Dottorato di Ricerca in Valutazione e Mitigazione dei Rischi Urbani e Territoriali

Dottorato di Ricerca Nazionale in Difesa dai Rischi Naturali e Transizione Ecologica del Costruito

ABSTRACT

Performance-based methodologies were first developed for seismic applications and have enabled the quantification of structural system performance under extreme events. The fundamental premise of performance-based seismic design (PBSD) is to provide buildings that meet specified performance goals at specific limit states, rather than strictly adhering to prescriptive construction details. In accordance with code-based seismic practice, structures are designed to undergo controlled inelasticity at predetermined, well-detailed members under the design earthquake. Conversely, wind design in modern building codes remains predominantly prescriptive: structures are required to respond elastically under strength-level wind loads and to satisfy stringent serviceability criteria under frequent wind events. This inconsistency between code-compliant seismic and wind design may become critical for taller structures located in multi-hazard environments where both wind and earthquake actions are significant.

In this talk, an original performance-based design framework is proposed for the efficient design of tall buildings subjected to combined wind and seismic loads in multi-hazard environments. The viability of the proposed framework is demonstrated through case studies in regions around the world where both wind and seismic hazards are critical, including Canada, the United States, India, and Italy. The presentation discusses the fundamentally different nature of wind and seismic hazards and their respective effects on structural behaviour. The discussion extends to the incorporation of limited ductility in wind design, the use of incremental dynamic and fragility analyses, multi-hazard considerations, and the need for large-scale experimental validation to support the transition toward performance-based wind design.

SHORT BIO

Dr. Anastasia Athanasiou has been Assistant Professor for Natural Hazards and Structural Resilience at Bauhaus-University Weimar since July 2023, supported by a €120,000 Carl-Zeiss Foundation grant. She teaches core courses in the international Master's program in Natural Hazards and Risks in Structural Engineering (NHRE) and conducts advanced research in multi-hazard engineering. Prior to Weimar, she was a postdoctoral researcher at Concordia University, Canada, focusing on the effects of strong winds and earthquakes on multi-story steel buildings. Her early work involved full-scale testing and simulation of hybrid base-isolation systems. She earned her PhD in Structural Engineering from the University of Catania, Italy, and holds a Bachelor's and two Master's degrees in Earthquake Engineering from Aristotle University of Thessaloniki, Greece. Her research has been published in peer-reviewed journals, book chapters, and conference proceedings.