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Effect of a Base Isolation System for Reduction of Annual Seismic Risk of a Steel Building

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Abstract

This research focuses on the effects of base isolation on annual probable seismic loss in a typical existing educational building. The physical seismic damage is related to economic losses to investigate the financial aspects of application of base isolation system in building. Meanwhile the probabilistic nature of both seismic event and structural response has been considered by the employed methodology. The building, which experienced the 2012 East Azerbaijan –North West of Iran- twin earthquakes, suffered non-structural damage. The annual probable seismic loss is evaluated for both structures. The existing information of the seismic hazard of area and fragility curves of buildings were employed from previous research. The results indicate that although the initial cost of the project may increase due to application of base isolation, the overall probable loss is reduced due to lower vulnerability of the building equipped by such equipment.

Keywords: Push-Over analysis; seismic performance; performance level; seismic risk.

Introduction

The past earthquake observations indicate an ascending trend of seismic loss within time. It means that, while development of new technologies and improvement of skills have led to development of more complicated urban facility and higher social demand, it also have been associated with higher seismic risk. As a result, the application of innovative methods and technology to limit the damage is increasing all over the world. However, economic issues appeared as the initial cost of the projects usually is a barrier for application of such systems. To illustrate the merits and capabilities of these approaches, loss estimation methodologies and their result can provide a useful tool.

The distribution of structural damages of facilities in a special seismic region is usually estimated using the relationship between the structural damage and Peak Ground Acceleration (PGA). Blejwas and Bresler (1978) declared the relationship of damage state of structure between the ratio of demand and capacity of the system. Banon et al. (1982) expressed damage state parameters based on many variables such as flexural damage ratio, normalized cumulative rotation and so on. Thereafter Di Pasquale and

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