2024 DOE/NRC Natural Phenomena Hazards Meeting - Abstract

Use of Damping & Isolation for Seismic Qualification of Equipment for Increased Hazards

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In both nuclear facilities and DOE sites, nonstructural components (i.e. equipment and distribution systems) must be seismically qualified in accordance with ASCE 43 or ACSE 7. As seismic hazards are updated and inevitably increased, these components need to be reevaluated for the updated hazard. When these increases are significant enough to exceed the previously defined capacities of the systems, the owner is placed in a difficult position. Depending on the prior qualification method (analysis, testing, or experience data), it is possible that there is still some margin in the capacity. However, without shake table testing or analyzing the equipment to the new seismic level, this margin is difficult to quantify. An alternate approach is to use isolation and damping devices to either shift the frequency of the system to a lower acceleration range of the seismic spectra or to reduce the accelerations across the flexible frequency range. Elastomeric, friction pendulum bearings, helical springs, and wire rope isolators are all potential options that come with certain tradeoffs. Wire rope isolators are lesser known and used but provide an ideal solution for certain types of equipment (e.g., fans or other vibrating mechanical components) that already use traditional spring isolators. By replacing traditional spring isolators with wire rope isolators and snubbers, the seismic demands experienced by the equipment can be reduced. The increased damping provided by the wire rope isolators can reduce the seismic demands below the previously defined capacity for the equipment and eliminate the need for reevaluation of the equipment.