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Seismic Site Characterization and Ground Response Analysis of Railway Line on Eastern Dedicated Freight Corridor

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Abstract

Response of local soil during seismic events influences the response of the motion of the structure. Therefore, it is important to consider the local site characteristics while designing the structure for seismic design. In the present work, seismic site characterization and ground response analysis (GRA) have been performed for the proposed railway line between New Karchana Station - New Bhaupur (Kanpur) railway station, India. Total of 27 borehole data has been collected from the site. Further, seismic site characterization has been performed by adopting US National Earthquake Hazard Reduction Program (NEHRP) guidelines. A power method of nonlinear regression analysis has been used to propose an empirical correlation between SPT blow count (SPT-N) and shear wave velocity (V_s) for the study site to estimate the V_s profile. All the borehole location has been characterized as class D as per 30 m average V_s and SPT-N. In addition, a 1D equivalent linear approach has been used for the seismic GRA for six borehole locations by using *DEEPSOIL v*7.0 software. Total 3 ground motions have been considered for GRA. Significant amplification has been observed at the site. Maximum displacement at the surface layer, Fourier amplification ratio, amplification factor, amplified PGA at surface level, effective stress, and maximum stress ratio have been also estimated for all the locations. Average response spectra have been estimated for the site. With the help of the above findings, liquefaction studies, seismic hazards analysis, and existing structures could be retrofitted with seismic protection.

Keywords: Correlation, Seismic site characterization, Ground response analysis