

INVESTIGATION OF DIRECTIVITY EFFECT ON SITE SPECIFIC SPECTRA: A CASE STUDY OF NORTHERN COASTAL SITES OF IRAN

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Records of earthquakes show that near field and far field earthquakes have different characteristics. Near field earthquakes are characterized by short time, higher PGA and a short-duration impulsive motion that exposes the structure to high input energy at the beginning of the record. This pulse type motion is due to an effect called directivity (PEER Report 2001/09).

Based on valid seismic codes, using site specific spectra for dynamic analysis of tall buildings built on deep soil deposits, is necessarily required (2800 Standard Seismic Code).

In the present study by fitting a curve (equation 1) from the results of several downhole geotechnical tests (Figure 1), a representative seismic geotechnical profile for northern coastal sites of Iran was generated (Figure 2).

$$V_s = V_0 (1 + 1.45 \times Z)^{0.27} \quad (1)$$

To evaluate directivity effect, two groups of earthquakes records including original near field records with velocity pulse and near field records which their velocity pulse were extracted (residual records), scaled to 0.2g and 0.3g, were used as input motions to seismic bedrock of the representative profile. Then by using soil dynamic analysis, site specific spectra were exported and were compared with each other. For example as shown in Figure 3 for lower periods from 0 to 0.6s site specific spectrum of near field records which their velocity pulse were extracted are above the spectrum of original near field records but for higher periods this is reversed.

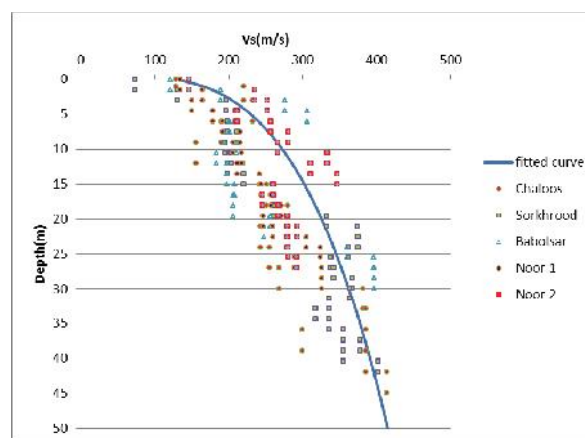


Figure 1. Results of downhole tests and fitted curve

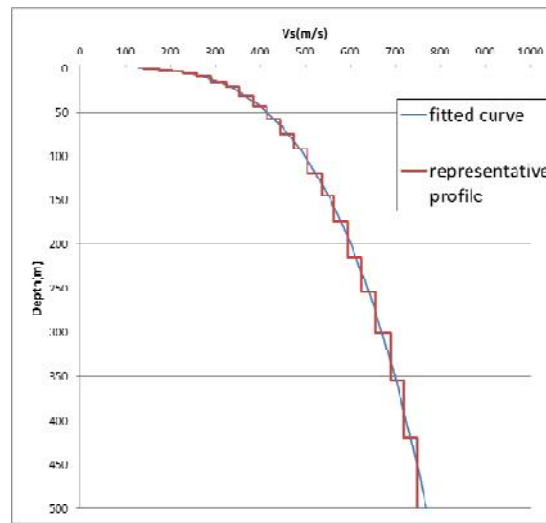


Figure 2. Fitted curve and representative profile of northern coastal sites of Iran

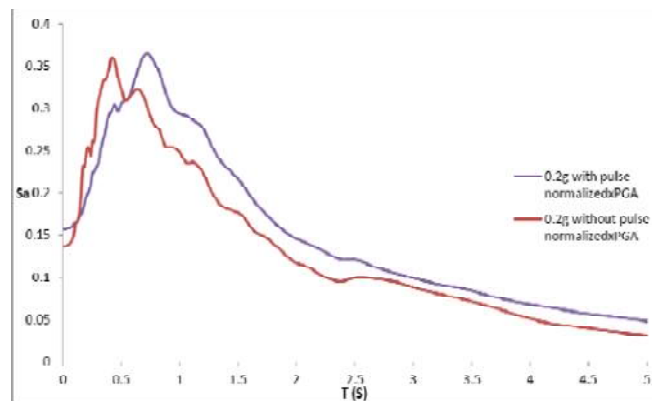


Figure 3. Site specific spectra of near field records with and without velocity pulse

At the end, site specific spectra of original near field and residual near field records were compared with valid seismic codes' spectra and showed that the results doesn't really have a good agreement with 2800 standard's design spectra. Therefore building structures in northern coastal sites of Iran, according to Iranian seismic code would not be economically optimal and revision of this almost old seismic code and considering near field earthquakes effects in an accurate way is necessary.

REFERENCES

2800 Standard, Iran Seismic Code, Third Edition

Stewart JP, Chiou SJ, Bray JD, Graves RW, Somerville PG and Abrahamson NA (2001) Ground Motion Evaluation Procedures for Performance-Based Design, PEER Report 2001/09, Pacific Earthquake Engineering Research Center, College of Engineering, University of California, Berkeley

