



Catalog of FEMA Earthquake Resources

FEMA P-736B / January 2013



FEMA



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How to Obtain Publications

The title of each publication in this catalog is followed by a note indicating whether the document is available online, in print (hard copy), or on compact disc (CD-ROM). Some publications are available in only one of these formats, while others are available in multiple formats.

View or download publications online—through FEMA’s Index of Earthquake Publications (<http://www.fema.gov/earthquake-publications/index-earthquake-publications>) or the online FEMA Library (<http://www.fema.gov/library/index.jsp>).

Order copies of publications in print or on CD—from the FEMA Distribution Center, by telephone at 1-800-480-2520 (M-F, 8 a.m. through 5 p.m. EST), fax at 1-240-699-0525, or e-mail at FEMA-Publications-Warehouse@dhs.gov.

This catalog is available online at: <http://www.fema.gov/library/viewRdo?id=3538>.

What's New

Several new FEMA earthquake publications and training resources have become available since this catalog was last updated in December 2010. They are introduced briefly below, and described more fully in the catalog entries that follow.

New Earthquake Publications / Training Materials

2009 NEHRP Recommended Seismic Provisions: Design Examples (FEMA P-751)

Building design examples that demonstrate the design procedures found in the 2009 edition of the NEHRP Recommended Seismic Provisions (FEMA P-750).

Quantification of Building Seismic Performance Factors: Component Equivalency Methodology (FEMA P-795)

Builds upon the FEMA P-695 publication by providing a component-based methodology that can reliably evaluate structural elements, connections, or subassemblies proposed as substitutes for equivalent components in established seismic-force-resisting systems.

Rapid Observation of Vulnerability and Estimation of Risk (FEMA P-154 ROVER CD)

Now available on compact disc, ROVER is the software package for smartphones that automates the FEMA 154 rapid visual screening (RVS) procedure and the ATC-20 procedures for post-earthquake safety evaluations of buildings.

Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories (FEMA P-807)

Guidelines for retrofitting weak-story, wood-frame buildings in seismically active regions. Focuses on multi-family, multi-story buildings with weak first stories, such as those damaged in the 1989 Loma Prieta earthquake, and on apartment buildings with tuck-under parking, such as those damaged in the 1994 Northridge earthquake. The publication comes with a CD that includes the Weak Story Tool spreadsheet.

Seismic Performance Assessment of Buildings (FEMA P-58)

This new three-volume publication is the first-phase product of FEMA's Performance-Based Seismic Design Project, and provides a performance assessment methodology for determining how well a new building design or an existing building is likely to perform in an earthquake. FEMA P-58-1, Volume 1 Methodology, presents the actual assessment methodology; FEMA P-58-2, Volume 2 Implementation Guide, describes how the methodology can be implemented; and FEMA P-58 CD, Volume 3 Supporting Materials, is a CD-ROM containing Volumes 1 and 2 as well as supporting electronic materials and background documents, including the Performance Assessment Calculation Tool (PACT) spreadsheet and information about environmental benefits.

Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50) and Seismic Retrofit Guidelines for Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50-1)

The FEMA P-50 guide provides a simple form on how to assess and calculate a Seismic Performance Grade for detached, single-family, wood-frame homes. It is a nationalized version developed for Los Angeles after the Northridge earthquake. The FEMA P-50-1 guide provides seismic retrofitting guidance on how to address identified deficiencies and improve a home's Seismic Performance Grade.

Earthquake Publications for Businesses (QuakeSmart Toolkit, FEMA P-811)

Developed by FEMA for NEHRP, QuakeSmart is an initiative to help businesses in seismically at-risk communities start and maintain earthquake mitigation efforts. The QuakeSmart Toolkit (<http://www.fema.gov/earthquake-publications/quakesmart-toolkit-table-contents>) provides actionable and scalable basic guidance and tools to the private sector about the importance of earthquake mitigation and the simple things that businesses can do to reduce the potential for earthquake damages, injuries, and financial losses. The toolkit walks you through a three-step process: 1) identify your risk, 2) make a plan, and 3) take action. This information was specifically developed to encourage businesses to incorporate earthquake mitigation into their decision making and planning processes to enhance their all-hazards resilience.

Guidelines for Design of Structures for Vertical Evacuation from Tsunamis (FEMA P-646)

Vertical evacuation structures provide a means to create areas of refuge for communities in which evacuation out of the inundation zone is not feasible. This second edition of FEMA P-646 incorporates observations and lessons learned from the March 2011 Tohoku earthquake, revision of the debris impact expression to remove over-conservatism deemed to be present in the first edition, and additional explanation of the definition of the tsunami elevation as it relates to run-up elevation used in tsunami force equations.

