Liquefaction under Probabilistic Ground Motions

W. D. Liam Finn, University of British Columbia, Vancouver, Canada

Abstract

Liquefaction potential and lateral spreading are generally evaluated in engineering practice using deterministic procedures based on a design magnitude, M, and an associated Peak Ground Acceleration, PGA. In a probabilistic ground motion environment, a wide range of magnitudes contributes to the PGA. A common solution adopted to cope with the problems this poses for the deterministic approach is to select a single magnitude somewhat close to the maximum magnitude to represent the combined effects of all the magnitudes contributing to the hazard. However, there is no measure of whether this approach is appropriate. In many cases , this approach leads to reduced factors of safety that are too low, resulting in inflated estimates of lateral spreading and settlements. This paper presents two approaches to avoiding this problem. These are a magnitude deaggregation approach in which the contribution of each constituent magnitude is individually taken into account and effective stress dynamic site response analysis using ground motions scaled to the probabilistic hazard and the pore water pressure model is tuned to the SPT or CPT resistance curves, CRR, used for evaluating liquefaction potential. The deaggregation method is extended to methods such as Youd's for the calculation of lateral spreading.