

Accepted Manuscript

Detailed seismic risk analysis of buildings using structural reliability methods

Mohammad Aghababaei, Mojtaba Mahsuli

PII: S0266-8920(17)30074-7
DOI: <https://doi.org/10.1016/j.pro bengmech.2018.04.001>
Reference: PREM 2963

To appear in: *Probabilistic Engineering Mechanics*

Received date: 22 April 2017
Revised date: 6 October 2017
Accepted date: 26 April 2018

Please cite this article as: M. Aghababaei, M. Mahsuli, Detailed seismic risk analysis of buildings using structural reliability methods, *Probabilistic Engineering Mechanics* (2018), <https://doi.org/10.1016/j.pro bengmech.2018.04.001>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Detailed Seismic Risk Analysis of Buildings Using Structural Reliability Methods

Mohammad Aghababaei

M.Sc. Graduate, mohamad1992@tamu.edu, Dept. of Civil Engineering, Sharif University of Technology, Tehran, Iran

Mojtaba Mahsuli

Assistant Professor, mahsuli@sharif.edu, Dept. of Civil Engineering, Sharif University of Technology, Tehran, Iran;

Corresponding Author, Phone: +98 (21) 6616-4217, Fax: +98 (21) 6601-4828

Abstract

This paper presents probabilistic models and methods for detailed seismic risk analysis of structures using structural reliability methods. This approach to risk analysis is an alternative to those that employ the theorem of total probability and conditional probability distributions. Detailed risk analysis entails probabilistic quantification of responses, the ensuing damage of individual structural and nonstructural components, and the resulting economic and social losses. Such an analysis requires a library of probabilistic models for hazards, responses, damage, repair cost, downtime, and casualty with a specific format as presented in this paper. Two analysis options are proposed: one that is based on sampling and another that is based on the first-order reliability method. Furthermore, this paper puts forward importance and sensitivity measures that identify the most important sources of uncertainty and the most important design decisions considering multiple sources of hazard. The developments are showcased by a comprehensive application to a four-story building in Tehran, Iran. The primary results are the loss exceedance probabilities and their disaggregation into direct and indirect economic losses and social loss. The application provides insights into the most vulnerable components, the most influential seismic sources, the most important sources of uncertainty, and the most influential design decisions.

Keywords: Seismic risk; Reliability method; Probabilistic model; Sensitivity analysis; Economic loss; Social loss.

1 Introduction

This paper employs a library of predictive models in conjunction with structural reliability methods for detailed seismic risk analysis of structures. Risk analysis with structural reliability

Download English Version:

<https://daneshyari.com/en/article/7180865>

Download Persian Version:

<https://daneshyari.com/article/7180865>

[Daneshyari.com](https://daneshyari.com)