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ReStructure 2.0 Webinar Series

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The influence of soil-foundation-structure interaction on the seismic performance of masonry buildings

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Abstract: Most of the damage and of the casualties induced even by the most recent strong-motion earthquakes which stroke Central and Southern Italy can be attributed to the extreme seismic vulnerability of the ordinary residential buildings. Both in small villages and in mid-size towns, these latter are mainly constituted by two- to four-story masonry structures built without anti-seismic criteria, with direct foundations corresponding to an in-depth extension of the loadbearing walls or to an underground level. For such structures, especially when founded on soft soils, soil-foundation-structure interaction can significantly affect the seismic performance; on the other hand, its influence must be handled with methods which should be as simple and straight-forward as possible, in order to be cost-effective and accessible by practitioners. The contribution wishes to summarize the studies carried out in the last years at University of Napoli Federico II, based on parametric numerical analyses on complete soil-foundation-structure models reproducing the most recurrent building configurations combined with different subsoil conditions. The analyses provided calibration criteria for: i) predicting the elongation of the fundamental period of the structure, ii) defining and optimizing fragility functions for different damage mechanisms accounting for soil-foundation-structure interaction. The effectiveness of these simplified tools was validated against well-documented case studies at the scale of single instrumented buildings or of extended areas, with building properties and subsoil conditions comparable to those adopted in the parametric analyses.



Presenter Bio-Sketch: Francesco Silvestri, born in Napoli (Italy) in 1960, M.Sc. in Civil Engineering (1986), Research Assistant (1990) and Ph.D. in Geotechnical Engineering (1991) at University of Napoli Federico II. Associate Professor at University of Calabria in 1998, Professor since 2003, in 2007 back to University of Napoli Federico II.

Currently teaching 'Soil Dynamics and Earthquake Geotechnical Engineering' at University of Napoli Federico II and 'Soil dynamics and non-linear site response analysis' (Master on Geomechanics, Civil Engineering and Risks) at University of Grenoble-Alpes (France).

Experimental and analytical research on the seismic behaviour of soils, slopes, buildings and infrastructures; main current interests: seismic response analysis, seismic slope stability, liquefaction, soil-foundation-structure interaction, seismic performance of earth dams and underground excavations.

Session, panel reporter, chairman and discussion leader at national and international conferences.

Principal Investigator in national and international Research Projects on soil dynamics and earthquake engineering.

Member of national and international Technical Committees on geotechnical testing and earthquake geotechnical engineering, including ISSMGE TC203.

Guest editor of special issues on the Italian Geotechnical Journal (Rivista Italiana di Geotecnica) and Acta Geotechnica.

Co-organizer and editor of the proceedings of the International Symposium on Volcanic Rocks and Soils (Ischia, 2015).

Chairman and editor of the proceedings of the 7ICEGE – 7th International Conference on Earthquake Geotechnical Engineering (Rome, June 17-20, 2019).

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