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Probabilistic Modeling of Post-Liquefaction Ground Deformation

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Abstract : This paper utilizes a probabilistic liquefaction triggering method for modeling post-liquefaction ground deformation. This cone penetration test CPT-based liquefaction triggering is employed to estimate the factor of safety against liquefaction (FSL) and compute the maximum cyclic shear strain (γmax). The study identifies a maximum PL value of 90% across various relative densities, which challenges the decrease from 90% to 70% as relative density decreases. It reveals that PL ranges from 5% to 50% for volumetric strain (εvol) less than 1%, while for εvol values between 1% and 3.2%, PL spans from 50% to 90%. The application of the CPT-based simplified liquefaction triggering procedures has been employed in previous researches to estimate liquefaction ground-failure indices, such as the Liquefaction Potential Index (LPI) and Liquefaction Severity Number (LSN). However, several studies have been conducted to highlight the variability in liquefaction probability calculations, suggesting a more accurate depiction of liquefaction likelihood. Consequently, the utilization of these simplified methods may not offer practical efficiency. This paper further investigates the efficacy of various established liquefaction vulnerability parameters, including LPI and LSN, in explaining the observed liquefaction-induced damage within residential zones of Christchurch, New Zealand using results from CPT database.

Keywords : cone penetration test (CPT), liquefaction, postliquefaction, ground failure
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