



Fragility Curves for Structures Using Energy Criterion

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Abstract

The adaptation of structures to various regulations for the disaster, and therefore its developing risk and management, is the major problem of resilient and sustainable infrastructure. Generally, the drift based damage index has been used to compute the number of lives lost and the amount of money lost for structures damaged by disasters such as earthquakes, explosions, and other natural disasters. In our research, we demonstrate that the energy based damage index is superior for the buildings under consideration when subjected to various earthquake ground motions. For more precise loss estimation for those disasters, the energy based damage index is more suited than the drift based damage index. The energy concept is the approach of the future since it tackles the performance of a structure at both the global and local levels when subjected to varied dynamic loading. For the same reason, energy based fragility assessment is seen to be more useful because higher values indicate a greater likelihood of exceeding the threshold. In the field of damage assessment, drift based fragility curves are widely used to quantify damage under a variety of failure criteria. Well-designed three story and six story steel building structures have been modelled and analysed for various earthquake ground motions. Incremental dynamic analysis estimates drift and energy components. Output data, such as drift and energy, are looked at for their mean and standard deviation, then compared to each other. Fragility curves were created based on the mean and standard deviation data. Finally, observations and conclusions were made that, energy based fragility assessment are more effective for identification and quantification of performance of a structure under varying earthquake ground motions.

Keywords: Fragility curves, Incremental dynamic analysis, Nonlinear time history analysis, RAM PERFORM 3D, Performance levels