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Exploring an Alternate Perspective of the Importance Factor for Seismic Design of Structures

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Abstract

Contingent to the risk to human life in the event of failure structural systems are designed with an additional factor, commonly known as the importance factor (Cl 7.2.3) [1]. In other words, importance factor is aimed to augment the design seismic hazard to reduce the probability of failure of a structure contingent on the associated risk to human life. Most standards recommend a factor (such as 1.5, 1.2 and 1.0 by Indian standard) based on the importance of a structure. The important question arises here is, given the varying level of epistemic uncertainty contingent on the fundamental period and regional seismicity, are we maintaining the underlying objective of uniform mean annual rate of exceedance while using a constant importance factor (such as that specified by most seismic standards)? This study offers an alternate perspective of increasing the design seismic hazard while maintaining the same underlying principle in an effort to comprehend the underlying problem. The ratio of fractile to weighted mean- hazard is envisioned in this study as an alternate perspective of the importance factor used in seismic de-sign, which appears to be dependent of the regional seismicity and fundamental period (but not on the soil sites). Besides, PSHA of the North-East Indian region is carried out using the logic tree approach and the results of few cities are presented here for the purpose of comparative illustrations. Finally, the importance factor is given by a linear function of the time period with contour maps of location dependent constants.

Keywords: Importance factor, Weighted mean and fractile seismic hazard, Logic tree, Contour map