

Testing and Modeling of Elastomeric Seismic Isolation Bearings for Extreme Loading Conditions

Seismic isolation in the modern era began with elastomeric bearings, and over 45 years they have become the most widely used type of seismic isolation bearing in the world. Variants include lead-rubber, high-damping rubber and natural rubber bearings, and all embody common characteristics of high compression (vertical) stiffness for stable load-carrying, low shear (horizontal) stiffness, and for LRBs and HDR bearings, energy dissipation properties.

The presentation will briefly introduce the main types of elastomeric bearings and their general behaviors, describe the evolution of isolation bearing testing, behavior of bearings under extreme loading conditions, give an overview of modeling and analysis of bearings under multi-directional and extreme loading conditions, give a brief case study of a project that included analysis and testing for extreme loads, and provide some conclusions about future directions.

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Ian Aiken is a Principal with Seismic Isolation Engineering, Inc., in Berkeley, California, and has 40 years of experience in earthquake, structural and civil engineering. He holds a Bachelor of Engineering degree from the University of Auckland, New Zealand, and Masters and Doctoral degrees in Civil Engineering from the University of California, Berkeley. His particular areas of expertise are seismic isolation and passive energy dissipation for seismic structural control, the use of nonlinear analysis for structural analysis and full-scale testing of isolation and damping devices. He has worked on more than 100 seismic isolation and energy dissipation projects including many notable building, bridge, industrial and equipment applications worldwide.

Ian has been a member of state, national and international committees on isolation and energy dissipation, including ASCE, AASHTO and SEAONC committees, FEMA-BSSC for the NEHRP national provisions and IEEE and ISO working groups. He is currently co-chair of ASCE 7 TC-7, responsible for the coming 2028 updates to the seismic isolation and damping provisions, and is the President of ASSISi, the Anti-Seismic Systems International Society the leading professional association worldwide in the field of isolation and damping.

