

Sensitivity of Parameters Affecting Seismic Risk

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Seismic risk or mean annual probability of unacceptable performance of structures, systems, and components (SSCs) (e.g., building structures, mechanical components) is required to meet preclosure safety analysis and performance objectives of the Code of Federal Regulations, Title 10, Part 63 for the proposed high-level nuclear waste geologic repository at Yucca Mountain, Nevada. Seismic performance of an SSC is defined by a specified limit state or failure criteria. This paper provides results of the study performed to evaluate sensitivity of various parameters or methods that could affect seismic performance of SSCs,

The probability of unacceptable performance of SSCs, is estimated by convolving the seismic hazard (i.e., annual probability of exceedance of ground motion level, and the SSC fragility (i.e., conditional probability of failure, given the ground motion level) curves. The seismic hazard curves at different sites can have substantially different slopes. The mean fragility curve of an SSC for a defined failure mode is typically defined as being log-normally distributed, and can be expressed in terms of a median capacity level, and a composite logarithmic standard deviation. The hazard curve and the fragility curve are convolved either by numerical integration or by a closed form solution.

This paper examines the following for their effects on the probability of unacceptable performance of an SSC: (a) low probability range of the seismic hazard curve; (b) slope of the hazard curve; (c) discretization steps in the numerical integration method; and (d) logarithmic standard deviation of the fragility curve.

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