance and limitations.*

Keywords: *Masonry, retrofitting, meshes, seismic loading, in-plane tests.*

1. INTRODUCTION

The result of earthquake damage investigations and studies conducted in earthquake-prone regions have revealed that the masonry constructed type buildings would collapse within a few seconds during earthquake movement, and does become a major cause of human fatalities. Lack of structural integrity is one of the principal sources of weakness responsible for severe damage leading to collapse. Lack of interlocking units between external and internal wythes of the wall sections and the lack of connection between crossing walls give rise to the possibility of out-of-plane behavior, as their formation increases the net length of the walls. In-plane lateral loads induce shearing deformations in masonry walls. This deformation elongates one diagonal, including tension, and shortens the other, including compression perpendicular to the tension. Since masonry materials have much lower strength in tension than compression, in-plane forces typically induce diagonal cracking perpendicular to the tension axis. Out-of-plane wall collapse is another major cause of destruction of masonry buildings, particularly in buildings with flexible floors and roofs. The inadequacy of connections between the cross walls and long walls is one of the key factors influencing out-of-plane wall collapse. When the walls are not connected to the roof, collapse is often caused. Roof collapse can also be caused by the collapse of walls subjected to shear forces and gravity loads. Heavy roofs also contribute to the seismic vulnerability of masonry buildings.

This study focus on an experimental program of in-plane tests of masonry specimens retrofitted with different mesh types of steel, soft polymer, industrial geo-grid, PP-band and plastic carrier bags. These tests performed to investigate the effectiveness of different mesh types in preventing brittle failure of unreinforced masonry specimens, under in-plane loading.

2. MESH TYPE RETROFITTING

In order to reduce damage on these masonry buildings during earthquakes, which could happen anywhere in the world, it is important to examine at the early stage how to improve and upgrade the