8th International Conference on Seismology & Earthquake Engineering
11-13 Nov. 2019, Tehran, Iran

SITE-SPECIFIC RESPONSE ANALYSIS VERSUS IMPLEMENTING THE MEAN SHEAR WAVE VELOCITY WITHIN PSHA

Faranak NAGHDIBAK
M.Sc. Graduate, Arak University, Arak, Iran
f-naghdibak@msc.araku.ac.ir
Alireza AZARBAKHT
Department of Civil and Environmental Engineering, University of Strathclyde, Glasgow, UK
Associate Professor, Arak University, Arak, Iran
a-azarbakht@araku.ac.ir

Keywords: Ground motion prediction equations, Site effects analysis, Spectral values correlation, Shake2000, Shear wave velocity

Analysis of recent earthquakes effects on the sites shows the importance of the soil properties on the ground seismic response. Several methods for evaluating site conditions effects on the ground response, during earthquakes, are presently available. Most of them are based on the assumption that the primary response in soil deposit is caused by the upward propagation of shear waves from underlying rock formation (Ordonez, 2012). In this study, the Uniform Hazard Spectrum (UHS) as well as the correlation between spectral ordinates have been examined by means of the two following methods. The first methodology is based on the site-specific studies of a given local soil deposit. The Probabilistic Seismic Hazard Analysis (PSHA) has been employed by using a well-known Ground Motion Prediction Equation (GMPE) and applying a relatively high shear wave velocity value (herein taken equal to 1200 m/s) which is representing the seismic bedrock. After obtaining the target UHS on the bedrock, by performing a site-specific analysis, it comes to select spectrum-compatible records in different hazard levels. Then, the matched records on the bedrock will pass through the Shake soil column. The second methodology is based on the incorporation of PSHA and the top 30 m mean shear wave velocity (herein taken equal to 529 m/s based on recent experiments (Azarbakht, 2016) in the current case study) within the given GMPE. The corresponding UHS spectra are shown in Figure 1 that indicates the second methodology is conservative and Figure 2 shows both methods procedures in brief.

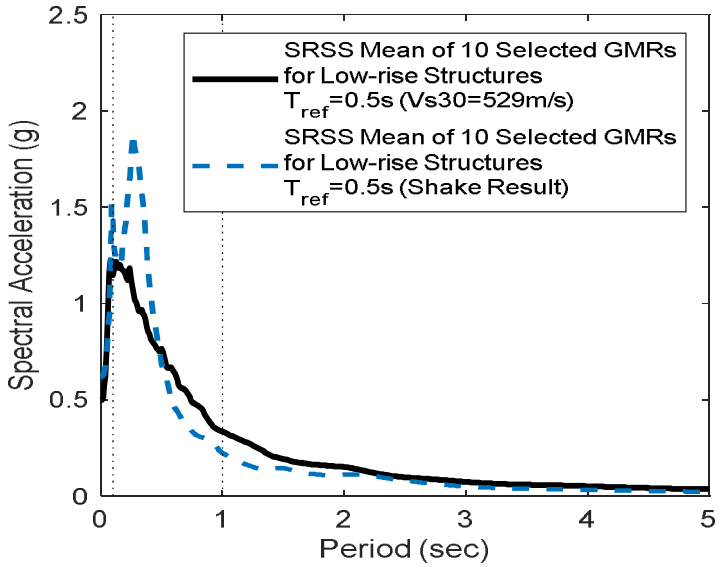

Figure 1. Uniform hazard spectrum for 475 year return period with Vs30=529 and Vs30=1200 m/s.

