

Anthony F. Tessari

Assistant Professor

Department of Civil, Structural and Environmental Engineering

Office Address:

University at Buffalo
229 Ketter Hall
Buffalo, NY 14260

Contact:

Office: (716) 645-4359
Email: atessari@buffalo.edu
Web: anthonytessari.com

AREAS OF EXPERTISE

Advanced sensing technologies, algorithms, and data acquisition techniques for field and high-gravity environments. Physical modeling of levee and floodwall systems, blast testing, dynamic response of soil and soil-foundation systems, lateral spreading, and liquefaction.

EDUCATION AND LICENSURE

Doctor of Philosophy, Civil Engineering December 2012
Rensselaer Polytechnic Institute, Troy, NY
Dissertation: Centrifuge Modeling of the Effects of Natural Hazards on Pile-founded Concrete Floodwalls

Master of Science, Civil Engineering December 2007
Rensselaer Polytechnic Institute, Troy, NY
Thesis: Measurement of Primary and Secondary Wave Velocities on a Geotechnical Centrifuge Using Bender Elements

Bachelor of Science, Civil Engineering May 2006
Rensselaer Polytechnic Institute, Troy, NY

Professional Engineer

New York State
License 093340

PROFESSIONAL HISTORY

Assistant Professor University at Buffalo August 2013 – Present
Department of Civil, Structural,
and Environmental Engineering

November 2014

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A.F. Tessari CV

- Served on board of directors and as a core member of the Institute for Bridge Engineering.
- Designed an offshore geotechnical engineering course focusing on the probabilistic evaluation of deep foundation soils and design optimization for offshore driven piles, caissons, micropiles, and suction caissons utilizing bridge case studies.
- Reintroduced a course on geotechnical earthquake engineering and soil dynamics that incorporates seismology, probabilistic seismic hazard analysis, dynamic properties of soil, and modern design methodologies.

Geotechnical Research Engineer, Geotechnical Centrifuge Research Center	Rensselaer Polytechnic Institute and the Network for Earthquake Engineering Simulation	November 2007 – August 2013
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- Designed and assisted in commissioning major experimental equipment and upgrades to the geotechnical centrifuge facility, including: the in-flight 2-Dimensional Earthquake Simulator, which is capable of reproducing seismic events with less than 2% RMS error; the Force-controlled 2D Robotic Z Loading System, with maximum axial capacity of 50 kN; and several data acquisition system upgrades that tied in advanced sensing capabilities.
- Designed and installed upgrades to the 4-DOF In-flight Robot, which include an upgraded cone penetrometer, t-bar full-flow penetrometer, and biaxial load arm. The modifications have been used extensively in several high-profile research projects.
- Assisted in the development and implementation of an NSF TUES Type 1 Project, “A Multi-Institutional Classroom Learning Environment for Geotechnical Engineering Education,” for undergraduate soil-mechanics students with Prof. T. Abdoun (Co-PI) at Rensselaer Polytechnic Institute, Prof. U. El-Shamy (PI) at Southern Methodist University, and Prof. M. Pando (Co-PI) at University of North Carolina Charlotte.
- Supported over 10 NEES and 4 Non-NEES major research projects.
- Managed and co-advised over 25 individual undergraduate researchers, many of whom went onto graduate studies at institutions including RPI, MIT, and UC Berkeley.
- Developed methods for the adaptation of tactile pressure sensors to the centrifuge environment, which include preparation and calibration procedures for static and dynamic events in dry and saturated environments.
- Member of an international consortium that is designing and specifying next-gen subminiature pore water pressure sensors.
- Commissioned and implemented several upgrades to the centrifuge data acquisition hardware and software. Worked closely with Bloomy Control Systems to implement a Centrifuge DAQ Software suite, which has been generalized and adopted by the US Army Corps of

Engineers Centrifuge Facility, the KAIST Centrifuge Facility, and is part of a few proposals for new facilities.

- Organized sessions for three international centrifuge workshops (RPI & UC Davis joint ventures).

**Acting Technical Manager,
Geotechnical Centrifuge
Research Center**

Rensselaer Polytechnic Institute
and the Network for Earthquake
Engineering Simulation

August 2011 –
January 2012

- Managed two full time staff engineers (mechanical and electrical) and two full time IT personnel while ensuring efficient and effective use of the research equipment.
- Balanced budget and prepared financial reports for CEES facility, which encompasses approximately \$1.9M of funded research per year.
- Supervised 4 internal graduate student researchers and 14 undergraduate researchers on several projects.
- Supported NEES shared-use time by scheduling two external researchers for centrifuge experiments.
- Prepared supplemental funding proposal for equipment upgrades; received \$80,000 for high-speed tactile system upgrade.
- Oversaw development of dynamic retrofit and testing of the three-piece split-box testing container.

