



Exponent[®]
Engineering & Scientific Consulting

Lucas Laughery, Ph.D., P.E.

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Professional Profile

Dr. Laughery is a licensed civil engineer specializing in forensic investigations of buildings and structures. He performs root-cause analyses to determine the origin of failures of structures built using steel, concrete, wood, and masonry. He has investigated the scope of structural damage caused by earthquakes, wildfires, extreme storms, explosions, impacts, earth movement, and more. He also has worked on disputes on complex civil engineering infrastructure projects involving adequacy of engineering designs, engineers' professional standard of care, and changes in design and construction work scope.

Dr. Laughery's work experience includes structural analysis and design of aerospace ground support equipment, from launch tower infrastructure to blast shielding, as well as analysis of other critical infrastructure like test stands. These structures experience extreme demands and are subject to special performance requirements, including highly concentrated loads, blast loads, and acoustics. He also has experience with civil engineering R&D for 3D-printed residential buildings, as well as design of structural elements, connections, and foundations for these buildings.

He is also experienced in the planning and execution of structural test programs. His doctoral research on the seismic response of concrete frames reinforced with ultra-high strength steel involved first-of-their-kind experimental shake table tests. His post-doctoral work included test planning and analysis of largest-of-their-kind pile caps, as well as structural testing of walls to investigate the cause of failure of a building during the Tohoku Earthquake.

Dr. Laughery serves as Vice-Chair for the ASCE Aerospace Advanced Materials and Structures Committee, co-Chair for the ASCE LIEDAC (Lunar Infrastructure Engineering, Design, Analysis and Construction) Guidelines Loads Subcommittee, and actively serves on the ASCE LIEDAC Structures Committee. He is also a voting member of two American Concrete Institute committees: ACI 133 Disaster Reconnaissance, for which he was deployed to document damage after earthquakes in 2016 in Taiwan, and in 2017 in South Korea, and ACI 445B Seismic Shear.

Academic Credentials & Professional Honors

Ph.D., Civil Engineering, Purdue University, 2016

M.S., Civil Engineering, Purdue University, 2013

B.S., Civil Engineering, Missouri University of Science and Technology, 2012

B.S., Architectural Engineering, Missouri University of Science and Technology, 2012

"Kick****" Award, Space Exploration Technologies (2021 Q2, 2022 Q3)

Excellence Award, Exponent (2019 Q2)

Andrews Fellowship, Purdue University (2012-2016)

Outstanding Graduate Student, Purdue University (Fall 2015)

SE Solutions Structures Scholarship, Purdue University (Fall 2015)

Chancellor's Scholarship, Missouri S&T (2007-2011)

Licenses and Certifications

Professional Engineer Civil, Louisiana, #0049546

Professional Engineer Structural, Texas, #153019

Academic Appointments

Lecturer, The University of Texas at Austin, Maseeh Department of Civil, Architectural, and Environmental Engineering, 2023

Prior Experience

Senior Structural Engineer I, ICON, 2023-2024

Senior Launch Engineer, SpaceX, 2020-2023

Associate, Exponent, 2019-2020

Visiting Researcher, Nagoya Institute of Technology, 2017-2018

Professional Affiliations

ASCE Aerospace Division, Advanced Materials & Structures Committee, Vice Chair

ASCE Aerospace Division, LIEDAC Lunar Design Guidelines Loads Committee, co-Chair

ACI Committee 133 Disaster Reconnaissance, Voting Member

ACI Committee 445B Seismic Shear, Voting Member

Publications

Journal Articles

Laughery L., Ichinose T., Kasai K., Mogili S., and Hwang S-J. (2024), "Experimental Investigation of Size Effect on Shear Strength of Reinforced Concrete Pile Caps." ACI Structural Journal, Vol. 121, No. 1, Jan, pp. 105-117.

Laughery, L., Puranam, A., Segura, C., and Behrouzi, A. (2020) "The Institute's Team for Damage Investigations – Lessons learned from field deployments." Concrete International, Vol. 42, No. 15, pp. 32-40.

Usta M., Alhmoed A., Carrillo J., Cladera A., Laughery L., Pujol S., Puranam A., Rautenberg J., Sezen H., Sneed L.H., To D.V. (2019). "Shear Strength of Structural Walls Subjected to Load Cycles." *Concrete International*, Vol. 41, No. 5, pp. 42-48.

Laughery L., Pujol S. (2019), "Drift Demands in Reinforced Concrete Structures Subjected to Strong Ground Motions." *ACI Structural Journal*, Vol. 116, No. 1, Jan., pp. 103-115.

Takahashi S., Hotta K., Hirose M., Ichinose T., Maeda M., Laughery L., Pujol S. (2019), "Unintended Consequences of a Strengthening Technique Used in Japan Due to Failure of Post-installed Anchors." *JCI Journal of Advanced Concrete Technology*, Vol 17, No. 3, pp. 138-150.

Pujol S., Laughery L., Puranam, A., Hesam, P., Cheng, L-H, Lund, A., Irfanoglu, I. (2018), "Evaluation of Seismic Vulnerability Indices Including Data from the 6 February 2016 Taiwan Earthquake." *Journal of Disaster Research*. Vol. 40, No. 1, pp. 9-19.

