



Exponent[®]
Engineering & Scientific Consulting

Brian McDonald, Ph.D., S.E., F.ASCE

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Professional Profile

Dr. McDonald specializes in the design and construction of complex structures, structural damage assessment and repair, and quantitative risk assessment of buildings and structures exposed to hazards such as extreme winds, wildfires and climate change.

During more than 30 years at Exponent, Dr. McDonald has evaluated problems with the design and construction of industrial, transportation, residential and commercial structures constructed of wood framing, concrete, masonry and steel. Dr. McDonald has specialized experience designing and evaluating overhead power transmission lines and cable-supported or fabric structures.

Dr. McDonald provides quantitative risk assessments for electrical transmission structures, power plants, nuclear structures at national laboratories, and industrial facilities. In addition, Dr. McDonald has participated on expert teams to provide loss estimates and retrofit strategies for California residential structures subject to intense earthquake ground shaking. Dr. McDonald also provides design peer review services for the design of complex structures, including safety-critical nuclear power plant structures.

Dr. McDonald has investigated structures damaged by wind, snow, explosion, fire, construction errors, design defects, decay and corrosion, as well as hundreds of structures damaged by seismic shaking after earthquakes including Loma Prieta, Northridge, San Simeon, and Hawaii. Dr. McDonald's work often includes nonlinear and dynamic structural analysis, instrumentation and full-scale testing of structures, and material failure evaluations including fracture and plasticity analyses.

Dr. McDonald has held several positions in the fields of structural engineering and software design, most recently as Chief Analyst at Krawinkler, Luth, and Associates, a leading structural design firm. He has taught a graduate level course in Finite Element Analysis at Stanford University, where he is currently an Adjunct Lecturer teaching a graduate course on the performance of structures. Dr. McDonald chairs the American Society of Civil Engineers committee that develops and maintains structural design standards for nuclear structures, and is an invited member of the Nuclear Standards Committee.

Academic Credentials & Professional Honors

M.S., Engineering Mechanics, University of Wisconsin, Madison, 1989

Ph.D., Civil Engineering, University of Wisconsin, Madison, 1988

M.S., Civil Engineering, University of Wisconsin, Madison, 1984

B.S., Civil Engineering, University of Wisconsin, Madison, 1982

Chair of the Nonductile Concrete Subcommittee for the Structural Engineers Association of California

Licenses and Certifications

Professional Engineer Civil, California, #47585

Professional Engineer Structural, California, #4330

Professional Engineer, Hawaii, #PE-12310

Professional Engineer Structural, Nevada, #21563

Professional Engineer, Oregon, #81321PE

Professional Engineer Structural, Oregon, #81321PE

Professional Engineer Civil and Structural, Washington, #37689

Professional Engineer, Wisconsin, #35893-6

Academic Appointments

Former Adjunct Professor and current Adjunct Lecturer, Stanford University

Professional Affiliations

Fellow of the American Society of Civil Engineers (member #270581)

Structural Engineers Association of Northern California (Member SE, past Chair of the Existing Buildings Committee, past Chair of the Research Committee, past Chair of Nonductile Concrete Subcommittee)

American Concrete Institute (member #00121237)

American Institute of Steel Construction (member #064972)

Earthquake Engineering Research Institute (member ID 8096)

Publications

Kytömaa H, Jampole E, McDonald B. Proactive Risk-Informed Hardening for Cold Weather Grid Reliability. WE Magazine 2024; 20-23

Ryan Bliss, P.E., M.ASCE; Bryce DeQuoy, P.E.; Brian McDonald, S.E., F.ASCE; and John Birch. Does Compliance with Minimum Regulatory Standards Adequately Mitigate Wildfire Risk? Electrical Transmission and Substation Structures 2022: Innovating for Critical Global Infrastructure. 2022

Brian McDonald (2018) Revisiting Earthquake Lessons - Masonry Chimneys and Fireplace Surrounds, Structural Engineers Association of California Newsletter, December 20, 2018

Maison B. and McDonald B, Fragility Curves for Residential Masonry Chimneys. Earthquake Spectra: August 2018, Vol. 34, No. 3, pp. 1001-1023.