**Graduate Research
Assistant, Geotechnical
Centrifuge Research Center**

Rensselaer Polytechnic Institute
and the Network for Earthquake
Engineering Simulation

August 2006 –
November 2007

- Designed custom unity-gain buffer hardware and developed custom high-speed acquisition software titled, “Bender Elements Data Acquisition and Analysis,” for the construction of a piezoelectric tomography system for the geotechnical centrifuge.
- Implemented piezoelectric transducers into a resonant column and torsional shear device.

**Undergraduate Research
Assistant, Geotechnical
Centrifuge Research Center**

Rensselaer Polytechnic Institute
and the Network for Earthquake
Engineering Simulation

January 2006 –
May 2006

- Assisted in the construction of centrifuge models of failed New Orleans levees in the wake of Hurricane Katrina.
- Performed cycles of standard geotechnical laboratory testing for quality control (e.g., liquid and plastic limits).

Land Survey Instrument Operator

A+ Construction Services,
Norwell, MA

June 2004 – August 2006

- Operated a total station on public highway projects, railway renovation, new bridge construction, overpass repair projects, and a shopping mall expansion project.
- Performed preliminary surveys, intermediate, and as-builts over the course of several projects.

SCIENTIFIC PUBLICATIONS

- **Theses**

T1. **Doctoral Dissertation:** *Centrifuge Modeling of the Effects of Natural Hazards on Pile-founded Concrete Floodwalls*
Rensselaer Polytechnic Institute, December 2012
Adviser: Professor Tarek Abdoun
Co-adviser: Professor Inthuorn Sasanakul

T2. **Master's Thesis:** *Measurement of Primary and Secondary Wave Velocities on a Geotechnical Centrifuge Using Bender Elements*
Rensselaer Polytechnic Institute, November 2007
Adviser: Professor Tarek Abdoun

Prints available upon request.

- **Refereed Journal Articles**

Current citation data available at scholar.google.com/citations?user=owHPoN8AAAAJ

J1. El Ganainy, H., Tessari, A., Abdoun, T. & Sasanakul, I. (2014). Tactile pressure sensors in centrifuge testing, *ASTM Geotechnical Testing Journal*, 37(1), pp. 151-163.

- J2. El Sekelly, W., Tessari, A., & Abdoun, T. (2014). Shear wave velocity measurement in the centrifuge using bender elements, *ASTM Geotechnical Testing Journal*, 37(4), pp. 689-704.
- J3. Abdoun, T., Tessari, A., Sasanakul, I., & Varuso, R. (In submission, August 2014). Evaluation of the effects of fixitation on centrifuge modeled pile-founded concrete floodwalls.
- J4. Tessari, A., Sasanakul, I., Varuso, R., & Abdoun, T. (In submission, August 2014). Centrifuge modeling of the effects of unstable soils on pile-founded concrete floodwalls.
- J5. Panthangi, V., Tessari, A., Abdoun, T., & Sasanakul, I. (In preparation, December 2014). Dynamic response and calibration of tactile pressure sensors in geotechnical physical modeling.

- **Refereed Conference Proceedings**

- C1. De, A., Zimmie, T.F., Abdoun, T. & Tessari, A. (2010). Physical Modeling of Explosive Effects on Tunnels, In *Fourth International Symposium on Tunnel Safety and Security*, Frankfurt am Main, Germany, pp. 159-167.
- C2. Tessari, A., Sasanakul, I., & Abdoun, T. (2010). Advanced Sensing in Geotechnical Centrifuge Models, In *7th International Conference on Physical Modeling in Geotechnics*, Zurich, Switzerland, pp. 395-400.
- C3. Tessari, A., Sasanakul, I., & Abdoun, T. (2013). Characterization of Soil-Foundation Interaction for a T-Wall Flood Protection System in New Orleans, In *Geo-Congress 2013*, San Diego, California, pp. 1100-1103.
- C4. Abdoun, T., El-Shamy, U., Tessari, A., Bennett, V., & Lawler, J. (2013). Multi-Institutional Physical Modeling Learning Environment for Geotechnical Engineering Education, In *2013 ASEE Annual Conference*, Atlanta, Georgia.
- C5. Tessari, A., Abdoun, T., Wroe, E., & Sasanakul, I. (2014). Boundary Corrected Calibration of Tactile Pressure Sensors, In *8th International Conference on Physical Modeling in Geotechnics*, Perth, Australia, pp. 331-336.
- C6. Abdoun, T., Sasanakul, I., Tessari, A., & Lawler, J. (2014). In-flight Earthquake and Dynamic Shaking using RPI 2D Shaker, In *8th International Conference on Physical*

Modeling in Geotechnics, Perth, Australia, pp. 259-264.

