Structural Engineering Seminar Series

CEE 595 S (Cross-listed with EERI)

Seismic Risk Evaluation of Water Supply Systems

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Abstract:

A seismically-resilient water lifeline system is critical for ensuring effective post-event response and rapid community recovery after disastrous earthquakes. To design, construct, and maintain seismically-resilient water systems, it is crucial that the damage potential of a pipeline system be quantified in future earthquakes. Mitigation strategies to address known vulnerabilities are essential in ensuring that system performance goals and criteria can be achieved with available resources. To assess the damage potential of a large water pipeline network, the following factors must be addressed: regional seismicity, spatial distribution of earthquake-induced shaking, and ground deformation (event footprint) in future events, pipeline fragilities, and agency resources for emergency response. In this study, a large stochastic catalog of earthquake simulations, or an "event set," that adapts the Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) model is developed to represent the regional seismicity of the Los Angeles Basin. Random event footprints for each earthquake simulation are constructed by utilizing empirical ground motion models (GMMs) that are consistent with the 2014 United States Geological Survey (USGS)'s National Seismic Hazard Mapping Project (NSHMP). This set of earthquake simulations captures the large uncertainties in seismic hazard models than simplified methods and is utilized to evaluate system-level consequences for the entire City of Los Angeles water pipeline network, measured by the total number of pipeline repairs and subsequent repair costs and times due to strong ground shaking and ground deformations. These estimates of damage and impact are based on empirical pipeline fragility models and restoration data from two past events that affected the water system in the past (1971 San Fernando and 1994 Northridge Earthquakes). System-level performance is then evaluated at various targeted probability levels and influential seismic sources are identified. This study was performed as part of a long-term program administered by the City of Los Angeles Department of Water and Power to quantify and ultimately enhance the seismic resilience of all city trunklines and distribution pipelines.

Bio:

Mr. Eguchi is President and CEO of ImageCat, Inc., an international risk management company that supports the global risk and catastrophe management needs of the insurance industry, governments and NGOs. Mr. Eguchi has over 30 years of experience in risk analysis and risk reduction studies. He currently serves or has served on several editorial boards including EERI's Journal *SPECTRA*. In 1997, he was awarded the ASCE C. Martin Duke Award for his contributions to the area of lifeline earthquake engineering. In 2006, he accepted an ATC Award of Excellence on behalf of the ATC-61 project team for work on *An Independent Study to Assess Future Savings from Mitigation Activities* that showed that a dollar spent on hazard mitigation saves the nation about $4 in future benefits. He was recognized by EERI as the 2008 Distinguished Lecturer where he discussed the topic of *"Earthquakes, Hurricanes, and other Disasters: A View from Space."* In 2015, he founded the Technical Committee on Advances in Information Technologies for the SEI Division of ASCE. He has authored over 300 publications, many of them dealing with the seismic risk of utility lifeline systems and the use of remote sensing technologies for disaster response. He was awarded the 2017 Civil & Environmental Engineering Department Distinguished Alumnus Award from UCLA.

Monday, April 25th, 2022 4:00 – 5:20 p.m.

1310 Yeh Student Center