Book Chapter: (Chapter 7) to FEMA P-2006 | Example Application Guide for ASCE/SEI 41-13 Seismic

Evaluation and Retrofit of Existing Buildings; with Additional Commentary for ASCE/SEI 41-17, June 30, 2018

Book Chapter: (Chapter 7) to FEMA P-1100 | Vulnerability-Based Seismic Assessment and Retrofit of One- and Two- Family Dwellings, December 5, 2018

Blaney, Colin, McDonald, Brian et. al. Prestandard for Seismic Assessment and Retrofit of One- and Two-Family Dwellings (FEMA P-1100, ATC-110 Project), Structural Engineers Association of California 2018 Convention Proceedings

Lizundia, Bret, McDonald, Brian et. al. Example Application Guide for ASCE/SEI 41-13: Selected Design Examples, Structural Engineers Association of California 2018 Convention Proceedings

Haselton, C., McDonald et.al. (2015). U.S. Resiliency Council® - FEMA P58 Evaluation Methodology, Proceedings of the 2015 ATC&SEI Conference on Improving the Seismic Performance of Existing Buildings and Other Structures, San Francisco, December 2015.

McDonald B, Morgan T, Swensen S. Use of Bayesian updating to improve fragility estimates for single-family houses in San Francisco. Structural Engineers Association of California 2016 Convention, Maui, HI, October 12-15, 2016.

Bishop CD, Griffith M, McDonald B. Instability of solar power tower structures during construction. Proceedings, Annual Stability Conference, Structural Stability Research Council, Orlando, FL, April 12-15, 2016.

Bishop CD, Uriz P, McDonald BM. Stability of column rebar cages for buildings under construction. Proceedings, Annual Stability Conference, Structural Stability Research Council, Nashville, TN, March 24-27, 2015.

Maison, B., McDonald, B., McCormick, D., Schotanus, M., and Buckalew, J. Discussion of FEMA P-807 for the Retrofit of Soft-Story Buildings, Proceedings of the 2015 ATC&SEI Conference on Improving the Seismic Performance of Existing Buildings and Other Structures 2015, December 2015: pp. 497-508.

Schotanus, M., Maison, B., and McDonald, B. (2015) Pounding of San Francisco-Type "Soft Story" Midblock Buildings. Proceedings of the 2015 ATC&SEI Conference on Improving the Seismic Performance of Existing Buildings and Other Structures, December 2015: pp. 535-547.

Buckalew J, McDonald B, McCormick D, Schotanus M, Maison B. Example case studies of soft-story retrofits using the San Francisco ordinance. Improving the Seismic Performance of Existing Buildings and Other Structures, December 2015: pp. 548-559.

Whittaker A, Goen L, Kennedy R, McDonald B, Morgan T, Wyllie L. Independent review of seismic performance assessments for the plutonium facility PF-4. Los Alamos National Laboratory Report Number: LA-UR-15-29138, November 2015.

Lizundia, B, McDonald, B, et al. Development of design guidance and example applications for ASCE/SEI 41-13, Seismic Evaluation and Retrofit of Existing Buildings, the ATC-124 Project, Structural Engineers Association of California 2015 Convention, Bellevue, WA, September 9-12, 2015.

Bishop CD, Uriz P, McDonald B. Stability of column rebar cages for buildings under construction. Proceedings, Annual Stability Conference, Structural Stability Research Council, Nashville, TN, March 24-27, 2015.

Maison B, McDonald B, McCormick D, Schotanus M, Buckalew J. Commentary on FEMA P-807 for Retrofit of Wood-Frame Soft-Story Buildings. Earthquake Spectra: November 2014, Vol. 30, No. 4, pp. 1359-1380.

Maison B, McDonald B, McCormick D, Schotanus M, Buckalew J. Commentary on FEMA P-807: Seismic evaluation and retrofit of multi-unit wood-frame buildings with weak first stories. Structural Engineers Association of Northern California Existing Buildings Committee Report, January 2014.

Maison B, McDonald B, Schotanus M. Pounding of San Francisco-Type soft-story midblock buildings. Earthquake Spectra August 2013, 29(3):1069-1089.

Morgan TA, McDonald BM. Design for uniform risk to standardized nuclear power plants using seismic isolation. Transactions, Structural Mechanics in Reactor Technology (SMiRT-22), San Francisco, CA, 2013.

Morgan TA, McDonald, BM. Design for uniform risk to standardized nuclear power plants using seismic isolation. Proceedings, 10th CUEE Conference, Tokyo, Japan, 2013.

