

IGT-Kolloquium

Wednesday, 13 November 2019

Performance-based Seismic Evaluation of Under-designed Foundations

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1.45 pm, ETH Zurich, Hönggerberg, HCI J7

The Occurrence of induced earthquakes in areas of low tectonic seismicity, where most structures have not been designed to resist earthquake loading, creates the need for seismic performance evaluation of existing structures. This presentation focuses on the evaluation of two aspects of the dynamic performance of existing buildings: a) liquefaction-induced settlements of buildings on narrow spread footings, and b) available axial capacity of under-designed pile foundations.

Advanced dynamic soil-structure interaction analyses were performed to estimate liquefaction-induced settlements for buildings on narrow spread footings. The analyses covered a wide range of soil conditions, ground motions and structural characteristics. Results verify patterns observed in recent studies for slab foundations and shed light on new mechanisms. For typical, low magnitude induced earthquakes, the total foundation settlements were found to be relatively limited. The findings of this study have been adopted in the latest update of the relevant building code of an induced seismicity prone area.

For the preliminary seismic evaluation of poorly reinforced pile foundations, a methodology based on analytical models was developed. Application of the proposed methodology showed that piles can bear vertical loads even after shear failure has initiated, as long as the imposed drifts on the pile are less than a critical value. This finding is likely to have a significant influence on the design of retrofit approaches.

Vasileios Drosos is a Senior Engineer at GR8 GEO. He obtained his undergraduate degree at the National Technical University of Athens (NTUA) and graduate degrees at Georgia Tech and NTUA. For more than 15 years he has been working as a consultant engineer and served as a researcher in Greece, Turkey, the Netherlands, and the USA. He has worked extensively on advanced numerical modeling activities for several infrastructure projects. After completion of his post-doctoral research at the University of California, Berkeley on the dynamic SSI of seismically isolated nuclear power plants, he joined Fugro in 2014. While in Fugro, Dr. Drosos worked in a range of projects involving site investigation, site characterization, foundation recommendations and earthquake engineering design services. Selected projects include the preliminary earthwork design for the Istanbul New Airport in Turkey; the site characterization, earthquake engineering studies and foundation design services for the Çanakkale Bridge in Turkey; and the assessment of the seismic performance of critical earth structures in Groningen, the Netherlands. He joined GR8 GEO in 2018. As a researcher, Dr. Drosos has worked in several research projects funded by the EU, Public and Private Organizations. He has co-authored 15 journal papers and more than 30 conference papers.