THE EFFECT OF SOURCE DISTANCE IN DETERMINATION OF SITE-SPECIFIC HAZARD SPECTRUM

Mohammad Reza SOGHRAT
PhD student, International institute of earthquake engineering and seismology (IIEES), Tehran, Iran
m.soghrat@iiees.ac.ir

Mansour ZIYAEIFAR
Associate Professor, International institute of earthquake engineering and seismology (IIEES), Tehran, Iran
mansour@iiees.ac.ir

Keywords: Short Return Period, PSHA, Gmpes, Seismicity Zones

ABSTRACT

Some elements of the completed structures that supply strength, stiffness and stability may not be existed at the special phases of the construction procedure. Incomplete structures must have enough structural integrity in various stages of construction to ensure stability and resistance against the seismic loads. Stability of the partially completed structures and the probability of progressive collapse should be considered in seismic design. For seismic design during construction, it seems that we should use reduced seismic load compared to design spectrum (with return period, Tr,of 475 years). To achieve this goal, we should estimate the site-specific spectrum. In this study, we use the probabilistic seismic hazard analysis (PSHA) to determine the uniform hazard spectrum by focusing on short return periods.In short return periods, the low intensity measures of the earthquakes will be important. The measures may be originated from large distant orsmall near earthquakes. Ground Motion Prediction Equations (GMPEs) are an important parameter in PSHA. We select a GMPE which can cover the distance up to 400 km.It is clear that the radius of imaginary circlearound the desired site may be an effective factorin evaluation of seismic hazard (especially in spectrum with short return period) which it is generally considered about 150 km.

In this study; we consider three different radii around the site (100, 200, 400 km) to control the sensitivity of result to the radius parameter.It should be noted that two sites (Tehran; very high seismic zone and Arak; moderate seismic zone) in Iran are chosen to analyze. It is shown that the controlling scenarios in spectrum with short return periods for Tehran site are nearer than Arak. Also, it can be concluded that in lower seismicity zones, considered radius larger than 200 km has significant effect on spectrum with short return periods that are important in during construction structure.

INTRODUCTION

Lack of some important elements which supply strength, stiffness and stability in structures can cause the failure during construction against lateral loads. Therefore, stability of the partially completed structures should be considered in seismic design. For temporary or during construction structures, it seems unreasonably conservative to use design spectrum with return period of 475 years (Design Basis Earthquake; DBE). As an alternative approach, it is better to apply the reduced seismic load due to shorter exposure periods for during construction structures.To achieve this goal, we should estimate the site-specific spectrum in short return periods.

Various studies have been done on seismic hazard analysis with the classic approach of Cornell (1968). From the previous studies,itis observed that researchers consider different radii around the site to assess seismic hazard analysis. For example, Kijko et al. (2002) considereda 300 km radius around the interest site while Irsyam et al. (2008) assume the radius of 500 km.According to previous studies, it can be