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Title
WHY WE NEED TO PAY CLOSE ATTENTION TO THE DAMPING MODELS FOR NON-LINEAR TIME HISTORY ANALYSIS

Convenors
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Description
Nonlinear time history analyses are becoming more prevalent in engineering practice to support performance based seismic design of buildings, bridges, and other structures. Whereas the development of the structural model itself in terms of geometry and hysteretic behavior is well understood, limited knowledge is available to the practicing engineer as to the damping model that should be used. Conceptually, the important effect of damping on inelastic structure response may be understood by considering the response of the structural elements that are yielding (plastic hinges) along with those elements that do not yield. Prior to development of a full plastic mechanism, non yielding elements deform locally giving rise to intrinsic damping throughout those elements. As a full plastic mechanism develops, hysteretic energy is dissipated by the yielding elements in the plastic hinging zones, and simultaneously the non-yielding elements deform primarily with rigid body motion. Thus, non-yielding elements material damping drops off significantly. To account for this analytically, tangent stiffness proportional damping may be used to model viscous damping, and most of the energy dissipation in the system shifts to the hysteretic damping inelastic elements (plastic hinges). Note that we are using the term tangent stiffness damping in a colloquial manner to represent a damping model where the damping force reduces for a yielding system. It is well established that pure tangent stiffness damping will result in instability for strength degrading systems, and the variation that is discussed here counteracts that effect by utilization of the secant damping matrix in the analysis. This technical session will cover a broad range of topics from computational to experimental studies to understand the important mechanisms that impact the non-linear response of structures.

Invited Speakers
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