Affordable Seismic Isolation for Ordinary Buildings:
Advances in Fiber-Reinforced Elastomeric Isolators

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Abstract

The 2023 Turkey–Syria earthquake sequence resulted in over 50,000 fatalities, in stark contrast to the 57 deaths from the 1994 Northridge, California, earthquake. This disparity underscores the stark inequities in earthquake impacts across different economic settings, where most fatalities occur in less privileged regions. Earthquake-resistant technologies developed in wealthier nations are often prohibitively expensive in other seismic regions.

Seismic isolation is widely recognized as one of the most effective strategies for mitigating earthquake risk. However, conventional isolation technologies are often too costly—even in developed countries—limiting their use to high-importance structures. In response, recent efforts have focused on developing low-cost seismic isolation systems to make this technology accessible and scalable for buildings of normal importance in both developing and developed regions.

This presentation will provide an overview of recent developments in Fiber-Reinforced Elastomeric Isolators (FREIs)—a novel class of seismic isolators that use carbon fiber reinforcement instead of steel—based on research conducted by Prof. Konstantinidis' group at University of California, Berkeley and in collaboration with the University of Naples Federico II. Costing less than one-tenth of traditional steel-reinforced elastomeric bearings, FREIs offer a promising and affordable solution for improving earthquake safety in a broader range of structures. The presentation will highlight recent advances in the modeling and stability of these devices, as well as full-scale system-level testing that demonstrated their performance in a realistic structural configuration.

Biography

Dimitrios Konstantinidis is an Associate Professor in the Civil and Environmental Engineering Department at the University of California, Berkeley. He earned his Bachelor's, Master's, and Ph.D. degrees in Civil and Environmental Engineering from the University of California, Berkeley. He then held postdoctoral appointments at UC Berkeley and Lawrence Berkeley National Laboratory before joining McMaster University in Canada as a faculty member in 2011. In 2019, he returned to UC Berkeley as a professor. He currently teaches courses on structural analysis theory

and applications, advanced structural dynamics, and seismic isolation and energy dissipation. Specializing in earthquake engineering and engineering mechanics, his research focuses on developing advanced seismic isolation and structural control systems and improving the seismic performance of nonstructural components. He integrates experimental testing with mathematical modeling to better understand and accurately characterize mechanical behavior, develop effective protection strategies, and help shape modern seismic design codes and standards. He serves as a voting member of the U.S. code committee for new buildings: ASCE 7-28 and its Task Committees on Nonstructural Components, Seismic Isolation, and Energy Dissipation. His publications include the book *Mechanics of Rubber Bearings for Seismic and Vibration Isolation*.