- C7. Reeb, A., Filz, G., Johnson, J., Varuso, R., Kokkali, P., Tessari, A., & Abdoun, T. (2015). Validation of a Numerical Model to Analyze Pile-Supported T-Walls, In *International Foundations Congress and Equipment Expo*, San Antonio, Texas.

PROJECTS

- *Subsidence and Downdrag Bending Moments Developed in New Orleans T-Walls as co-PI* (December 2012 - December 2014) with T. Abdoun, G. Filz, R. Varuso, R. Pinner, M. Woodward, I. Sasanakul, J. Johnson, N. Schwanz, and A. Reeb. The purpose of this study is to investigate and gain insight into the mechanisms and magnitudes of downdrag bending moments that develop in battered piles supporting T-Wall structures in the New Orleans area. Funding budget of \$220k and possibility of continued research.
- *New Orleans T-Wall and Levee Reinforcement Study* (September 2007 – August 2012), for United States Army Corps of Engineers with Professor T. Abdoun (PI), Professor I. Sasanakul, and Dr. R. Varuso. Designed, developed, and tested over 11 centrifuge models to evaluate the structural impact of a sheet-pile cutoff in resisting global instability in soft soils as induced by storm surge surcharge. Results and recommendations have been used to develop new standards as published in the Hurricane and Storm Damage Reduction System Design Guidelines (2012).
- *A Multi-Institutional Classroom Learning Environment for Geotechnical Engineering Education* (2011 – 2013), for the National Science Foundation with Professors U. El-Shamy (PI), T. Abdoun, and M. Pando. Designed and developed instrumentation and testing methods for an undergraduate engineering education module. Worked closely with a team of undergraduate researchers to identify and correct potential sources for misinterpretation and logistical errors. The students designed, constructed, and analyzed a centrifuge experiment. Over 90% of the students responded favorably and indicated that the experience encouraged them to think critically and make deeper conclusions about the experiment results than they would have otherwise done with a regular classroom-based exercise.
- *Bender Element System Development* (January 2007 – November 2007), for Rensselaer Geotechnical Centrifuge with Professor T. Abdoun and Dr. Y. Choo. Designed specialized hardware and wrote custom software to allow researchers to rapidly collect, verify, and analyze data from piezoelectric transducers. The software and hardware is used extensively in centrifuge testing and has been adopted by the centrifuge facility at the Korea Advanced

Institute of Science and Technology (KAIST).

- *Tactile Sensor System Development* (2007 – 2012), for Rensselaer Geotechnical Centrifuge with Professor T. Abdoun, Professor I. Sasanakul, and Dr. H. El-Ganainy. Established a frequency response function via dynamic testing of the sensors using a MTS machine. This method entails sending random uniform white noise waveforms to the sensors to establish a frequency-based transfer function, which can be applied to correct any event within the defined frequency range. Designed and tested several methods for enabling using in saturated models. Developed and implemented a reliable static in-situ calibration method for the sensors.
- *Resonant Column, Torsional Shear, and Bender Element Apparatus Development* (April 2009 – August 2010), for Rensselaer Geotechnical Laboratory with Professor T. Abdoun and Professor I. Sasanakul. Designed and developed a bender element system for an existing resonant column and torsional shear chamber.
- *Vulnerability of Offshore Pipelines to Blast Loading* (November 2007 – January 2009), for confidential entity with Professors T. Abdoun, T. Zimmie, and I. Sasanakul. Designed instrumentation procedure to survive underwater blasting. Performed several centrifuge experiments to evaluate key failure criteria.
- *Tunnel Hardening and Blast Mitigation Strategies for Under Water Tunnels* (October 2008 – April 2009), for the Department of Homeland Security with Professors T. Abdoun, R. Dobry, and I. Sasanakul. Designed and tested centrifuge models to develop strategic schemes to provide protective measures for under-river tunnels. This study consisted of over 40 advanced centrifuge tests and led to the design and implementation of an external protection system instead of the originally proposed internal retrofit. It resulted in savings of over \$1 billion and shortened the implementation time of the protection system in the field from 36 to 9 months.
- **NEES Research Support**
 - *NEESR-SG: Experimental and Micromechanical Computational Study of Pile Foundations Subjected to Liquefaction-Induced Lateral Spreading*, PI: Ricardo Dobry, RPI (2007 – 2011).
 - *NEESR-SG: Evaluation of Ground Rupture Effects on Critical Lifelines*, PI: Michael O'Rourke, RPI (2007 – 2009).