New FEMA Earthquake Training Resources

FEMA 232CD, Homebuilders' Guide to Earthquake Resistant Design and Construction

Compact disc containing English- and Spanish-language versions of the FEMA 232 publication, as well as complementary training materials consisting of PowerPoint slides.

FEMA P-751, 2009 NEHRP Recommended Seismic Provisions: Design Examples

With building design examples based on the latest edition of the NEHRP Recommended Seismic Provisions, this publication is an excellent training tool!

FEMA P-752, NEHRP Recommended Provisions for New Buildings and Other Structures: Training and Instructional Materials

PowerPoint slides presenting earthquake engineering training based on the 2009 NEHRP Recommended Seismic Provisions. This material can be presented to engineers or architects by a qualified speaker, used by individuals, or used as the basis for classroom instruction on earthquake-resistant design.

FEMA P-909, Train-the-Trainer: Home and Business Earthquake Safety and Mitigation

Training and materials that prepare and equip individuals to conduct training courses and hands-on demonstrations conveying basic knowledge about earthquakes and what people can do to increase earthquake safety and mitigate seismic risks in homes and workplaces.

IS-325, Earthquake Basics: Science, Risk, and Mitigation

A short independent study course presenting basic information about earthquake causation, potential seismic vulnerabilities in homes and workplaces, and structural and nonstructural mitigation techniques. Available online through the FEMA Emergency Management Institute's website.

FEMA Earthquake Publications

Individuals and Homeowners

Are You Ready? An In-depth Guide to Citizen Preparedness (FEMA IS-22)

Available online and in print

This guide provides citizens with step-by-step procedures on how to develop, practice, and maintain emergency plans for protecting lives and property before, during, and after a disaster. Also included is information for individuals and their families on how to assemble a disaster supplies kit with a sufficient quantity of food, water, and other supplies. The guide is available in Spanish as well as English.



FEMA 528

Earthquake Home Hazard Hunt Poster (FEMA 528)

Available online and in print

This poster provides visuals and descriptions so that homeowners can identify and fix at-risk areas of their homes to reduce future earthquake damage and disruption.

Earthquake Publications for Individuals and Homeowners (FEMA P-711CD)

Available online and on CD

This compilation contains all of the publications listed in this section (Individuals and Homeowners) of the catalog. Two additional publications are also included: “Drop, Cover, and Hold Poster” (FEMA 529); and “The Adventures of Terry the Turtle and Gracie the Wonder Dog, Grades 3–6” (FEMA 531).



FEMA P-711CD

Earthquake Safety Checklist (FEMA B-526)

Available online and in print

This quick-reference guide helps individuals and families prepare for an earthquake and prevent earthquake-related damage to their homes. The easy-to-read brochure features instructions on conducting earthquake drills and “hazard hunts.” Also included are a checklist of disaster supplies, tips on what to do during and after an earthquake, and additional resources. Available in English and Spanish in print, and multiple languages online.

Earthquake Safety Guide for Homeowners (FEMA 530)

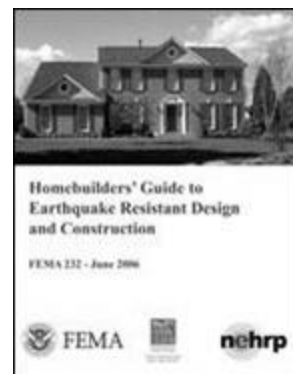
Available online and in print

This updated safety guide, which was originally developed and published by the California Seismic Safety Commission, provides homeowners with a good start to strengthening their homes against earthquake damage. The guide also illustrates the relative cost of prevention versus repair or replacement.

Homebuilders' Guide to Earthquake Resistant Design and Construction (FEMA 232 and P-232CD)

Available online, in print, and on CD

This illustrated guide presents seismic design and construction guidance for one- and two-family light frame residential structures that can be utilized by homebuilders, knowledgeable homeowners, and other non-engineers, and provides information supplemental to the 2003 edition of the “International Residential Code.” The guide presents background information on the principles of seismic resistance and how earthquake forces impact conventional residential construction and more detailed information on architectural considerations (site selection, foundations and foundation details, floors, shear walls, and roofs). Also included are discussions of masonry and stone elements, examples of typical floor plans for earthquake-resistant one- and two-story homes, excerpts of seismic requirements from building codes, and checklists for homebuilders. The guide also presents a series of “above-code recommendations” that provide low-cost measures that would increase the performance of the building and help keep it functional after an earthquake. The CD-ROM, FEMA P-232CD, contains both English- and Spanish-language versions of the FEMA 232 publication, as well as related training materials.