McDonald B, Hunt J. Thermal load-induced failure of steel space frame structure. Proceedings, 6th Congress on Forensic Engineering, San Francisco, CA, October 31-November 3, 2012.

Uriz P, Osteraas J, McDonald B. Using ASTM E1155 to determine finished floor quality: background and areas for consideration. Proceedings, 6th Congress on Forensic Engineering, San Francisco, CA, October 31, 2012.

Krawinkler H, Osteraas J, McDonald B, Hunt J. Development of damage fragility functions for URM chimneys and parapets. Proceedings, 15th World Conference on Earthquake Engineering, Lisbon Portugal, September 23-28, 2012.

Maison B, McDonald B, Schotanus M. Pounding of San Francisco-type soft-story midblock buildings. Structural Engineers Association of Northern California Existing Buildings Committee Report, September 2012.

Osteraas J, Krawinkler H, McDonald B, Hunt J. ATC-58 Fragility of masonry chimneys. Applied Technology Council, Redwood City, CA, March 2011.

McDonald B, Hunt J, Krawinkler H, Osteraas J. ATC-58 Fragility of masonry parapets. Applied Technology Council, Redwood City, CA, March 2011.

McDonald B, Ross B, Carnahan RA. The Bellevue crane disaster. Engineering Failure Analysis 2011 Oct; 18(7):1621-1636.

McCann DJ, Corr D, McDonald B. Lessons learned from Marcy Bridge collapse. ASCE 5th Congress on Forensic Engineering, Washington DC, November 11-14 2009.

McDonald B. The art and science of designing structures to resist earthquakes. Silicon Valley Engineering Council Journal 2009; 1.

Gupta A, McDonald BM. Performance of building structures during the October 15, 2006 Hawaii earthquake. The 14th World Conference on Earthquake Engineering, Beijing, China, October 12-17, 2008.

Luth G, Supriya S, Krawinkler H, McDonald B. USC School of Cinema: An example of reparable performance based design. Proceedings, 77th Annual Structural Engineers Association of California (SEAOC) Convention, Hawaii, 2008.

Osteraas J, Gupta, A, Griffith, M, McDonald, B. Woodframe seismic response analysis—Benchmarking with buildings damaged during the Northridge Earthquake. Proceedings, 2008. ASCE Structures Conference, Vancouver BC Canada, April 24-26, 2008.

Ross B, McDonald BM, Saraf V. Big blue goes down. The Miller Park crane accident. Engin Failure Anal 2007; 14(6):942-961.

McDonald BM, Gupta A, Alavi B, Osteraas J. Rational seismic evaluation and retrofit of a multistory RC shear wall structure. 100th Anniversary Earthquake Conference Commemorating the 1906 San Francisco Earthquake, San Francisco, CA, April 18-22, 2006.

Gupta A, McDonald BM, Griffith M, Osteraas J. Displacement coefficients for conventional residential wood-frame structures. 100th Anniversary Earthquake Conference Commemorating the 1906 San Francisco Earthquake, San Francisco, CA, April 18-22, 2006.

Meldrum J, Gupta A, McDonald BM. Investigation of structural damage in a corrosive environment. Proceedings, 5th International Conference on Case Histories in Geotechnical Engineering, New York, NY, April 2004.

McDonald BM, Luth G, Osteraas J. Review of safety factors for assessing column stability in existing braced frame buildings. Proceedings, 2004 Structures Congress, The Structural Engineering Institute of the American Society of Civil Engineers, Nashville, TN, May 22-26, 2004.

Osteraas J, Bonowitz D, Gupta A McDonald BM. Development of guidelines for assessment and repair of earthquake damage in woodframe construction. 13th World Conference on Earthquake Engineering, Paper No. 1580, Vancouver, BC, Canada, August 1-6, 2004

Ross B, McDonald BM, Saraf V. Big Blue goes down: The Miller Park crane accident. Proceedings, 6th International Symposium on Risk, Economy and Safety, Failure Minimization and Analysis, Capetown, South Africa, March 8-12, 2004.

McDonald BM, Saraf V, Ross B. A spectacular collapse: The Koror-Babeldaob (Palau) balanced cantilever prestressed post-tensioned bridge. Indian Concrete J 2003; 77(3). Also in Proceedings, 27th Conference on Our World in Concrete and Structures, XXI:57-68, August 29-30, 2002.