- *CAREER - Seismically Induced Delayed-Landslides in Homogeneous Cohesive Slopes and Embankments*, PI: Joseph Wartman, Drexel (2007 – 2008).
- *NEESR-II: Advanced Site Monitoring and Effective Characterization of Site Nonlinear Dynamic Properties and Model Calibration*, PI: Mourad Zeghal, RPI (2008 – 2014).
- *NEESR-SG: Soil Improvement Strategies to Mitigate Impact of Seismic Ground Failures via Novel Integration of Experiment and Simulation*, PI: Scott Olson, UIUC (2008 – 2011).
- *Centrifuge Tests for Static and Seismic Soil-Culvert-Interaction (SCI) of Square Box Culvert Inside a Dry Cohesionless Soil*, PI: Hesham El-Naggar, UWO (2010 – 2011).
- *Seismic Isolation of Earth Retaining Structures Using EPS Geof foam – Centrifuge Testing*, PI: Adda Athanasopoulos-Zekkos, UM Ann Arbor (2010 – 2011).
- *NEESR-CR: Evolutionary Intensity Measures for More Accurate and Informative Liquefaction Hazard Evaluation*, PI: Steve Kramer, UW (2010 – 2014).
- *NEESR-CR: Seismically Induced Rock-Slope Failure: Mechanisms and Prediction*, PI: Joseph Wartman, UW (2010 – 2013).
- *NEESR-CR: Capacity and performance of foundations for offshore wind towers*, PI: Giovanna Biscontin, Texas A&M (2011 – 2014).
- *DARE: Monotonic and cyclical performance of horizontally actuated shallow foundations*, PI: Ioannis Anastasopoulos, NTAU (2012 – 2014).

PROFESSIONAL AND PUBLIC PRESENTATIONS

- “Designing and implementing instrumentation for centrifuge testing,” 6th International Centrifuge Workshop, Troy, NY, May 2011.
- “Enhancing centrifuge modeling using advanced sensing technology,” Rensselaer Polytechnic Institute’s 175th Anniversary of Civil Engineering, Troy, NY, October 2010.
- “Overview of the geotechnical centrifuge research center at Rensselaer,” 5th International Centrifuge Workshop, Davis, CA, September 2009.
- “Model preparation methods and planning for instrumentation,” 4th International Centrifuge Workshop, Troy, NY, September 2008.

- “RPI centrifuge facility and mini-centrifuge demonstration,” GEESD IV NEES Field Demonstration Day, Davis, CA, May 2008.

COURSES

- Offshore and Deep Foundation Design (CIE500AT - S14).
- Geotechnical Earthquake Engineering and Foundation Dynamics (CIE534 - F14).

SERVICE ACTIVITIES

- UB CSEE Undergraduate Studies Committee (2014 - Present).
- UB CSEE Undergraduate Curriculum Committee (2014 - Present).
- Mentor for UB CSEE freshmen students (2014).
- Advisor for ASCE Geo-Institute GeoVideo and GeoPrediction teams (2014).

HONORS AND AWARDS

- Recipient of the 2013 Thomas Archibald Bedford Prize. This award is given to a graduate student in civil engineering who has demonstrated high scholastic ability and has made a substantial contribution to the field. The selection is made by the Provost based on recommendations from the Graduate School.
- Co-advised a team of graduate and undergraduate students to 1st Place in the 2011 ASCE G-I Geo-Challenge Competition, March 2011.
- Recipient of UR Marx Prize, an award for outstanding research on the New Orleans Levee Project, May 2006.
- Inducted into Chi Epsilon, the civil engineering honors society, in May 2006.

PROFESSIONAL AFFILIATION

- American Society of Civil Engineers and Geo-Institute (ASCE GI)
- Earthquake Engineering Research Institute (EERI)
- American Society for Testing and Materials (ASTM)
- Structural Engineers Association of New York (SEAoNY)
- Consortium of Universities for Research in Earthquake Engineering (CUREE)