Exponent®
Engineering & Scientific Consulting

Aerik Carlton, Ph.D., P.E.

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Professional Profile

Dr. Carlton is a licensed professional engineer working as a forensic engineering consultant within the Civil and Structural Engineering practice at Exponent. He provides engineering expertise in code compliance, site inspection, finite element analysis, and forensic collapse and damage evaluations. His forensic work has included stair collapse, personal injury related building code evaluation, industrial building failure, weather and construction related building damage evaluations, and explosion-initiated building damage and collapse analysis.

Prior to Exponent, he completed projects including private space-industry launch complex design, building seismic evaluation, and traditional residential and commercial building designs. He has experience working on building projects for federal government agencies and their partners providing physical security assessment and design as a blast engineering consultant.

He earned a PhD in Structural Engineering at Lehigh University, where he conducted experimentation at the ATLSS Engineering Research Center and Fritz Laboratory. His dissertation research focused on the behavior of structures in fire with special emphasis on thermally induced explosive concrete spalling and mitigation of that behavior in the context of U.S. roadway tunnels. Prior to his dissertation work, he completed performance-based engineering and probability analysis of structures subjected to high-consequence, low-probability hazards, specifically the structural evaluation of earthquake and subsequent fire follow-on as cascading hazards.

Academic Credentials & Professional Honors

Ph.D., Structural Engineering, Lehigh University, 2022

M.S., Civil Engineering, Michigan Technological University, 2013

B.S., Civil Engineering, Portland State University, 2012

P.C. Rossin College of Engineering Doctoral Fellow

Fritz Engineering Research Society

Chi Epsilon Civil Engineering Honor Society

Licenses and Certifications

Professional Engineer Civil, California, #C94841

Professional Engineer, Illinois, #062.075041

Professional Engineer, Indiana, #PE12300869

Professional Engineer, Iowa, #P28408

Professional Engineer, Michigan, #6201316481

Professional Engineer Civil, Minnesota, #63909

Professional Engineer Civil, Nebraska, #E-21174

OSHA 30 Hour Outreach Training for the Construction Industry (29 CFR 1926)

Prior Experience

Project Engineer, Nishkian Dean, 2017-2018

Engineer, Hinman Consulting Engineers, 2014-2016

Professional Affiliations

ACI 216 Fire Resistance and Fire Protection of Structures Committee

ASCE/SEI Blast Protection of Buildings Standards Committee

Publications

Carlton, A., Ma, S., Quiel, S., and Naito, C. (2023) “Comparative Response of Tiled Finishes and Bonded Fire Resistive Coatings for Normal Weight Concrete Tunnel Liners under High-Intensity One-Sided Heating,” Tunnelling and Underground Space Technology, vol. 139C, 2023 DOI: 10.1016/j.tust.2023.105225

Zhu, Z., Carlton, A., Quiel, S., and Naito, C. (2023) “Objective-Level Assessment of Circular Roadway Tunnels with Reinforced Concrete Liners for Vehicle Fire Hazards,” Resilient Cities and Structures, vol. 2, issue 3, 2023 DOI: 10.1016/j.rcns.2023.04.001

Carlton, A., Guo, Q., Ma, S., Quiel, S.E., and Naito, C.J. (2021) “Experimental Assessment of Explosive Spalling in Normal Weight Concrete Panels under High Intensity Thermal Exposure,” Fire Safety Journal, vol. 134, 2022. DOI: 10.1016/j.firesaf.2022.103677

Ouyang, Z., Carlton, A., Guo, Q., Quiel, S.E., Naito, C.J. (2020) “Blast Vulnerability of Drop Ceilings in Roadway Tunnels,” ASCE Journal of Performance of Constructed Facilities, vol. 34, issue 6, 2020 DOI: 10.1061/(ASCE)CF.1943-5509.0001526

Guo, Q., Carlton, A., Quiel, S.E., and Naito, C.J. (2020) “Stochastic Thermal Demand and Resulting Capacity Loss of Concrete Tunnel Liners Subjected to Vehicle Fires,” Transportation Research Record: Journal of the Transportation Research Board, vol. 2674, issue 5, 2020, pp. 293-304. DOI: 10.1177/0361198120914612

