

## Incremental dynamic analysis of woodframe buildings

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### SUMMARY

The collapse of wood buildings was one of the main contributors to the heavy death toll and economic losses during the 1995 Hyogo-ken Nanbu (Kobe) earthquake in Japan. In California, half of the property loss from the 1994 Northridge earthquake was attributed to wood construction. Based on damage observed in recent earthquakes, the seismic vulnerability of existing wood buildings under maximum credible seismic events is uncertain. The main objective of this study is to quantify the seismic collapse fragilities and collapse mechanisms of a two-story townhouse and three-story woodframe apartment building through numerical analyses. Three construction quality variants (poor, typical and superior) were considered for each building in order to assess the effects of construction qualities on seismic collapse fragilities. The buildings were also re-designed according to the 2006 edition of the International Building Code to quantify the seismic fragilities of modern woodframe construction. The results obtained suggest that the construction quality, excitation direction and wall finish materials can influence significantly the collapse fragilities of woodframe buildings. Copyright © 2008 John Wiley & Sons, Ltd.

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**KEY WORDS:** collapse; incremental dynamic analysis; seismic; wood structure

### 1. INTRODUCTION

Observations from significant earthquakes in the last two decades, such as the 1989 Loma Prieta and the 1994 Northridge earthquakes in California and the 1995 Hyogo-ken Nanbu (Kobe) earthquake

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# Northridge Earthquake Field Investigations Statistical Analysis Of Woodframe

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## **Northridge Earthquake Field Investigations Statistical Analysis Of Woodframe:**

**Northridge Earthquake Field Investigations** G. G. Schierle, Consortium of Universities for Research in Earthquake Engineering (CUREe), California Institute of Technology, 2003-01 The objective of the field investigation was to analyze Northridge earthquake damage data to clarify important relationships for use in other elements of the Woodframe Project This report focuses on residential buildings though many other occupancies are commonly built of wood as well The report also provides background material for other research about wood frame structures the predominant type of residential construction in the U S The study examined data for both multi family dwellings apartment buildings and single family homes

**Techniques for the Seismic Rehabilitation of Existing Buildings**, 2006 **Earthquake Engineering Handbook** Charles Scawthorn, Wai-Fah Chen, 2002-09-27 Earthquakes are nearly unique among natural phenomena they affect virtually everything within a region from massive buildings and bridges down to the furnishings within a home Successful earthquake engineering therefore requires a broad background in subjects ranging from the geologic causes and effects of earthquakes to understanding the impact of these effects on foundations buildings structures the infrastructure and even their social and economic impact The Earthquake Engineering Handbook is a comprehensive resource that covers the spectrum of topics relevant to designing for and mitigating earthquakes In it international experts present engineering practices research and developments in North America Europe and the Pacific Rim countries The emphasis is on professional applications with discussion ranging from basic dynamics and geoscience to new technologies intended to avoid rather than resist the forces of earthquakes Covering both traditional and innovative practices the Earthquake Engineering Handbook is the first professional reference that brings together all of earthquake engineering s many facets Formulas tables and illustrations give immediate answers to questions arising in practice and summaries of the essential elements of each topic paint a global picture from which readers can develop understanding and the ability to think beyond the results presented **Handbook of Structural Engineering** W.F. Chen, E.M. Lui, 2005-02-28 Continuing the best selling tradition of the Handbook of Structural Engineering this second edition is a comprehensive reference to the broad spectrum of structural engineering encapsulating the theoretical practical and computational aspects of the field The contributors cover traditional and innovative approaches to analysis design and rehabilitation New topics include fundamental theories of structural dynamics advanced analysis wind and earthquake resistant design design of prestressed structures high performance steel concrete and fiber reinforced polymers semirigid frame structures structural bracing and structural design for fire safety

**Principles of Structural Design** W.F. Chen, E.M. Lui, 2005-10-31 Many important advances in designing high performance structures have occurred over the last several years Structural engineers need an authoritative source of information that thoroughly and concisely covers the foundational principles of the field Comprising chapters selected from the second edition of the best selling Handbook of Structural Engineering this book provides a tightly focused economical guide to the

theoretical practical and computational aspects of structural design Expert contributors discuss a wide variety of structures including steel aluminum timber and prestressed concrete as well as reliability based design and structures based on wind engineering

**Earthquake Spectra** ,2006 Proceedings of the Third Conference on Earthquake Hazards in the Eastern San Francisco Bay Area ,2010 **U.S. Geological Survey Bulletin** ,1983 **Geological Survey Professional Paper** Geological Survey (U.S.),1998 **Dwelling and Mobile Home Monetary Losses Due to the 1989 Loma Prieta, California, Earthquake with an Emphasis on Loss Estimation** Karl V. Steinbrugge,Richard J. Roth,1994 **U.S. Geological Survey Professional Paper** ,1984 **Newsletter** ,1998 Performance of HUD-assisted Properties During the January 17, 1994, Northridge Earthquake ,1994 **The Loma Prieta, California, Earthquake of October 17, 1989--building Structures** ,1998 A Compendium of Background Reports on the Northridge Earthquake (January 17, 1994) for Executive Order W-78-94 California. Seismic Safety Commission,1995 *1994 Northridge Earthquake Buildings Case Studies Project* California. Seismic Safety Commission,1996 **The Northridge Earthquake of January 17, 1994: Damage and inventory data** ,1995 **The Northridge Earthquake of January 17, 1994: Analysis and trends** ,1997

**Risk Modeling for Hazards and Disasters** Gero Michel,2017-08-29 Risk Modeling for Hazards and Disasters covers all major aspects of catastrophe risk modeling from hazards through to financial analysis It explores relevant new science in risk modeling indirect losses assessment of impact and consequences to insurance losses and current changes in risk modeling practice along with case studies It also provides further insight into the shortcomings of current models and examines model risk and ideas to diversify risk assessment Risk Modeling for Hazards and Disasters instructs readers on how to assess price and then hedge the losses from natural and manmade catastrophes This book reviews current model development and science and explains recent changes in the catastrophe modeling space including new initiatives covering uncertainty and big data in the assessment of risk for insurance pricing and portfolio management Edited by a leading expert in both hazards and risk this book is authored by a global panel including major modeling vendors modeling consulting firms and well known catastrophe modeling scientists Risk Modeling for Hazards and Disasters provides important insight into how models are used to price and manage risk Includes high profile case studies such as the Newcastle earthquake Hurricane Andrew and Hurricane Katrina Provides crucial information on new ideas and platforms that will help address the new demands for risk management and catastrophe risk reporting Presents the theory and practice needed to know how models are created and what is and what is not important in the modeling process Covers relevant new science in risk modeling indirect losses assessment of impact and consequences to insurance losses and current changes in risk modeling practice along with case studies USGS Response to an Urban Earthquake, Northridge '94 ,1995

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