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Comprehensive Probabilistic and Deterministic Seismic Hazard Analysis of Arak City

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Abstract

Absence of a comprehensive seismic analysis and poor structural control systems in developing countries is the main reasons which cause countless casualties after the occurrence of an earthquake. The main purpose of the presented research is to conduct a full comprehensive seismic evaluation on one of the Iranian cities located in a region with a high rate of earthquake occurrence. The analysis is conducted both deterministically and probabilistically in order to consider the uncertainties of occurrence. A large database of the earthquakes that occurred in a circle with a radius of 100 kilometers around the Arak city in Iran is gathered. The records that are used are started from the beginning of the 19th century until the present time. All faults around the city are modeled and the Campbell & Bozorgnia and Abrahamson & Silva attenuation relation were used for evaluation of PGA in the center of the city. Finally, a new Gutenberg-Richter model is developed for the region and specifically for the Arak city. It is concluded that the code spectrum works properly for the Arak city; however, it underestimate the intensity in some cities like Tehran, and Tabriz.

Key words: Seismic hazard analysis, probabilistic analysis, deterministic analysis, Hazard curve.

1. Introduction

One of the most hazardous types of natural disasters that can even destroy a whole city is an earthquake. The main reason that thousands of innocent lives are usually get lost is not the earthquake itself but it is the poor structural system and lack of sufficient knowledge and data about earthquakes. Because of the insufficiencies of some design codes which results from lack of adequate data, some buildings that are even constructed based on design codes are vulnerable to earthquake and they may experience severe damages after the occurrence of an earthquake. Estimation of earthquake is still a difficult problem for the scientists and it is acceptable to implement seismic hazard analysis for assessing the