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Engineering & Scientific Consulting

Nathan P. Mayercsik, Ph.D., P.E.

Senior Engineer | Buildings & Structures
1331 17th Street, Suite 515 | Denver, CO 80202
(303) 802-3413 tel | nmayercsik@exponent.com

Professional Profile

Dr. Mayercsik is a consultant in the Buildings & Structures practice for issues related to the design, construction, and performance of various constructed improvements in residential, commercial, and public spaces. Dr. Mayercsik has specialized experience in the durability and mechanical properties of construction materials, particularly cement-based materials. His expertise includes concrete's freeze/thaw resistance, concrete mix design, self-consolidating concrete, geopolymers, and blast-resistant concrete and composites. He has evaluated architectural precast and architectural cast-in-place concrete, historic concrete structures, residential and commercial concrete pavements, concrete slabs and foundations, stucco, concrete and shotcrete swimming pools, and concrete parking structures. Dr. Mayercsik has experience in multi-scale modeling, testing, and evaluation of the structure and properties of cementitious materials. He has studied materials via quantitative image analysis, optical microscopy, and x-ray microtomography, and has also modeled materials using continuum mechanics, fracture mechanics, and poromechanics.

Dr. Mayercsik has consulted on large wind and hail losses involving glazing systems, wood composite siding, and concrete tile, built-up, single ply, and asphalt composition roofing materials. He has experience evaluating structures damaged by impact from vehicles and trees. Dr. Mayercsik has also evaluated construction injuries involving falling objects, falls from heights, and cement burns. He has also evaluated the potential contribution of building code noncompliance to slips, trips, and falls.

Prior to joining Exponent, Dr. Mayercsik was a graduate research assistant at the Georgia Institute of Technology, where he earned a Ph.D. in civil engineering with a minor in quantitative materials science. His dissertation work focused on the influence of multi-scale void space on cementitious materials' response across length and time scales. As part of this research, Dr. Mayercsik investigated the role that flaws play in governing high strain-rate (i.e., blast and impact loading) response of concrete, including dynamic testing using a Kolsky bar and modeling using fracture mechanics. He also developed a poroelastic model to describe the evolution of stresses which develop in concrete during repeated freezing and thawing cycles, and introduced a new spacing factor for entrained air voids in concrete which can be used to predict concrete's resistance to cyclic freeze/thaw. Dr. Mayercsik's academic background includes graduate coursework in concrete design; finite element analysis; structural dynamics; structural reliability; elastic wave propagation; durability of concrete; quantitative characterization of microstructure; statistical methods. Dr. Mayercsik taught statics as the instructor-of-record at the Georgia Institute of Technology, and he also served as a lecturer for several graduate courses on the properties and durability of construction materials.

As a Sam Nunn Security Fellow, Dr. Mayercsik also explored issues at the nexus of science, technology, and public policy. This included evaluating policy, technology, and implementation (PTI) studies to understand the path that historic and contemporary technologies have undergone from conception to adoption.

Academic Credentials & Professional Honors

Ph.D., Civil Engineering, Georgia Institute of Technology (Georgia Tech), 2015

M.S., Civil Engineering, Georgia Institute of Technology (Georgia Tech), 2011

B.C.E., Civil Engineering, University of Delaware, *with distinction*, 2010

Sam Nunn Security Fellowship, Georgia Institute of Technology

Tau Beta Pi

Chi Epsilon

Licenses and Certifications

Licensed Professional Engineer, Arizona, #70620

Licensed Professional Engineer, Colorado, #54340

Licensed Professional Engineer, Civil, Nebraska, #E-18074

Professional Affiliations

American Concrete Institute — ACI

American Society of Civil Engineers - ASCE

International Concrete Repair Institute - ICRI

Publications

Mayercsik NP, Brisard S, Vandamme M, Kurtis KE. Using Fractal Geometry to Recover the 3D Air Void, Scale-Independent, Microstructure Information from 2D Sections of Mortars. ASTM Advances in Civil Engineering Materials 2016; 5(2): 1-21. DOI: 10.1520/ACEM20150030

Mayercsik NP, Vandamme M, Kurtis KE. Assessing the efficiency of entrained air voids for freeze-thaw durability through modeling. Cement & Concrete Research 2016; 88: 43-59. DOI: 10.1016/j.cemconres.2016.06.004

Mayercsik NP. Characterization of multiscale porosity in cement-based materials: Effects of flaw morphology on material response across size and time scales. Doctoral thesis, Georgia Institute of Technology, 2015.

