ETH zürich

IGT-Kolloquium

Thursday, 22 June 2017

Tall Anchored Sheet-Pile Walls: Seismic Response and Improvement Schemes

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3 - 4 pm, ETH Zurich, Hönggerberg, HIL C 10.3

The seismic response of anchored steel sheet-pile walls subjected to strong earthquake shaking in non-liquefiable ground is investigated through a typical quay-wall with a free height of 18 m, embedded into: (i) a relatively dense sandy, or (ii) a stiff clay “foundation” soil. The sheet pile wall is triggered by seismic motions of various intensities with respect to the PGA at the rock-outcrop level, namely 0.15 g, 0.30 g, and 0.50 g. The long-established simplified design methods of pseudo-static limit equilibrium in conjunction with the Mononobe-Okabe method, are shown to lead to results for bending moments that in some cases are larger than, but in other cases quite similar to, those computed with the commercially available finite element (FE) codes of ABAQUS, FLAC, and PLAXIS. The numerical FE analyses can capture well the physical phenomena of this complex interaction problem leading to reliable results, although the computed deflection of the wall is quite sensitive to the soil constitutive model. For the case of strong excitation with 0.5 g records, the horizontal deflection of the wall attains excessive values. To limit these displacements, soil improvement was chosen at two “crucial” locations: (i) the anchor-wall and (ii) the front of the main wall. Both lead to significant reduction of the anchor wall deformation, but the induced bending moments of the sheet pile wall are slightly larger than those of the non-improved cases.

Evangelia Garini received her Diploma in Civil Engineering from the National Technical University of Athens (NTUA) in 2003, followed by a MS from State University of New York at Buffalo in 2005. She then pursued her PhD at NTUA under the supervision of Professor George Gazetas, which she obtained in 2011 specializing in the strongly inelastic analogues of sliding systems under near–fault ground shaking. The damage potential of forward directivity and fling affected records on sliding displacement against conventional intensity measures was also studied. Since 2012 she is a postdoctoral researcher at Soil mechanics Laboratory in NTUA. Her current work focuses on non-linear soil amplification, seismic response of gravity and anchored sheet pile retaining walls, dynamic behavior of concrete and earthfill dams, forensic geotechnical engineering, 3D simulation of overturning systems.