SEISMIC HAZARD ANALYSIS OF SHIRAZ & TABRIZ PIPELINES BY EMPLOYMENT OF PROBABILISTIC & STATISTICAL METHODS

Yasaman TAVANA
M.Sc. Student of Science & Research Branch of Islamic Azad University, Tehran, Iran
yt.cenario@rocketmail.com

Abbas MAHDAVIAN
Shahid Beheshti University, Tehran, Iran
a_mahdavian@sbu.ac.ir

Fatemeh Sadaat AKHAVAN HEJAZI
Structural Engineer, Mahab Ghodss Consulting Engineering Company, Tehran, Iran
fatahejazi@gmail.com

Keywords: Seismic Hazard, Probabilistic Method, Regression Coefficients, Static Method, 2800 Code

Due to continuous changes in seismic codes caused by increasing human knowledge and experience over earthquakes, achieving an outright method of assessing seismic parameters for rehabilitation of important projects is inevitable. Since these results are generally estimated and are not based on specific investigations on one particular zone.

In this paper, the seismic hazard of Tabriz & Shiraz pipeline sites has been particularly reassessed. To achieve such goal, after investigating & modelling the seismic sources in the mentioned areas and their seismic parameters, the geologically appropriate regression coefficients of the two cities, based on weighted regression analysis of relations, represented by Ambraseys and Douglas, 2003; Campbell and Bozorgnia, 2003; Mahdavian, 2006 and Ghodrati et al., 2007 are defined and calculated

Furthermore, based on PSHA method (Probabilistic Seismic Hazard Analysis) the seismic hazard assessment of the pipelines zones for three return periods, constituting of (75, 475, and 2475 years) and different hazard levels, has been evaluated. Considering Exceedance Probability, this process is carried out by applying the "Cornell (1968)" method and "Bender & Perkins" relations for achieving the amount of Peak Ground Acceleration (PGA) on the bedrock, using an authentic software (SEISRISK–III, 1987). Based on this PGA, we classified Tabriz and Shiraz to several seismic zones.

To calculate the accelerograms on the ground surface, conventional methods of dynamic analysis such as non-liner method are used. In addition to site effect studies, different layers of soil, based on 2800 Iran Code, and data received from geophysical boreholes are classified and soil profile is modeled relatively.

As the PGA is generally considered for high frequencies, a set of response spectrums for the site specifics, considering a wider range of frequencies, has been calculated. Thus, by an adoption of PSHA method the horizontal and vertical components of peak ground acceleration and design response spectra have been assessed and represented.

In order to gain a more solid conclusion, acceleration response spectrums, derived by Statistical method of "Kimball 2008" are also provided for both Shiraz and Tabriz.

Ultimately, the resulting diagrams are compared by the relative design spectra, cited in the "Seismic design codes for buildings (Iran 2800 Code)".

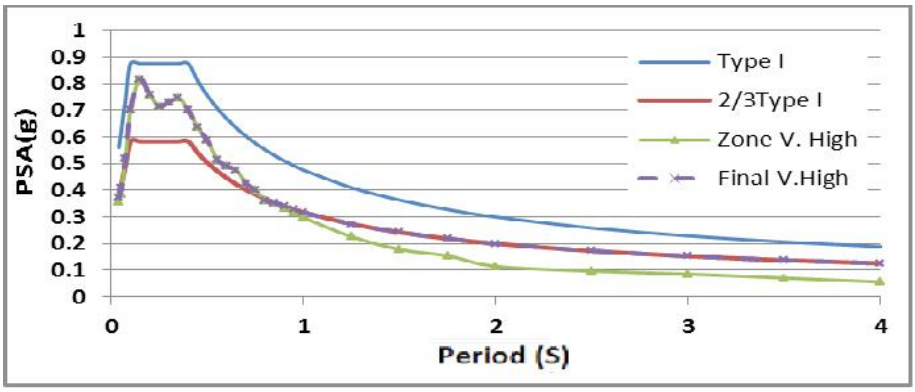

Figure 1. The comparison of the response spectra obtained by statistical methods by using 2800 Code for regions with high seismic potential zone for return period of 475 years on seismic bedrock of Tabriz pipelines, Soil type I

According to Figure 1, in low periods (here in Tabriz less than 1 seconds), the statistical and probabilistic response spectra compromise with the outlined amount of acceleration cited in the 2800 Code; however, in higher periods, the statistical & probabilistic response spectra indicate much lower amounts of acceleration amplitude than 2/3 of 2800 spectrum.

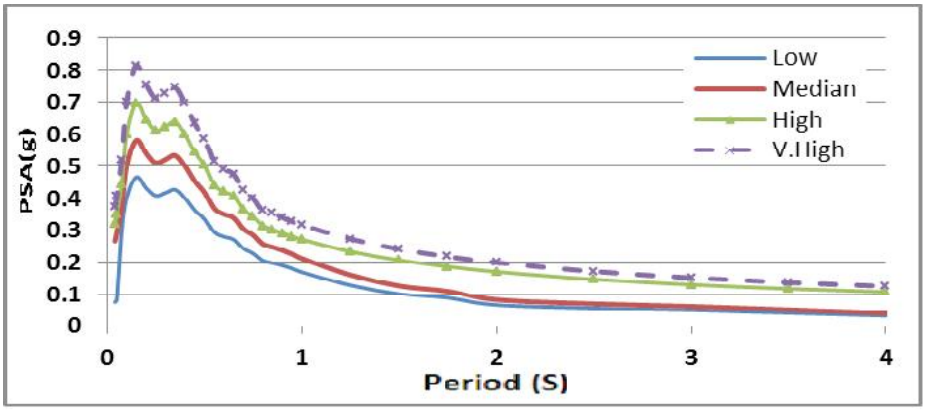

Figure 2. The comparison of ultimate response spectra for zones with different seismic potential for return period of 475 years in Tabriz pipelines

A similar attitude in the diagrams of Shiraz could be observed.

To sum up, it is clear that Iran 2800 code's Spectra are depicting considerably high amounts of acceleration in high periods; and therefore, it seems that they are rather conservatively calculated. Thus, the ultimate design spectrum would be preferably a combination of the mentioned spectra.

REFERENCES

Ambraseys NN, and Melville CP (1982) A History of Persian Earthquakes, Cambridge University Press

Ambraseys NN, Douglas J, Sarma SK and Smit PM (2005) Equations for the Estimation of Strong Ground Motions from Shallow Crustal Earthquakes Using Data from Europe and the Middle East: Vertical Peak Ground Acceleration and Spectral Acceleration, Bulletin of Earthquake Engineering, 3: 55-73

Berberian M (1995) Master blind thrust faults hidden under the Zagros folds: active basement tectonics and surface morphotectonics, *Tectonophysics*, 241:193-224

MGCE (2009) Seismotectonic studies, seismology and earthquake faulting in the range of aqueous systems Shiraz, MGCE Consulting Engineering Company