Mayercsik NP, Felice R, Ley MT, Kurtis KE. A probabilistic technique for entrained air void analysis in hardened concrete. Cement & Concrete Research 2014; 59:16-23. DOI: 10.1016/j.cemconres.2014.01.023.

Mayercsik NP, Shaeffer M, Graham-Brady LL, Kurtis KE. Analysis of Portland cement mortar under impact: a combined materials characterization, micromechanics modeling, and dynamic testing approach. Cement & Concrete Research 2015; 73:190-206. DOI: 10.1016/j.cemconres.2015.01.021.

Graham-Brady LL, Katcoff CZ, Mayercsik NP, Kurtis KE. Micromechanical model and associated validation for dynamic failure of brittle materials containing pores and slit-like flaws. Journal of

Engineering Mechanics 2015; 141 (10) . DOI: 10.1061/(ASCE)EM.1943-7889.0000927.

Mayercsik NP. Finite element analysis of advanced composite sandwich panel core geometries for blast mitigation. Senior Thesis, University of Delaware, 2010.

Presentations

Beauregard MS, Mayercsik NP. Airfield Maintenance for Remote Sensing of Pavement Condition. Oral Presentation, GAP 2019 (Geo-Structural Aspects of Pavements, Airfields, and Railways), Colorado Springs, CO, November 2019.

Bennett PJ, Mayercsik NP. HVAC Systems and Managing Indoor Humidity. 2018 CDLA CLE: Construction and Property Claims, Denver, CO, November 2018.

Bennett PJ, Mayercsik NP, Burnett DT. Building Material Failures. 2017 CDLA CLE: Construction and Property Claims, Denver, CO, November 2017.

Mayercsik NP, Jen G. Evaluation of Hail Impact on Cementitious Building Materials. Rocky Mountain Property Claims Association (RMPCA) Luncheon, Centennial, CO, October 2017.

Mayercsik NP, Shaeffer M, Graham-Brady L, Kurtis KE. High strain-rate behavior of cement-based materials: a multiscale experimental and modeling effort. Oral Presentation, Engineering Mechanics Institute Conference, Stanford University, Stanford, CA, June 2015.

Mayercsik NP, Ordun C, Lantz A. The bomb-blast damage injury scale. Poster presentation, Special Operations Medical Association Scientific Assembly, Tampa, FL, December 2014.

Mayercsik NP, Kurtis KE. Measuring entrained air voids: Analysis in 2D, 3D, and everywhere in between. Oral presentation, the Corvallis Workshop, Oregon State University, Corvallis, OR, July 2014.

Mayercsik NP, Shaeffer M, Graham-Brady L, Kurtis KE. Strain-rate dependent properties of cement-based materials: A multiscale experimental and modeling effort. Oral presentation, American Concrete Institute Spring Convention, Reno, NV, April 2014.

Mayercsik NP, Katcoff CZ, Graham-Brady L, Kurtis KE. Strain-rate dependent properties of cement-based materials: A multiscale experimental and modeling effort. Poster presentation, Multiscale Computational Modeling of Cement-based Materials, Kraków, Poland, October 2013.

Mayercsik NP, Katcoff CZ, Graham-Brady L, Kurtis KE. Strain-rate dependent properties of cement-based materials: A multiscale experimental and modeling effort. Poster presentation, NSF CMMI Grantees Conference, Boston, MA, July 2012.

Mayercsik NP, Kurtis KE. Probabilistic modeling of entrained air voids in hardened concrete. Poster presentation, Third Advances in Cement-Based Materials: Characterization, Processing, Modeling, and Sensing, the University of Texas at Austin, Austin, TX, June 2012.

Mayercsik NP, Kurtis KE. Pore size, shape, and distribution information from virtually-hydrated microstructures. Second Advances in Cement-Based Materials: Characterization, Processing, Modeling, and Sensing, Vanderbilt University, Nashville, TN, July 2011.

Peer Reviewer

Cement and Concrete Composites

Cement and Concrete Research

ASCE Journal of Materials in Civil Engineering

Structural Concrete (Journal of the Fédération Internationale du Béton)