

ABSTRACT

CPT-BASED PROBABILISTIC ASSESSMENT OF SEISMIC SOIL LIQUEFACTION INITIATION

by


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The correlation of seismic field performance with *in situ* index test results has been proven to be a reliable method for defining the threshold between liquefaction and non-liquefaction. The objective of this research was to define in the most accurate and unbiased manner possible the initiation of seismic soil liquefaction using the Cone Penetration Test (CPT). Case histories of occurrence and non-occurrence of soil liquefaction were collected from seismic events over the past three decades. These were processed to develop improved CPT-based correlations for prediction of the likelihood of “triggering” or initiation of soil liquefaction during earthquakes. Important advances over similar, previous efforts include, (1) collection of a larger suite of case histories, (2) development of an improved treatment of CPT thin-layer corrections, (3) improved treatment of normalization of CPT tip and sleeve resistances for effective overburden stress effects, (4) improved evaluation of cyclic stress ratio (CSR) in back analyses of field case histories, (5) assessment of uncertainties of all key parameters in back-analyses of field case histories, (6) evaluation and screening of case histories on the basis of

overall uncertainty, and (7) use of higher-order (Bayesian) regression tools. The resultant correlations provide improved estimates of liquefaction potential, as well as quantified estimates of uncertainty. The new correlations also provide insight regarding adjustment of CPT tip resistance for effects of “fines” content and soil character for purposes of CPT-based liquefaction hazard assessment.



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