POLITECNICO DI TORINO

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ALBENGA ROOM, DOOR 1, SECOND FLOOR

DEPARTMENT OF STRUCTURAL, GEOTECHNICAL AND BUILDING ENGINEERING

CORSO DUCA DEGLI ABRUZZI, 24 - TORINO

REAL-TIME DYNAMIC HYBRID SIMULATION OF SOIL-FOUNDATION-STRUCTURE INTERACTION

ANTHONY F. TESSARI, PH.D., P.E.,

ASSISTANT PROFESSOR

UNIVERSITY AT BUFFALO, DEPARTMENT OF CIVIL, STRUCTURAL AND ENVIRONMENTAL ENGINEERING

Abstract: Soil-Foundation-Structure-Interaction (SFSI) is a necessary consideration in the design of multi-hazard resilient infrastructure. Laboratory studies of SFSI at an element scale or reduced-scale are challenging as realistic boundary conditions are not replicated appropriately, and the response of integrated sub-systems and agglomerated soils are prone to scaling issues, particularly when pore fluid is present. Large-scale testing with real-time dynamic hybrid simulation is a useful tool for characterizing SFSI effects. By increasing knowledge of the fundamental physics and parameters that drive SFSI phenomena, new and existing high-risk facilities will be better analyzed and designed (or retrofitted) to achieve target performance goals at the component and systems levels.

The Geotechnical Laminar Box at the University at Buffalo (UB) was used to create a large-scale model of a liquefiable soil column and pile foundation system, upon which a hybrid shake table was installed. The parametric experimental program included three inputs: base motions, superstructure only motions, and hybrid scenarios involving the base and superstructure. More than 150 seismic events were executed on the large-scale model to characterize the response of the soil-structure system. Novel sensing technologies were employed to identify the state of the soil and soil-foundation system between successive seismic events. The research produced positive initial findings of the hybrid SFSI setup and identified areas for further research.

Biography: Anthony F. Tessari is an Assistant Professor in the department of Civil, Structural and Environmental Engineering at the University at Buffalo. His background is in geotechnical engineering, specializing in the domains of soil-structure interaction (SSI) and soil-foundation-superstructure interaction (SFSI) of bridges, nuclear power plants, tunnels, and flood protection systems as they pertain to multi-hazard resilience. He has designed and implemented full-scale real-time dynamic hybrid SFSI simulation in a large geotechnical laminar box as well as advanced sensing and instrumentation systems to determine the elastic and elastic-plastic parameters of the soil models using non-destructive or minimally invasive methods. The results of recent research thrusts are being used by the United States Department of Energy (DOE) to update current design methodologies and retrofitting strategies for high-risk nuclear energy infrastructure.

Dr. Tessari also serves as a founding executive board member for the Institute for Bridge Engineering, the only degree program in the United States to specifically offer graduate degrees in bridge engineering. He maintains professional licensure in the State of New York, consulting on large infrastructure projects both domestic and international. Additional information can be found on his geotechnical group website at geotechnic.al and personal website at anthonytessari.com.