Chapter

3

Seismic Performance Assessment, Retrofitting, and Loss Estimation of an Existing Non-Engineered Building in Nepal

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Abstract
The non-engineered building built before 2004 remained after Gorkha earthquake although such structures demonstrate seismic deficient. Therefore, the present study aims to carry out detail seismic performance of such building to investigate as-built seismic performance and its performance after intervention of retrofit measures. Two *in situ* tests were performed, which includes Schmidt hammer test and ambient vibration test. The adaptive pushover analysis and dynamic time history analyses were performed for as-built and retrofitted building. The retrofit measures increase the stiffness and maximum base shear capacity of the buildings. In addition, such retrofit measures improved single storey drift concentration in existing building such that uniform drift profile can be attained. Furthermore, the probability of exceeding damage states can be significantly reduced and mainly found to be more effective in minimizing higher damage states, such as partial collapse and collapse states. The maximum expected annual loss occurs between 0.1 g and 0.2 g PGA (Peak Ground Acceleration). It was revealed that the steel braced building was found to be relatively more effective in enhancing the seismic performance, whereas reinforced concrete shear wall found more economic feasible retrofit measure for this particular building.

Keywords: non-engineered, retrofit techniques, ambient vibration test, fragility curves, cost–benefit analysis, sensitivity analysis, risk curve

3.1 Introduction

The reinforced concrete (RC) buildings built before the implementation of any design codes and guidelines, whose structural sections and reinforcement details resemble only to carry gravity loads, were classified as non-engineered buildings. In context of Nepal, it includes RC buildings built before 2004, after which Nepal Building Code (NBC), that is, NBC 205:1994[1] guideline was implemented. It provides ready to use dimensions and detailing for structural elements, but