A Study on the Site Response Spectrum for Ulchin Region

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1. Introduction

Strong ground motion and hazard are increasing in the world. Seismic risk assessment on public infrastructure has become more important. The seismic risk assessment includes many uncertainties associated with earthquake characteristic and should be consider realistic motion on structure and ground by earthquake. Therefore, the use of probabilistic method in the seismic risk assessment is increasing. The study that considered ground motion and characteristic should be performing for reasonable risk assessment on domestic ground motion characteristic. Anxiety of people who lived in the region that includes a nuclear power plant site had grown after Fukushima nuclear power plant accident.

This study suggests site response spectrum on the region that includes a nuclear power plant site by probabilistic seismic hazard analysis.

2. Method

This Study performed the probabilistic seismic hazard analysis on Ulchin region to probabilistic applying the domestic earthquake characteristic. The site response spectrum that considered site response characteristic was suggested by using the SHAKE code. To do first is estimates the uniform hazard spectrum for 1.0E-04 and 1.0E-05 level by probabilistic seismic hazard analysis. Then to do is calculates site response by applied site amplification factor to spectral acceleration on frequency of uniform hazard spectrum.

Uniform hazard spectrum is established by generating the set of seismic hazard curves, each of which expresses an annual frequency of an exceedance as a function of an acceleration response spectral value for a specific discrete value of a frequency and damping. With these sets of spectral hazard curves, the response spectra for a specified probability of an exceedance over an entire frequency range of interest are obtained directly.

Site amplification factor for the SHAKE code was calculated by using the suggested simplified shear wave velocity structure by Yoon and Kim [1]. Fig. 1 shows the selected simplified shear wave velocity on SB, SD, and SD soil condition.

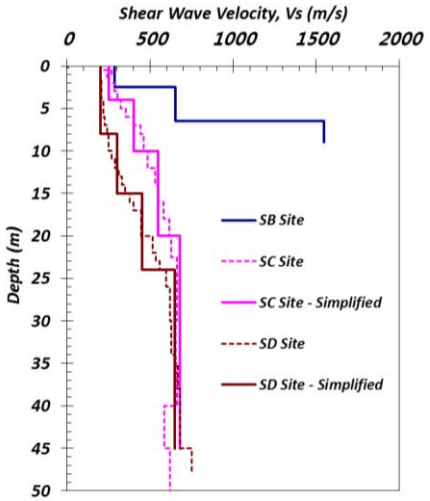

Fig. 1 Columnar Section of Shear Wave Velocity

3. Data

This study selected four estimated seismic source maps by assessment of expert panels, which were composed for reducing uncertainty of seismic source map for calculation of uniform hazard spectrum [2]. Fig.2 shows selected seismic source maps.

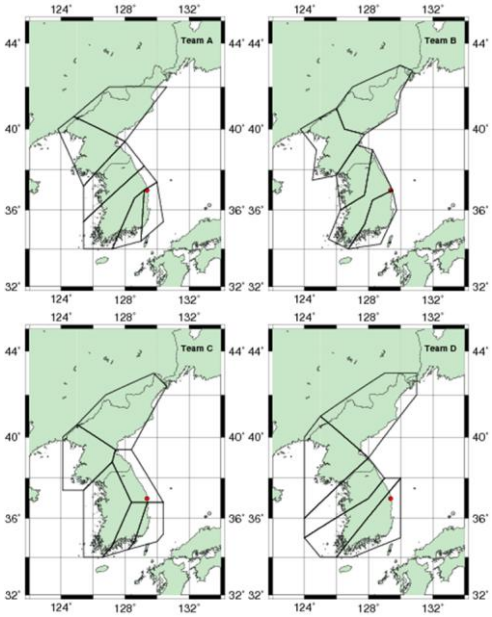

Fig. 2 Seismic Source Map

The probabilistic seismic hazard analysis performed by three attenuation equations were derived from domestic seismology research (Lee, J.M.(2002), Jo and Baag(2003), and Yun et al.(2005)) [3,4,5].

Fig.3 illustrated attenuation feature of each attenuation equation according to epicentral distance.

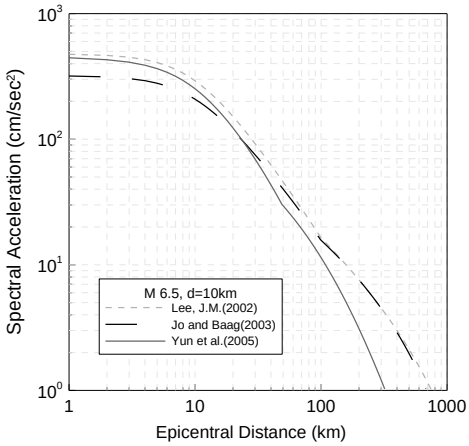

Fig. 3 Attenuation of spectral acceleration acording to the epipcentral distance (M=6.5, depth=10km)

4. Result

Site response spectrums on SB, SC, and SD soil condition were suggested by uniform hazard spectrum for Ulchin region. Fig. 4 and Fig. 5 shows site response spectrum on uniform hazard spectrum of 1.0E-04 and 1.0E-05 level. The response spectrum on SA soil condition shows uniform hazard spectrum, and other response spectrums show the results that were amplified on SB, SC, and SD soil condition.

The standard deviations of spectral acceleration on frequency of response spectrum for 1.0E-04 level were smaller than 1.0E-05 level. The response spectrum on SC soil condition generally showed the difference with spectrum on other soil condition. However, the standard deviations of spectral acceleration of response spectrum on soil condition were small range of about 0.004-0.108.

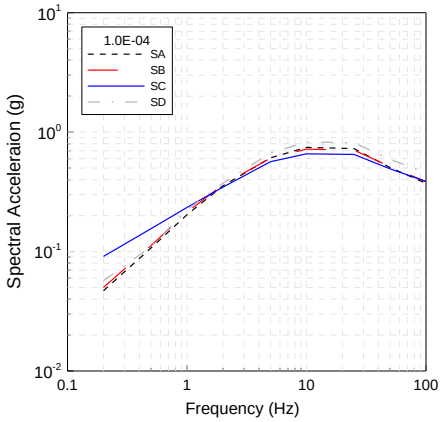

Fig. 4 Site Response Spectrums for 1.0E-04 level

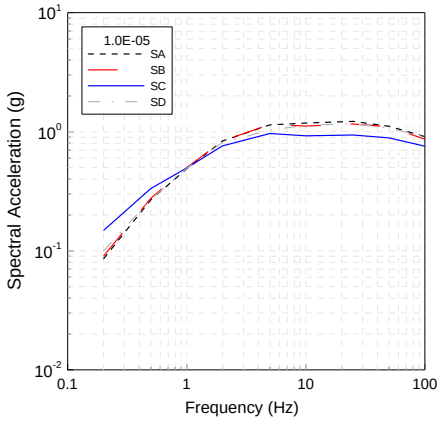

Fig. 5 Site Response Spectrums for 1.0E-05 level

5. Conclusion

This study performed probabilistic seismic hazard analysis(PSHA) for Ulchin region using seismic source maps that were selected by assessment of experts and domestic attenuation equations that were suggested since 2000. Site response spectrums on SB, SC, and SD soil condition were suggested by PSHA.

The difference of site response spectrum on soil condition for Ulchin region was small. So the result think that site response on Ulchin region will be less affected from amplification factor.

ACKNOWLEDGEMENT

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