



Exponent®
Engineering & Scientific Consulting

Maha Kenawy, Ph.D.

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Professional Profile

Dr. Kenawy specializes in nonlinear analysis of structures subjected to extreme loads, seismic hazard and risk assessment, performance-based earthquake engineering, and development of computational workflows for regional-scale engineering analysis. She has created advanced numerical modeling techniques for simulating the damage mechanisms controlling the deterioration and collapse of reinforced concrete structures.

Prior to joining Exponent, Dr. Kenawy worked as postdoctoral scholar at the University of Nevada, Reno where she led research efforts on using physics-based earthquake fault rupture simulations and high-performance computing workflows to conduct regional-scale assessments of the impacts of earthquakes on reinforced concrete buildings in the San Francisco Bay Area. She has developed new frameworks for using simulated earthquake ground motions in performance-based seismic design and the analysis of civil structures located near active faults. She also has experience with experimental testing of reinforced concrete structures, and has developed and assessed the performance of modular precast concrete shell structural systems.

Dr. Kenawy has consulted on projects related to assessing the vulnerability of electric transmission networks to wind and earthquake hazard, assessing the causes of ignition events in electric distribution networks for major utility companies, and investigating construction defects in concrete.

Dr. Kenawy's ongoing research involves predicting the impacts of earthquake fault rupture and site conditions on structures located near the Hayward fault. She co-advises graduate students at the University of Nevada, Reno in the area of numerical modeling of ultra high-performance concrete. She has taught and assisted teaching courses at the University of California, Davis and the American University in Cairo, Egypt, including engineering mechanics, structural analysis, design of reinforced concrete structures, and structural dynamics. She also prepared and delivered guest lectures for nonlinear structural analysis courses at the University of Nevada, Reno. She served in many leadership roles within the Earthquake Engineering Research Institute, including as a co-chair of the Younger Members Committee, and organized conference sessions on structural engineering research and practice. She currently also serves as a member and secretary of the ASCE/SEI Technical Committee on Performance-Based Design for Structures.

Academic Credentials & Professional Honors

Ph.D., Civil and Environmental Engineering, University of California, Davis, 2018

M.Sc., Construction Engineering, American University in Cairo, Egypt, 2015

B.S., Construction Engineering, American University in Cairo, Egypt, 2011

Earthquake Engineering Research Institute Younger Member Award 2022

Professional Development Postdoctoral Award, University of Nevada, Reno 2019

Natural Hazards Engineering Research Infrastructure (NHERI) Early-Career Summer Institute Grant, National Science Foundation, 2019

O.H. Ammann Research Award in Structural Engineering, American Society of Civil Engineers, 2016

Laboratory Instruction Graduate Fellowship, American University in Cairo, 2011-2014

Leadership for Education and Development (LEAD) Undergraduate Scholarship, American University in Cairo, U.S. Agency for International Development and the Egyptian Ministry of International Cooperation, 2005-2011

Academic Appointments

Postdoctoral Scholar, University of Nevada, Reno (2019 – 2021)

Course instructor, ENG35 - Engineering Statics, University of California, Davis (2016)

Professional Affiliations

Earthquake Engineering Research Institute (EERI) young professional member, Student Awards Committee member

American Society of Civil Engineers associate member, secretary of the Technical Committee on Performance-Based Design for Structures, Structural Engineering Institute

Member of the Seismological Society of America

Languages

Arabic

Publications

Kenawy, M., McCallen, D., and Pitarka, A. (2021) "Variability of Near-Fault Seismic Risk to Reinforced Concrete Buildings Based on High-Resolution Physics-Based Ground Motion Simulations." *Earthquake Engineering and Structural Dynamics*, 1–21.

Kenawy, M., Kunnath, S.K., Kolwankar, S., and Kanvinde, A. (2020) "Concrete Uniaxial Nonlocal Damage-Plasticity Model for Simulating Post-Peak Response of Reinforced Concrete Beam-Columns under Cyclic Loading," *Journal of Structural Engineering*, 146 (5), 04020052.

Kolwankar, S., Kanvinde, A., Kenawy, M., Lignos, D., and Kunnath, S.K. (2020) "Simulating Cyclic Local Buckling Induced Softening in Steel Beam-Columns Using a Nonlocal Material Model in Displacement-Based Fiber Elements," *Journal of Structural Engineering*, 146 (1), 04019174.

Kenawy, M., Kunnath, S.K., Kolwankar, S., and Kanvinde, A. (2018) "Fiber-Based Nonlocal Formulation for Simulating Softening in Reinforced Concrete Beam-Columns," *Journal of Structural Engineering*, 144 (12), 04018217.

Kolwankar, S., Kanvinde, A., Kenawy, M., Lignos, D., and Kunnath, S.K. (2018) "Simulating Local

Buckling-Induced Softening in Steel Members Using an Equivalent Nonlocal Material Model in Displacement-Based Fiber Elements,” Journal of Structural Engineering, 144 (10), 04018192.

Kolwankar, S., Kanvinde, A., Kenawy, M., and Kunnath, S.K. (2017) “Uniaxial Nonlocal Formulation for Geometric Nonlinearity-Induced Necking and Buckling Localization in a Steel Bar,” Journal of Structural Engineering, 143 (9), 04017091.

Kenawy, M., Ahmadi, A. and Kunnath, S.K. (2018) “Developing Reliable Seismic Demand Models with Limited Data.” Proceedings of the 11th U.S. National Conference on Earthquake Engineering, June 24-29, Los Angeles, CA.

Kenawy, M. and McCallen, D. (2020) “Regional-Scale Seismic Risk to Reinforced Concrete Buildings Based on Physics-Based Earthquake Ground Motion Simulations,” Center for Civil Engineering Earthquake Research Report No. 20-07, University of Nevada, Reno.

