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LIQUEFACTION POTENTIAL ASSESSMENT OF ALLUVIAL SOIL SITE USING 1D NONLINEAR GROUND RESPONSE ANALYSIS

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Natural phenomenon like earthquakes can cause large amount of damage to structures as well as to human lives. Phenomenon related to earthquake like soil liquefaction pose even higher threat as its consequences can be more disastrous. It is therefore essential to characterize these ground motions, in order to predict their damage potential and to suggest concrete measures to minimize their catastrophic effects. Subsoil strata of any particular region play a vital role in understanding the effect of earthquake to substructures and super structures. In this paper, liquefaction analysis study has been carried out for a representative site situated in north India which lies in seismic zone-III as per seismic zonation map of India (IS 1893:2002). Liquefaction susceptibility of soil can be assessed by determining the factor of safety (FOS) which is the ratio of cyclic resistance ratio (CRR) and cyclic stress ratio (CSR). CRR of soil has been determined using field data obtained from standard penetration test (SPT) following the NCEER approach (2001). 95 percentile values of field data, such as, N-value, soil density and fines content have been assessed at different depths for calculating CRR. CRR is also determined by use of empirical relationships given by Seed and Idriss (1984). CSR has been assessed by performing 1D nonlinear effective stress ground response analysis with pore water pressure dissipation, and by performing equivalent linear analysis. Spectrum compatible time history obtained from site specific ground response spectra have been used to perform the nonlinear dynamic analysis using time integration technique in DEEPSOIL (2016). A comparison between equivalent linear and nonlinear approach to assess cyclic stress ratio has been conducted. The relation of factor of safety with depth of strata, obtained by the performing site specific response analysis and tests is compared with FOS obtained by the empirical procedure given by Seed and Idriss (1984) in the paper.

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