FEMA 232

Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide. Fourth Edition (FEMA E-74)

Available online and on CD

This updated fourth edition of FEMA 74 has been redesigned for use online and expanded to include more examples that feature photos of actual damage and details illustrating correct mitigation measures. The online format makes it easy to browse and print out relevant details. The guide describes the sources of nonstructural earthquake damage and effective methods of reducing potential risks associated with such damage. It assists in identifying potential hazards and provides specific guidance on upgrades. The guide also contains a glossary, references, and an annotated bibliography for those who desire additional information. A nonstructural inventory form, a checklist of nonstructural earthquake hazards, and an explanation of nonstructural risk ratings are included as appendices. Target audiences for the guide include building owners, facility managers, maintenance personnel, homeowners, store or office managers, business proprietors, organizational department heads, and others concerned with building safety and the continuation of business. The online version of FEMA E-74 is located at <http://www.fema.gov/plan/prevent/earthquake/fema74/index.shtm>.



FEMA E-74

Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50) and Seismic Retrofit Guidelines for Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50-1)

Available online and in print

FEMA P-50 explains how to use the Simplified Seismic Assessment Form to calculate a Seismic Performance Grade for a detached, single-family, wood-frame home. The grade is based on a Structural Score and Seismic Hazard Score, which are derived using location-specific data available through online websites. The companion publication FEMA P-50-1 describes low-cost seismic retrofitting techniques that can be used to address deficiencies identified on the Simplified Seismic Assessment Form, and shows how implementing those techniques could improve a home's grade. These publications provide a tool that communities or other entities can use to encourage the seismic retrofitting of residential structures to reduce future earthquake losses.

Teachers and Kids

Drop, Cover, and Hold Poster (FEMA 529)

Available online and in print

This poster is intended for classroom use. It depicts a teacher and students in a classroom responding appropriately to the first sign of an earthquake (Drop, Cover, and Hold). Available in English and Spanish in print, and multiple languages online.



FEMA 529

Earthquake Publications for Teachers and Kids (FEMA P-710CD)

Available online and on CD

This compilation contains all of the publications listed in this section (Teachers and Kids) of the catalog. Two additional publications are also included: "Earthquake Safety Checklist" (FEMA B-526), and "Earthquake Home Hazard Hunt Poster" (FEMA 528).

Earthquake Safety Activities for Children and Teachers (FEMA 527)

Available online and in print

This updated publication provides elementary-school teachers with ready-to-use, hands-on activities that explain what happens during an earthquake, how to prepare for earthquake shaking, and how to stay safe during and after an earthquake. Included are a variety of handouts for students, including maps, songs, "hazard hunt" worksheets, and earthquake safety checklists.



FEMA P-710CD

Seismic Sleuths: A Teacher's Package for Grades 7–12 (FEMA 253)

Available online, in print, and on CD

This package provides middle- and high-school teachers with information about the causes and effects of earthquakes. Activity sheets for students and background materials for teachers are provided in each of the volume's six units. The units assess students' knowledge about earthquakes; provide information about preparedness and emergency management; discuss the causes of earthquakes and their effects; present information on seismic waves and the development of seismology and instruments used to measure an earthquake's magnitude; explain the effects of earthquakes on buildings and earthquake-resistant design techniques; and discuss earthquake preparedness and the reactions of different populations to historical earthquakes. The last unit provides a variety of summary and assessment activities and a list of additional resources.

The CD-ROM, FEMA 253CD, Second Edition, 2005, contains curriculum supplements that provide middle- and high-school teachers with background materials and activity sheets for students.

The Adventures of Terry the Turtle and Gracie the Wonder Dog, Grades 3–6 (FEMA 531)

Available online and in print

This storybook for children in grades 3–6 relates the adventures of the safety-conscious mayor of Shakeyville (Terry the Turtle) and a team of safety volunteers who meet with students at the local elementary school to teach them about earthquake safety. The students discover the importance of earthquake safety and preparedness. Included are suggestions for creating a disaster kit, illustrations of what to do if an earthquake happens (Drop, Cover, and Hold), and a list of resources.