McCallen, D., Petersson, A., Rodgers, A., Pankajakshan, R., Sjogreen, B., Tang, H., Pitarka, A., Kenawy, M. (2020) “ECP Milestone Report: FY2020 Q4 Annual performance/science demonstration simulations on Summit for evaluation of advancements in application performance and providing new science and engineering insight into earthquake phenomenon,” Exascale Computing Project Report, Department of Energy.

Kenawy, M. (2018) “Nonlocal Computational Framework for Simulating Extreme Limit States in Reinforced Concrete Structures,” Doctoral Dissertation, University of California, Davis.

Slawinski A., Yoo, D., Kenawy, M., et al. (2018) “Virtual Earthquake Reconnaissance Team (VERT): Immediate Response to M7.5 & Tsunami, Palu-Indonesia,” EERI Learning from Earthquakes program.

Kenawy, M. (2014) “A Proposed Segmented Precast Concrete Spherical Cap: Geometry, Structural Stability and Construction,” M.Sc. Thesis, American University in Cairo, Egypt.

Kenawy, M. (2020) “A Critical Look at the Numerical Modeling of Reinforced Concrete Structures for Extreme Events,” EERI Younger Members Committee Online Blog.

Invited Lectures

Kenawy, M. (2021). Regional-scale Structural Risk Assessment Using Physics-Based Earthquake Simulations and High-Performance Computing. Guest speaker at the Civil and Environmental Engineering Department Seminar Series, University of Nevada, Reno.

Kenawy, M. (2021). Are We Ready for the Next Big Earthquake? Guest speaker at the University of Nevada Postdoctoral Seminar Series.

Kenawy, M. (2020). Advances in Performance Assessment of Reinforced Concrete Structures under Extreme Events. Plenary lecture at the 2020 Pacific Earthquake Engineering Research (PEER) Annual Meeting, Berkeley, CA.

Kenawy, M. (2020). Regional-Scale Seismic Risk to Reinforced Concrete Structures using Broadband Simulated Earthquake Ground Motions. Earthquake Engineering Research Institute (EERI) Webinar hosted by the Younger Members Committee.

Kenawy, M. (2020). Introduction to Nonlinear Modeling of Structures for Earthquake Engineering. Guest lecture at the Finite Element Methods graduate course, Department of Civil and Environmental Engineering, University of Nevada, Reno.

Kenawy, M. (2019). From Localized Damage to Global Structural Collapse: Advancing Multiscale Modeling of Civil Structures for Earthquake Engineering. Department of Civil and Environmental

Engineering Seminar, Georgia Institute of Technology.

Kenawy, M. (2019). Advancing Computational Modeling of Reinforced Concrete Structures for Earthquake Engineering. EERI Younger Members Committee Seminar Series, Department of Civil Engineering, Ain Shams University, Cairo, Egypt.

Kenawy, M. (2018). Enhanced Fiber-Based Frame Model for Simulating Cyclic Degradation of Reinforced Concrete Beam-columns. Civil and Environmental Engineering Department Seminar, University of California, Berkeley.

Conference Presentations

Ramos, L. and Kenawy, M. (2021). "Predicting Damage to Steel Rebar in Reinforced Concrete Structures Subjected to Earthquake Loading." Poster presentation, 2021 Southern California Earthquake Center Annual Meeting, September 13-16, virtual event.

Kenawy, M., McCallen, D. and Pitarka A. (2021) "Impacts of Fault Rupture Characteristics and Shallow Basin Amplification on the Response of Ductile Buildings to Near-Fault Physics-Based Simulated Ground Motions." Oral presentation, Seismological Society of America Annual Meeting, April 19-23, virtual event.

Kenawy, M. (2021) "Uncertainty in Performance-Based Seismic Design: Simulation-Based Findings and Future Directions." Poster presentation, EERI Annual Meeting, March 23-25, virtual event.

Kenawy, M. and McCallen, D. (2020) "Near-Fault Earthquake Risk to Reinforced Concrete Buildings Based on High-Resolution Physics-Based Ground Motion Simulations." Poster presentation, National Earthquake Conference, March 4-6, San Diego, CA.

Kenawy, M., Kunnath, S.K., and Kanvinde A. (2019) "Advancing the Seismic Collapse Assessment of Reinforced Concrete Structures Using Nonlocal Frame Models." Oral presentation, Engineering Mechanics Institute Conference, June 18-21, Pasadena, CA.

Kenawy, M., Kunnath S.K. and Kanvinde A. (2019) "Nonlocal Computational Framework for Simulating Collapse in Reinforced Concrete Structures under Earthquake Loading." Poster presentation, Pacific Earthquake Engineering Research Center (PEER) Annual Meeting, January 17-18, Los Angeles, CA.

Kenawy, M., Kunnath, S.K., and Kanvinde A. (2018) "Nonlocal Fiber-Based Frame Model for Simulating the Post-Peak Response of Reinforced Concrete Beam-Columns." Oral presentation, Engineering Mechanics Institute Conference, May 29-June 2, Cambridge, MA.

Kenawy, M., Kunnath, S.K., and Kanvinde A. (2018) "Fiber-Based Nonlocal Formulation for Simulating Softening in Reinforced Concrete Beam-Columns." Poster presentation, PEER Annual Meeting, January 18-19, Berkeley, CA.

Kenawy, M., Kunnath, S.K., and Kanvinde A. (2017) "Nonlocal Formulation for a Displacement-Based Fiber Beam-Column Element." Oral presentation, ASCE Structures Congress, April 5-8, Denver, CO.

Peer Reviews

Journal of Structural Engineering

International Journal of fracture