

First Level Seismic Hazard Microzonation Studies Of Vijayawada Urban Agglomeration, Krishna District, Andhra Pradesh

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Abstract

Indian peninsular shield, once considered to be seismically stable, has been experiencing many earthquakes recently. In fact, after the Bhuj earthquake of 2001 the Indian standard BIS: 1893 upgraded cities like Vijayawada from zone II to zone III. Vijayawada, the third largest city of Andhra Pradesh with 4% of the total urban population of the state, falls under seismically moderate zone. The National Disaster Management Authority (NDMA), Govt. of India has also prioritized this city for pre-disaster studies, including seismic hazard microzonation.

The study aims at assessing the seismic site response of subsurface soil media and liquefaction hazard for a moderate earthquake (≥ 6 M) occurring in the proximal source area. Multidisciplinary approach with inputs from geomorphological, hydrological, geophysical, SPT drilling and related geotechnical studies was utilised. The geophysical input included seismic site response (peak amplitude and peak frequency) and resistivity surveys. Nakamura technique was used to estimate the predominant range of frequencies and amplification factor. The geotechnical inputs were based on Standard Penetration Test (SPT) carried at 2 m interval in each borehole upto a maximum depth of 30 m, followed by laboratory analyses of undisturbed/bulk samples. SPT derived N60 values were obtained for different depths (i.e., 3, 5, 7, 9.....29 m) at each borehole location and weighted average shear wave velocity was computed.

Based on the available past seismic data, four possible earthquake sources were identified within 300 km radius of the area and maximum credible earthquake (MCE), rock level peak ground acceleration (PGA), etc. were calculated. The result provided two hazard scenarios: (1) PGA of 0.06g with a 55 year return period and (2) PGA of 0.22g with a 220 year return period. For scenario-1, most of the area is characterized low to safe for liquefaction whereas for scenario-2, areas susceptible to liquefaction

were also noted. The site response study indicated that the peak frequency varies in the range from 1 to 13 Hz and peak amplification factor from 1 to 4 for the study area. The results obtained in the form of GIS derived, depth wise regional seismic / liquefaction hazard maps, are of high societal value in land use planning and for mitigation measures.