Tremor Troop: Earthquakes—A Teacher's Package for K–6. Revised Edition (FEMA 159)

Available online, in print, and on CD

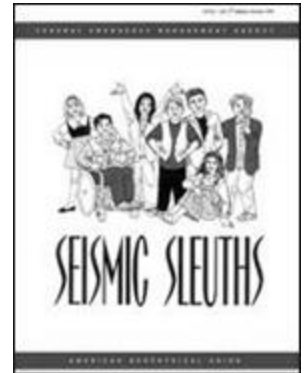
This teacher's package for grades K–6 provides ready-to-use, hands-on activities for students and teachers on the science of earthquakes and earthquake safety. This edition contains assessments throughout the units, matrices linking activities to the National Science Education Standards, and a new glossary. Four of the five units are divided into levels by grades: Level 1, for grades K–2; Level 2, for grades 3–4; and Level 3, for grades 5–6. The lessons introduce how earthquakes are defined, why and where earthquakes occur, the physical results of earthquakes, and how earthquakes are measured. The final unit addresses earthquake safety and survival and includes activities for students in all grades K–6. At the end of each unit, ready-to-reproduce masters are provided for classroom use.

Private Sector and Small Businesses

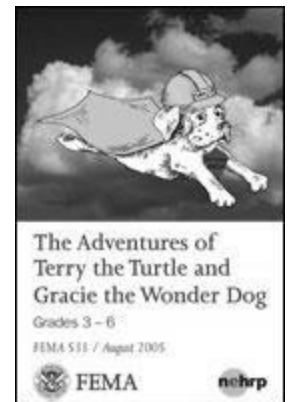
Earthquake Publications for Businesses (QuakeSmart Toolkit, FEMA P-811)

Available online and on DVD

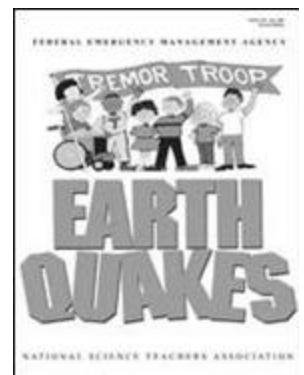
Developed by FEMA for NEHRP, QuakeSmart is an initiative to help businesses in seismically at-risk communities start and maintain earthquake mitigation efforts. The QuakeSmart Toolkit (<http://www.fema.gov/earthquake-publications/quakesmart-toolkit-table-contents>) provides actionable and scalable basic guidance and tools to the private sector about the importance of earthquake mitigation and the simple things that businesses can do to reduce the potential for earthquake damages, injuries, and financial losses. The toolkit walks you through a three-step process: 1) identify your risk, 2) make a plan, and 3) take action. This information was specifically developed to encourage businesses to incorporate earthquake mitigation into their decision making and planning processes to enhance their all-hazards resilience.



FEMA 253



FEMA 531



FEMA 159



FEMA P-811

Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide. Fourth Edition (FEMA E-74)

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Community Planning and Public Policy

Creating a Seismic Safety Advisory Board: A Guide to Earthquake Risk Management (FEMA 266)

Available online

This guide assists states, state coalitions, and local governments in creating, developing, and nurturing seismic safety advisory boards. It provides information on board operations, including staffing and funding a board, and guidelines for strategic planning and developing a model seismic risk management program to measure progress. The appendices include model executive orders, enabling legislation, staff duty descriptions, workshop designs, and workshop rosters; examples of an interstate compact, articles of incorporation, and corporate by-laws; a list of existing seismic safety advisory boards; and a lexicon of terms.

Earthquake Publications for Community Planners and Public Policy Makers (FEMA P-712CD)

Available online and on CD

This compilation contains most of the publications that provide information and guidance for local planners, policy makers, and advocates interested in assessing and responding to seismic hazards and the risks they pose for their communities. Six of these publications are offered individually in this catalog (FEMA 83, 154, 266, 275, 366, and 474). Also included are “Societal Implications: Selected Readings” (FEMA 84), “Seismic Retrofit Incentive Programs: A Handbook for Local Governments” (FEMA 254), and a series of mitigation planning “how-to” guides (FEMA 386-1 through 386-8) applicable to earthquakes and other hazards.



FEMA P-712CD

Earthquake-Resistant Design Concepts: An Introduction to the NEHRP Recommended Seismic Provisions (FEMA P-749)

Available online and in print

This document provides a readily understandable explanation of the intent and requirements of seismic design in general and the “NEHRP Recommended Seismic Provisions for New Buildings and Other Structures” (FEMA P-750) in particular. FEMA P-750 and the building codes and standards based on its recommendations are technical documents intended primarily for use by design and construction professionals. However, understanding the basis for the seismic regulations contained in the Nation’s building codes and standards is important to many people outside this technical community. This publication is designed for elected officials, members of the insurance and financial communities, individual business owners, and other interested individuals.