Guljaš I., Penava D., Laughery L., Pujol S. (2018), "Dynamic Tests of a Large-Scale Three-Story RC Structure with Masonry Infill Walls." *Journal of Earthquake Engineering*. Vol. 24, No., 11, pp. 1675-1703.

Suzuki T., Laughery L., Pujol S. (2018), "Learning from the Japanese Experience with High-Strength Longitudinal Reinforcement." 30 pp. *Concrete International*. Vol.40, No. 9, pp. 47-58.

Klaboe K., Pujol S., Laughery L. (2018), "The Seismic Response of Rocking Blocks." *EERI Earthquake Spectra*. 13 pp. Vol. 34, No. 3, pp. 1051-1063.

Catlin A.C., Nadungodage C.H., Pujol S., Laughery L., Sim C., Puranam A., Bejarano A. (2018), "A Cyber Platform for Sharing Scientific Research Data at DataCenterHub," *IEEE: Computing in Science and Engineering*. Vol. 20, No. 9. pp.49-70.

Laughery L., Pujol S. (2015), "Compressive Strength of Unreinforced Struts," *ACI Structural Journal*, Vol. 112, No. 5, Sept.-Oct., pp. 617-624

Conference Proceedings

Laughery L., Ichinose T., Maeda M., Alwashali, H., Takahashi H., Hanzawa H., Okada T., Ide A., and Sonn K. (2020), "A Potential Vulnerability in High-Strength Reinforced Concrete Shear Wall Retrofits," 17th World Conference on Earthquake Engineering. Paper 1948.

Laughery L., Ichinose T., Kasai K., Liu K-Y, Komatsu S., Liu K-Y, Nakagami Y., Matsunoshita, T. (2020), "Tests of Scaled Pile Caps, Part 1: Size Effect." 17th World Conference on Earthquake Engineering. Paper 1582.

Ichinose T., Laughery L., Liu K-Y, Komatsu S., Liu K-Y, Nakagami Y., Matsunoshita T., Kasai K. (2020), "Tests of Scaled Pile Caps, Part 2: Effect of Reinforcement Strain on Compressive Failure." 17th World Conference on Earthquake Engineering. Paper 1662.

Pujol S., Irfanoglu A., Gülkan P., Heaton T., Sozen M., Laughery L. (2018), "A Potential Problem in Estimating the Drift Response of Long-Period Structures." 11th U.S. National Conference on Earthquake Engineering.

Burilo D., Penava D., Laughery L., Guljaš I., Pujol S. (2018), "Accidental Torsional Response of a Large-Scale Three-Story Framed-Masonry Structure." 16th European Conference on Earthquake Engineering.

Laughery L., Pujol S. (2017), "Seismic Response of High-Strength Steel Reinforced Concrete Frames," Sixteenth World Conference on Earthquake Engineering. Paper No. 1234. 9 pp.

Presentations

Laughery L., Ichinose T., Kasai K., Mogili S., and Hwang S-J (2023), "Large Scale Experimental Tests of Size Effect in Pile Caps Loaded in Two-Way Shear." ACI Convention, San Francisco, CA.

Mogili S., Hwang S-J, Liu K-Y, Ichinose T., Laughery L., and Kasai K. (2023), "Estimating the Two-Way Shear Strength of Large Reinforced Concrete Pile Caps." ACI Convention, San Francisco, CA.

Laughery L. (2019), "RC Retrofits & Falling Roofs: Transitioning from a Researcher to a Consultant." Invited Lecture to University of Utah – Salt Lake City CE.

Laughery L. (2019), "Size Effect in Deep Pile Caps." Invited Lecture to Purdue University CE 691S Structures Seminar.

Laughery L. (2018), "A Potential Problem with RC Infill Wall Retrofits." Invited Lecture to EERI Purdue University Student Chapter.

Laughery L., Suzuki T., and Pujol S. (2017), "Learning from the Japanese Experience with High-Strength Longitudinal Reinforcement." ACI Convention, Detroit, MI.

Laughery L., and Pujol S. (2017), "Seismic Response of High-Strength Steel Reinforced Concrete Frames," 16th World Conference on Earthquake Engineering, Santiago, Chile.

Laughery L. (2016), "Innovation for International Development (I2D) Lab Projects: Nepal Seismic," World Bank Global Facility for Disaster Reduction and Recovery Delegates Visit, Indianapolis, IN.

Laughery L., and Pujol S. (2016), "Managing Bridge Data using DataHub," Bridging Big Data Workshop, Omaha, NE.

Laughery L., and Pujol S. (2016), "Response of High-Strength Steel Reinforced Concrete Frames to Simulated Earthquakes," ACI Convention, Milwaukee, WI.

Laughery L. and Pujol, S. (2015), "Shake Table Tests of High-Strength Steel Reinforced Concrete Frames," Poster, ACI Spring Convention, Kansas City, MO.

Choi J-H., Shen C., Laughery L., Smith A. (2012), "Climate-responsive adaptive control for natural ventilation," EPA P3 National Sustainable Design Expo, Washington, DC