Zhu, Z., Quiel, S.E., Carlton, A., Mueller, K.A., and Marjanishvili, S.M. (2020) “Performance-based prioritization of fire protection for steel girder overpasses in a complex highway interchange,” Structure and Infrastructure Engineering, vol. 16, no. 3, 2020, pp. 394-411. DOI: 10.1080/15732479.2019.1666884

Guo, Q., Root K.J., Carlton, A., Quiel, S.E., and Naito, C.J. (2019) “Framework for rapid prediction of fire-induced heat flux on concrete tunnel liners with curved ceilings,” Fire Safety Journal, vol. 109, 2019. DOI:

10.1016/j.firesaf.2019.102866

Quiel, S., Zhu, Z., Mueller, K., Carlton, A., and Marjanishvili, S. (2016) “Performance-based prioritization of fire mitigation for highway bridges,” Proceedings of the Ninth International Conference on Structures in Fire, Princeton, NJ, pp. 776-783. ISBN: 978-1-60595-320-5

Carlton, A. and Li, Y. (2015) “Performance-Based Engineering Framework for Fire Following Earthquake,” Proceedings of Structures Congress, April 23-25, pp. 1608-1618. DOI: 10.1061/9780784479117.138

Post-Earthquake Fire Hazard Task Group (2022) “Post-Earthquake Fire Assessment of Buildings: Evaluation Framework.” ASCE, Reston, VA. DOI: 10.1061/9780784415993

Presentations

Carlton, A., Quiel, S.E., Naito, C.J. “Explosive Spalling in Concrete Elements Under Fire: New Experiments and Analyses toward Performance-Based Design,” American Concrete Institute Concrete Convention, Orlando, FL, 2022

Carlton, A., Ma, S., Quiel, S.E., Naito, C.J. “Experimental Evaluation of Tiling and Fire Protection Coatings for Normal Weight Concrete Tunnel Liners under High Intensity Thermal Exposure,” Transportation Research Board, Annual Meeting, Washington, DC, 2022

Carlton, A., Quiel, S.E., Naito, C.J. “Experimental Investigation of the Relationship between Concrete Spalling under Heat Exposure and Concrete Moisture Content,” ADSC International Association of Foundation Drilling, Northeast Chapter Fall Meeting, Bethlehem, PA, 2019

Carlton, A., Quiel, S.E., Naito, C.J. “Experimental Investigation of the Relationship between Concrete Spalling under Heat Exposure and Concrete Moisture Content,” UTC-UTI Workshop, Colorado School of Mines, Golden, CO, 2019

Carlton, A. “Vortex Induced Vibration: Private Space Industry Launch Complex Design,” Fritz Engineering Research Society, Bethlehem, PA, 2018

Carlton, A., Quiel, S.E., Mueller, K. “Comparison of Analysis Methods for Fires in Large Compartments,” ASCE Structures Congress, Denver, CO, 2017

Carlton, A. and Goddard, N. “Adaptation of the Unified Facilities Criteria: DoD Security Engineering Facilities Planning Manual for Resilience Evaluation,” SAME Critical Infrastructure Symposium, Charleston, SC, 2016

Carlton, A. and Hinman, E. “State of Practice for Resilience Consideration,” SAME Critical Infrastructure Symposium, Arlington, VA, 2015

Carlton, A. and Li, Y. “Performance-based Engineering Framework for Fire Following Earthquake,” ASCE Structures Congress, Portland, OR, 2015

Additional Education & Training

Designing and Constructing Flood-Resistant Buildings (2-day Workshop)

FEMA P-154 Rapid Visual Screening of Buildings for Potential Seismic Hazards

FEMA P-646 Guidelines to Design Structures for Vertical Tsunamis Evacuation

CFSEI Blast Design of Cold-Formed Steel Framing

Software Competencies: Finite Element Analysis (SAP2000, ETABS, RAM), Fire (SAFIR, Fire Dynamics Simulator (FDS) and Smokeview, CFAST, Ozone), Blast (ProSAir, SBEDS, SBEDS-W, Wingard, ConWEP, Close-in Air-Blast (CAB))

Peer Reviews

ACI Structural and Materials Journals

ASCE Journal of Performance of Constructed Facilities

ASCE Practice Periodical on Structural Design and Construction

NFPA/SFPE Fire Technology

TRB Transportation Research Record