

Exponent® Engineering & Scientific Consulting

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Professional Profile

Dr. Locke is a licensed professional that specializes in the failure analysis, damage assessment (causes and impacts), and risk mitigation of structural systems. In his time at Exponent, Dr. Locke has investigated and analyzed a variety of structural systems (housing complexes, high-rises, dams, bridges, and historical buildings) composed of various building materials (concrete, steel, wood, and masonry). He has specialized experience in structural health monitoring and the dynamic evaluation of structures when subjected to various sources of excitation (e.g., wind, earthquakes, construction). He also has experience evaluating the condition of interior finishes and building envelope components.

Prior to joining Exponent, Dr. Locke was a graduate student researcher at Clemson University, where he earned a Ph.D. in Civil Engineering. He was the recipient of the Graduate Assistance in Areas of National Need (GAANN) and National Science Foundation Research Traineeship (NRT) fellowships awarded to Clemson University by the US Department of Education and National Science Foundation, respectively. As a GAANN and NRT fellow, Dr. Locke took additional courses and worked on interdisciplinary research teams to solve problems related to identifying and mitigating the vulnerabilities of complex, critical, and interdependent infrastructure systems. His primary research focused on the development of an indirect mobile health monitoring strategy that utilizes vehicle mounted sensors to continuously evaluate the health of bridges. Through his work, he was able to experimentally demonstrate the system identification capabilities of the indirect methodology, while also developing a Bayesian estimation framework capable of classifying physical damage through finite element model updating.

Apart from his primary academic institution, Dr. Locke has conducted research at the Los Alamos National Labs - Engineering Institute in New Mexico and at the Fraunhofer Institute for Structural Durability and System Reliability in Germany. While at these institutions, he gained experience conducting static and dynamic experiments on lab- and full-scale systems, working with nonlinear systems, performing data-driven uncertainty quantification on computational models, and utilizing machine learning techniques for structural health monitoring. Dr. Locke also has industry experience from internships and co-ops with various engineering firms. His industry work allowed him to gain experience overseeing construction projects, conducting visual inspections, and performing tests consistent with ASTM standards.

Academic Credentials & Professional Honors

Ph.D., Civil Engineering, Clemson University, 2021

- M.S., Civil Engineering, Clemson University, 2017
- B.S., Civil Engineering, Clemson University, 2015

Best Student Paper Award in the Dynamics of Civil Structures Technical Division at IMAC-XXXIX, 2021

NRT Fellowship, 2019-2021

GAANN Fellowship, 2016-2019

Los Alamos Dynamic Summer School Fellowship, 2017

RCI-IIBEC Student Scholar, 2013

Licenses and Certifications

Professional Engineer, Florida, #96183

Professional Engineer, Georgia, #PE050399

Prior Experience

International Exchange Student, Fraunhofer Institute for Structural Durability and System Reliability LBF, 2018

LADS Intern, Los Alamos National Labs - Engineering Institute, 2017

Co-op Student, Infrastructure Engineering (Now CONSOR), 2014-2015

Summer Intern, NCDOT, 2014

Co-op Student, Construction Science and Engineering, Inc., 2013

Publications

Journal

Locke W, Redmond L, Schmid M. Evaluating OMA System Identification Techniques for Drive-by Health Monitoring on Short Span Bridges. Journal of Bridge Engineering. 2022 Sep 1;27(9):04022079.

Mokalled S, Locke W1, Abuodeh O, Redmond L, McMahan C. Drive-by health monitoring of highway bridges using Bayesian estimation technique for damage classification. Structural Control and Health Monitoring. 2022 Jun;29(6):e2944.

Locke W, Sybrandt J, Redmond L, Safro I, Atamturktur S. Using drive-by health monitoring to detect bridge damage considering environmental and operational effects. Journal of Sound and Vibration. 2020 Mar 3;468:115088.

Conference/ Textbook

Locke W, Mokalled S, Abuodeh O, Redmond L, McMahan C. A Bayesian Estimation Technique for Multilevel Damage Classification in DBHM. In Leveraging Artificial Intelligence in Engineering, Management, and Safety of Infrastructure 2022 Nov 17 (pp. 232-260). CRC Press.

Locke W, Redmond L, Schmid M. Experimental Evaluation of Drive-by Health Monitoring on a Short-Span Bridge Using OMA Techniques. In Dynamics of Civil Structures, Volume 2: Proceedings of the 39th IMAC, A Conference and Exposition on Structural Dynamics 2021 2022 (pp. 109-127). Springer International Publishing. Locke WR, Mokalled SC, Abuodeh OR, Redmond LM, McMahan CS. An intelligently designed AI for structural health monitoring of a reinforced concrete bridge. The Concrete Industry in the Era of AI. 2021 Jan.

West BM, Locke WR, Andrews TC, Scheinker A, Farrar CR. Applying concepts of complexity to structural health monitoring. In Structural Health Monitoring, Photogrammetry & DIC, Volume 6: Proceedings of the 36th IMAC, A Conference and Exposition on Structural Dynamics 2018 2019 (pp. 205-215). Springer International Publishing.

Presentations

Locke W. Experimental Evaluation of Drive-by Health Monitoring on a Short Span Bridge Using OMA Techniques. Oral presentation, IMAC-XXXIX, Virtual, 2021.

Locke W. Techniques for Simulating Frozen Bearing Damage in Bridge Structures for the Purpose of Drive-by Health Monitoring. Oral presentation, IMAC-XXXVIII, Houston, TX, 2020.

Locke W, Kupis S. Applying Uncertainty Quantification to Structural Systems: Parameter Reduction for Evaluating Model Complexity. Oral presentation, IMAC-XXXVII, Orlando, FL, 2019.

West BM, Locke WR, Andrews TC. Applying Concepts of Complexity to Structural Health Monitoring. Oral Presentation, IMAC-XXXVI, Orlando, FL, 2018.

Peer Reviews

Journal of Bridge Engineering