Earthquakes and Structures, *Vol. 8, No. 3 (2015) 511-539*
DOI: http://dx.doi.org/10.12989/eas.2015.8.3.511

Assessment of seismic strengthening solutions for existing low-rise RC buildings in Nepal

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(Received February 28, 2014, Revised August 19, 2014, Accepted August 29, 2014)

Abstract. The main objective of this study is to analytically investigate the effectiveness of different strengthening solutions in upgrading the seismic performance of existing reinforced concrete (RC) buildings in Nepal. For this, four building models with different structural configurations and detailing were considered. Three possible rehabilitation solutions were studied, namely: (a) RC shear wall, (b) steel bracing, and (c) RC jacketing for all of the studied buildings. A numerical analysis was conducted with adaptive pushover and dynamic time history analysis. Seismic performance enhancement of the studied buildings was evaluated in terms of demand capacity ratio of the RC elements, capacity curve, inter-storey drift, energy dissipation capacity and moment curvature demand of the structures. Finally, the seismic safety assessment was performed based on standard drift limits, showing that retrofitting solutions significantly improved the seismic performance of existing buildings in Nepal.

Keywords: RC buildings; non-linear analysis; retrofitting; shear wall; steel bracings; RC jacketing

1. Introduction

Nepal is located in a seismically active Himalayan region with a long history of devastating earthquakes. Amongst the major earthquakes in recorded history, the Great Bihar-Nepal Earthquake of 1934 with a maximum intensity of *X* (MMI) caused extensive damage in the Kathmandu Valley (Pandey and Molnar 1988). The total death toll in Nepal was 8,519, from which 4,296 occurred in the Kathmandu Valley alone. In this earthquake, about 19% of the building stock collapsed and 38% experienced significant damage just in the Kathmandu Valley (Rana 1935). The past study indicated that the human and economic losses due to earthquakes are directly related with the development index of a country (Erdik and Durukal 2008). As an

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http://www.techno-press.org/?journal=eas&subpage=7 ISSN: 2092-7614 (Print), 2092-7622 (Online)