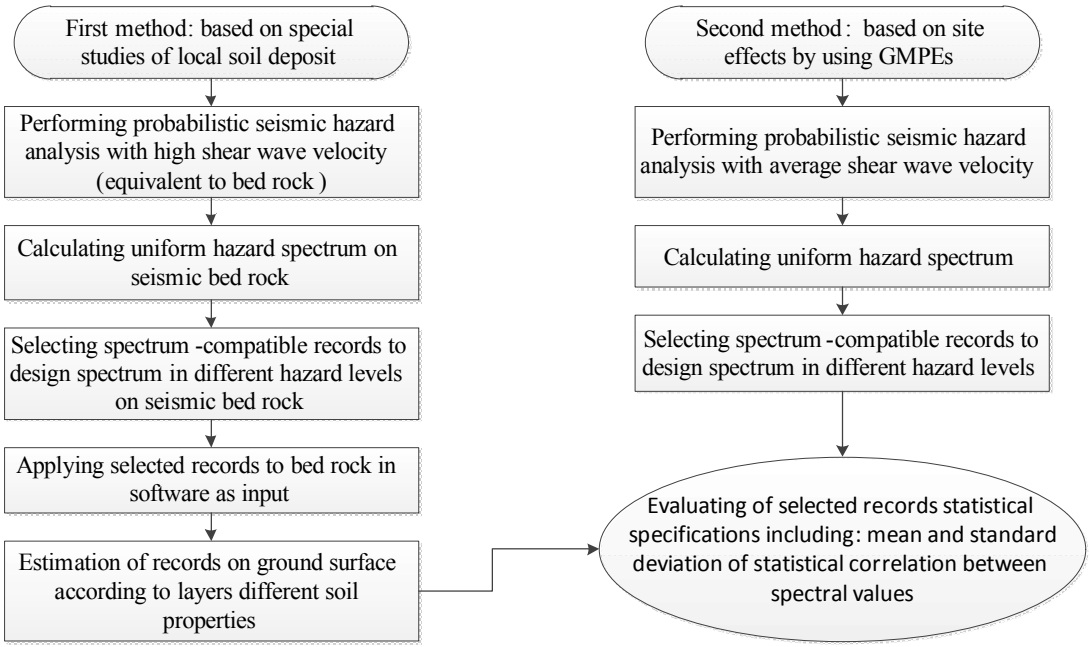

Figure 2. The flowchart for the two proposed analysis methods.

The most important result is the comparison between the two methodologies in terms of statistical correlation between spectral ordinates. As seen in Figure 3, the obtained results show that the record selection criteria may cause disturbance in the spectral correlation coefficient pattern in both methods. The reason comes from the scale factors that necessarily have been employed in the record selection procedure. This fact changes the correlation between spectral accelerations in a way that differs from the correlations which have been observed in as-recorded motions. Therefore, the evaluation of correlation between the chosen records during the matching procedure is suggested for further investigations.

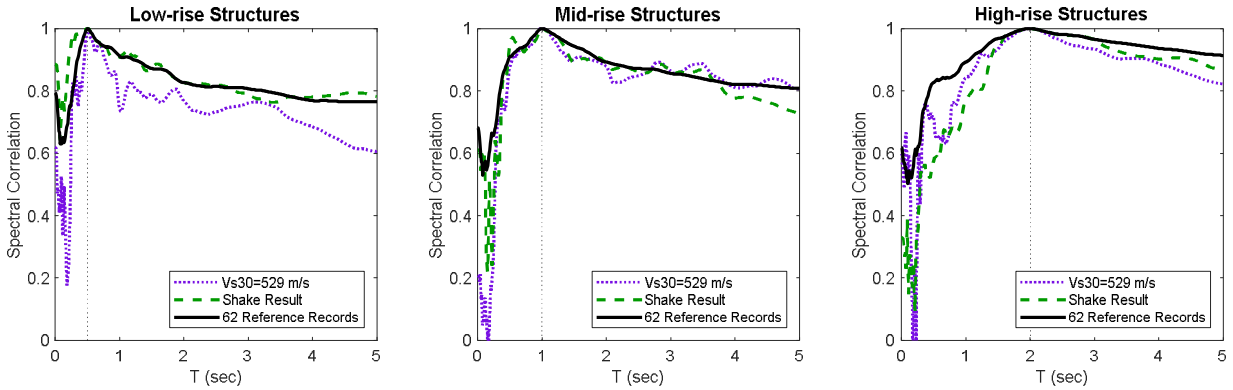

Figure 3. Spectral correlation comparison between matched GMRs to spectrum with Vs30=529 m/s and Shake results along with 62 reference records correlation for low-rise, mid-rise and high-rise structures.

REFERENCES

Azarbakht, A. (2016). *Probabilistic Seismic Hazard Analysis for the Tehran Dr. Shariati Hospital Development Site Project.* Report No. 27.03.1396, Joint Venture; Goupleh, Abad Rahan Pars, Maher Va Hamkaran.

Ordonez, G.A. (2012). SHAKE2000: A computer program for the 1D analysis of geotechnical earthquake engineering problems. *Geomotions*, LLC, USA (2000).