SEISMIC HAZARD ANALYSIS AND OBTAINING UNIFORM HAZARD SPECTRA FOR ESFAHAN REGION, IRAN

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Abstract

The present study was conducted to determine peak ground acceleration (PGA) over bedrock in probabilistic analysis methods for the seismic hazard and uniform hazard spectra at different hazard levels for Esfahan city. A series of statistics containing historical and instrumental seismic data covering from the 8th century A.D. to the now up to a radius of 200 km was employed and seismic sources were modeled up to a radius of 200 km from Esfahan city. For this purpose the method proposed by Kijko (2000) was employed considering uncertainty in magnitude and incomplete earthquake catalogue. Seismic hazard analysis is then carried out for Esfahan city by using SEISRISK III (Bender and Perkins, 1987) program for 11x13 grid points. Four different attenuation relationships of Ghodrati et al (2007), Campbell (1997), Ambrasyse et al. (1996) and Zare et al (1999) were used to determine the PGA on bedrock. Using the Logic Tree Method, these four relationships have been respectively combined with the weight of 0.4, 0.1, 0.2 and 0.3. The PGA can be determined for 143 points and the hazard spectra can be specified for 20 points of the city. Attenuation relationships of Ghasemi et al (2008), Thierry and Berge et al. (2003), Ghodrati et al (2010) and Ambrasyse et al. (1996) were also respectively combined with the weight of 0.3, 0.1, 0.4 and 0.2 in the Logic Tree Method for determined hazard spectra. Covering %2 and %10 probability of exceedance in one life cycle of 50 years are presented. Finally, the uniform hazard spectra was also presented with %10 and %2 of probability of exceedance in one life cycles of 50 years are presented along with New Mark and Hall Spectra.

Keywords: uniform hazard spectra, seismic hazard analysis, seismicity parameters, PGA, Esfahan

1. INTRODUCTION

Iran is located in a high-risk seismic zone, but its seismicity intention is not the same in all parts. Iran is a country where earthquake causes many financial and life losses. Locating in Alp – Himalaya seismic belt, Iran has a devastating earthquake per year. The specification of some cataclysmi earthquakes Tabas (1978), Manjil-Roudbar (1990) and Bam (2003) support the significance of the issue.

Esfahan Province is located in a special seismotectonic conditions; thus it includes different relative seismic hazard ranges. Since Esfahan city is one of the most important industrial cities of Iran, special seismic investigations are necessary.

Geological features in most parts of Esfahan are very similar, as a surface silt layer with gravel and coarse grain stone is extended in most parts and usually dig under construction. Beneath this surface layer, alluvium layers, with different grain sizes, sorting and relative good compaction are shown. In compaction point of view and because surface soil layer is removed during construction, geologically it could be classified in relatively hard soils.

Few researches were done in geology, seismotectonic structure and seismicity of central Iran, some of which has covered Esfahan province. Main earthquakes were occurred within 200 km radius of Esfahan city.