Osteraas J, Shusto L, McDonald BM. Forensic aspects of earthquake engineering: Protocols for earthquake damage assessment and repair. Proceedings, 2nd Forensic Engineering Congress, American Society of Civil Engineers, San Juan, Puerto Rico, May 19-23, 2000.

Rau G, Meldrum J, Medley E, McDonald BM. Forensic investigations of the soil-structure kind (wind & settlement failures). Proceedings, 2nd Forensic Engineering Congress, American Society of Civil Engineers, San Juan, Puerto Rico, May 19-23, 2000.

McDonald BM, Bozorgnia Y, Osteraas J. Structural damage claims attributed to aftershocks. Proceedings, 2nd Forensic Engineering Congress, American Society of Civil Engineers, San Juan, Puerto Rico, May 19-23, 2000.

Osteraas J, Shusto L, McDonald BM. Engineering involvement in post-Northridge damage assessment and repair of wood-frame dwellings. 12th World Conference on Earthquake Engineering, New Zealand Society of Earthquake Engineering, Auckland, New Zealand, February 2000.

Moncarz PD, McDonald BM, Caligiuri RD. Earthquake failures of welded building connections. Proceedings, 6th Pan American Congress of Applied Mechanics and 8th International Conference on Dynamic Problems in Mechanics, Rio de Janeiro, Brazil, January 4-8, 1999.

Moncarz PD, Caligiuri RD, McDonald BM, Sire RA, Borduin WP. Ultimate moment capacity of many steel connections: Failure in design, materials or workmanship? EUROMAT '98 Conference on Materials in Oceanic Environment, Lisbon, Portugal, July 22-24, 1998.

McDonald BM, Sire RA, Caligiuri RD. Ductile initiation of cleavage fractures in welded moment frame connections. 12th Engineering Mechanics Conference, American Society of Civil Engineers, La Jolla, CA, May 17-20, 1998.

Moncarz PD, Caligiuri RD, McDonald BM, Sire RA. Failures in steel frame building connections—A multi-billion dollar example of professional wishful thinking. 8th Annual International Federation for Information Processing (IFIP) Working Conference on Reliability and Optimization of Structural Systems, Krakow, Poland, May 11-13, 1998.

Johnston P, Shusto L, McDonald BM. Correlating torsional response to engine performance parameters. Presentation, International Off-Highway and Power Plant Congress and Exposition, Society of Automotive Engineering, Milwaukee, WI, September 1993.

Luth GP, McDonald BM, Jain D. Qualitative formulation of load paths through a functional description of structures. Proceedings, 5th International Conference on Computing in Civil and Building Engineering, Anaheim, CA, 1993.

McDonald BM, Burke M, Moncarz PD. The effects of natural aging on a polymer modified glass fiber reinforced concrete. Proceedings, 8th Biennial Congress of the Glassfibre Reinforced Cement Association, Maastricht, Netherlands, October 1991.

McDonald BM, Peyrot A. Generalized sag-tension calculations valid for any line geometry. J Struct Div, Am Soc Civil Engin 1990; 116(9).

McDonald BM, Peyrot A. Analysis of cable suspended in sheaves. J Struct Div, Am Soc Civil Engin 1988; 114(3).

McDonald BM. Analysis of cables suspended by sheaves. Dissertation, University of Wisconsin, Madison, WI, 1988.

Peyrot AH, Dagher HJ, McDonald BM. Reliability based design of transmission line structures—Theoretical user's manual for descal, reliability analysis and design of transmission line structures. EPRI Report for Project 1352-2, January 1986.

Saul W, McDonald BM. Microcomputer-aided structural analysis. In: Computer-Aided Processes in Instruction and Research. Beakley G, Haden C (eds), Academic Press Inc., Orlando, FL, 1985.

Saul W, Tuan CY-B, McDonald BM. Loads due to human movement. In: Structural Safety Studies. Yao JTP, Corotis R, Brown CB, Moses F (eds), American Society of Civil Engineers, New York, NY, 1985.

McDonald BM. The dynamic loading due to stadium crowds: A statistical measure of the coherency of crowd movements. Thesis, University of Wisconsin, Madison, WI, 1984.

Advisory Appointments

Nuclear Standards Committee of the American Society of Civil Engineers