

Mesh type seismic retrofitting for masonry structures: critical issues and possible strategies

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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: earthquake; masonry; seismic retrofitting; meshes

1. Introduction

Natural disasters are causing tremendous loss of life and property with earthquakes being the most serious risk. As shown in the Figure 1 (Guha-Sapir, Hoyois, & Below, 2013; Guha-Sapir, Vos, Below, & Ponserre, 2011, 2012; Hoyois, Scheuren, Below, Guha-Sapir, & Ponserre, 2007; Jha, Dwayne Barenstein, Phelps, Pittet, & Sena, 2010; Rodriguez, Vos, Below, & Guha-Sapir, 2009; Scheuren, Le Polain de Waroux, Below, Guha-Sapir, & Ponserre, 2008; Vos, Rodriguez, Below, & Guha-Sapir, 2010), in last two decades, about 96% of the fatalities attributed to earthquakes are caused in developing countries or least developing countries. Figure 2 shows the breakdown of the fatalities due to earthquakes in the period of 1900–1999 to different causes. About 75% of the fatalities attributed to earthquakes are caused by the collapse of buildings and the greatest proportion is from the collapse of masonry buildings (Coburn & Spence, 2002).

The result of earthquake damage investigations and studies conducted in earthquake-prone regions has 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. Major types of problems and basic damage patterns observed during earthquakes in this type of buildings are summarised in Figure 3.

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