

Final dissertation: Master of Science in Engineering Geology A.Y. 2021/2022

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Analysis of the rigorous Local Seismic Response of the new community hospital of San Secondo Parmense

Internship at Centre for GeoTechnologies of University of Siena

This paper is intended to depict the operating procedures adopted to determine the seismic action and aimed at designing a health care building with recovery rooms, which is part of the hospital complex building of via Felice Cavallotti in San Secondo Parmense (PR).

The study has been carried out in accordance with the current regulations – Technical Standards for Construction (NTC18) as presented in the M.D. 17/01/2018 and in the related directive of the Superior Council of Public Works, nr. 7 of the 21st of January, 2019.

In order to define the “geological model” of the project area, I obtained from the official thematic mapping the data relating to the local and regional geolithological, geomorphological, hydrogeological and seismotectonic structure.

In this sense I especially carried out specific direct geognostic investigations (sounding with continuous coring, static penetrometric tests with electric point “CPTU”, laboratory tests) and geophysical ones (Down-Hole, single-station microtremor measurements “HVSr” and seismic prospecting “MASW”).

The analysis of Local Seismic Response, realised through the Strata program, has been conducted by means of a linear-equivalent approach, which simulates the non-linear behaviour of the terrain using G-g and D-g curves associated with every type of land. For the analysis in question, these curves, have been used both as curves from international databases and as curves from specific laboratory tests, in the dynamic field, made from terrain samples picked up during sounding.

The results of the one-dimensional analysis have been expressed in terms of acceleration spectrum and put in comparison with the ones from the regulations. In consideration of a calculation approach through a non-linear dynamic analysis of the structures, I give the graphics of the elastic spectral responses relative states SLD and SLV computed and normalised, in their turn compared with the elastic spectrum of the regulation M.D. 17/01/2018. Moreover, I present charts with dependent and independent parameters values, in case the designer needs to integrate the output data of the spectral response “normalised” with the canonical regulation spectrum.

The results of the Local Seismic Analysis show that the spectral response SLD and SLV is in fact substantially equivalent to the regulation one for a terrain of “C” category.

Dr. Sara Cafaggi

HVSR surveys in abandoned quarries in the municipal area of Bologna

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Within the municipal area of Bologna there are numerous areas used as quarries for the extraction of clayey, sandy and gravelly sedimentary materials.

Many of these quarries are no longer active and after their decommissioning, when envisaged by an environmental restoration project, they have been filled with filling materials and, in some cases, have been reconverted to building areas.

In this work the seismic behavior of these areas has been investigated. Attention was focused on two former quarry areas located within the municipality of Bologna, the Bruschetti quarry area (abandoned at the beginning of the 1970s) located west of the city center and an older quarry area (presumed cultivation area dating back to the 1960s) located in the Due Madonne area east of the city center, both classified by the PAE 2007 as gravel pits.

For each of the two areas treated, a campaign of passive seismic investigations with a single station of the HVSR type was prepared with the aim of identifying any differences in the behavior of the soils inside and outside the former quarry areas.

At one of the investigated sites, two MASW-type active seismic tests were also carried out to estimate the velocity profiles of the shear waves of the filling materials in the extraction area.

The results of the seismic investigations were compared with the direct evidence available on the database of geognostic evidence of the Geological Cartography of the Emilia-Romagna Region.

The analysis of the acquired data has highlighted in the Bruschetti quarry marked differences in amplification between the soils outside and inside the quarry area, with marked resonances around 3 Hz found within the quarry area. In the other site investigated, however, no significant differences were found between the soil outside and inside the quarry area.