



Comparison Between Deterministic And Probabilistic Methods of A SPT-Based Liquefaction Potential Evaluation

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Liquefaction hazard has been recognized as a major cause of damage during earthquakes. In this paper, two methods of liquefaction potential evaluation based on in-situ tests were studied and compared. The first analysis is a deterministic one based on the Seed and Idriss simplified procedure for liquefaction evaluation that results in a Factor of Safety against liquefaction. The second method is probabilistic and based on Bayesian updating that gives a probability of liquefaction. The latter methodology is gaining acceptance in the geotechnical community and will likely be the preferred method in the future. To analyze both methods through a quantitative example, a data set based on the standard penetration test (SPT) from the southern San Francisco Bay area was used. The analysis showed that both methods yield comparable results for 94% of boring locations, especially for sites that result in a very high or very low potential to liquefy. However, for 6% of the sites, the results were different. Of that 6%, the deterministic method tends to classify borings as liquefiable more than the probabilistic method. Statistical presentation of the results is provided for a better comparison of the two methods. The distribution of calculated liquefaction probability and Factor of Safety values is presented with respect to the surficial geological unit and liquefaction susceptibility maps defined by Knudsen et al (2000) at the USGS as to identify locations of liquefaction potential. Liquefaction potential maps were displayed using geographic information system software. The geographic information system has recently emerged as a powerful tool for storing data as well as displaying maps in geotechnical earthquake engineering.