



Earthquake Loading Assessment to Evaluate Liquefaction Potential in Emilia-Romagna Region

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The May-June 2012 seismic sequence that struck Lombardia and Emilia-Romagna consisted of seven main events of magnitude greater than 5 followed by numerous aftershocks. The strongest earthquakes occurred on May 20 ($M=5.9$) and May 29 ($M=5.8$). The widespread soil liquefaction, unexpected because of the moderate magnitude of the events, pushed the local authorities to issue research projects aimed to define the earthquake loading to evaluate the liquefaction safety factor.

The reasons explained below led us to adopt a deterministic hazard approach to evaluate the seismic parameters relevant to liquefaction assessment, despite the fact that the Italian Seismic Building Code (NTC08) is based on probabilistic hazard analysis.

For urban planning and building design geologists generally adopt the CRR/CSR technique to assess liquefaction potential; therefore we considered PGA and a design magnitude to be representative of the seismic loading. The procedure adopted consists: a) identification of seismic source zones and characterization of each zone by the maximum magnitude; b) evaluation of the source to site distance and c) adoption of a suitable attenuation law to compute the expected PGA at the site, given the site condition and the design magnitude. The design magnitude can be: the maximum magnitude; the magnitude that causes the largest PGA, or both. The PGA values obtained are larger with respect to the 474 years return period PGA prescribed by NTC08 for the seismic design for ordinary buildings. We conducted a CPTU resistance test intended to define the CRR at the village of Cavezzo, situated in the epicentral area of the 2012 earthquake. The CRR/CSR ratio led to an elevated liquefaction risk at the analysed site. On the contrary the adoption of the 474 years return period PGA of the NTC08 prescribed for Cavezzo site led to a negligible liquefaction risk. Note that very close to the investigated site several liquefaction phenomena were observed.