FEMA P-749

Financial Incentives for Seismic Rehabilitation of Hazardous Buildings—An Agenda for Action. Volume 1: Findings, Conclusions, and Recommendations (FEMA 198)

Available in print

The Financial Incentives series publications (Volumes 1–3, FEMA 198, FEMA 199, and FEMA 216) identify and describe the existing and potential regulatory and financial mechanisms and incentives for lessening the risks posed by existing buildings in an earthquake. Volume 1 includes a discussion of the methodology used in this series, background information on financial incentives, and findings, conclusions, and recommendations for decision makers at the local, state, and national levels.

Financial Incentives for Seismic Rehabilitation of Hazardous Buildings—An Agenda for Action. Volume 2: State and Local Case Studies and Recommendations (FEMA 199)

Available in print

The Financial Incentives series publications identify and describe the regulatory and financial mechanisms and incentives for lessening the risks posed by existing buildings. Volume 2 includes detailed descriptions of the 20 case studies that were examined as part of the project.

HAZUS® MH Estimated Annualized Earthquake Losses for the United States (FEMA 366)

Available online

Recent earthquakes around the world show a pattern of steadily increasing damages and losses that is due primarily to two factors: (1) significant growth in earthquake-prone urban areas, and (2) vulnerability of the older building stock, including some buildings constructed within the past 20 years. This publication highlights the impacts of both high risk and high exposure on losses caused by earthquakes. It is based on loss estimates generated by HAZUS–MH.

HAZUS–MH is an electronic loss estimation tool that provides a method for quantifying future earthquake losses. FEMA’s objective in producing this report was to assess levels of seismic risk in the United States using HAZUS–MH and nationwide data. The analysis computes two interrelated metrics to characterize earthquake risk: Annualized Earthquake Loss (AEL) and the Annualized Earthquake Loss Ratio (AELR).



FEMA 366

Landslide Loss Reduction: A Guide for State and Local Government Planning (FEMA 182)

Available online and in print

This guide provides information for state and local officials involved in landslide mitigation. It describes the benefits of landslide mitigation; the causes and types of landslides; hazard identification, assessment, and mapping; the transfer and use of information; loss-reduction techniques; plan preparation and review; and approaches to overcoming problems. Illustrations provide additional information on the causes of and damage resulting from landslides.

Planning for Seismic Rehabilitation: Societal Issues (FEMA 275)

Available online and in print

This publication provides users with an understanding of the social and public policy issues that may accompany seismic rehabilitation, such as demographic, social, and economic impacts; historic property restrictions; resident dislocations; and business interruptions. The publication presents a four-step decision process to assist local officials, private owners, and design professionals in determining the need for rehabilitation. It includes an “escalation ladder” to assist in understanding the degree of conflict that might be generated and the implications of choosing particular strategies.



FEMA 474

Promoting Seismic Safety: Guidance for Advocates (FEMA 474)

Available online and in print

This booklet offers advice to assist seismic safety advocates in presenting risk-reduction information and ideas. The full version of “Promoting Seismic Safety: Guidance for Advocates” is a 200-plus page report that consists of two parts. Part One is the guidance provided in this booklet. Part Two is a set of background papers developed by the authors as part of the project. PDF files for Part Two can be downloaded from the MCEER website at <http://mceer.buffalo.edu/publications/tricenter/04-SP02/default.asp>.

Promoting the Adoption and Enforcement of Seismic Building Codes: A Guidebook for State Earthquake and Mitigation Managers (FEMA 313)

Available online and in print

This guidebook provides background information and educational materials to help state officials promote the adoption, administration, and enforcement of state and local model building codes that contain the latest seismic provisions. The guidebook describes the purpose, function, and effectiveness of building codes in general and seismic codes in particular and presents a step-by-step process for adopting and administering state or local codes. The appendices include the history and principles of seismic design; a state-by-state listing of state codes and code influences; seismic design practices in the United States; examples of state and local building codes and state legislation; the services of model code organizations in the United States; and resources, recommended readings, and educational materials.

Seismic Considerations for Communities at Risk (FEMA 83)

Available online and in print

This publication provides individuals and community decision makers with information that they can use to assess seismic risk, make informed decisions about seismic safety in their communities, and determine what can be done to mitigate risk. The publication includes information on the scope of earthquake risk in the United States, the effects of earthquakes on buildings, how design can reduce earthquake effects, and the importance of seismic codes and the “NEHRP Recommended Seismic Provisions for New Buildings and Other Structures” (FEMA P-750). Also included are factors to consider when deciding whether and how to take action to reduce earthquake risk and suggestions for stimulating community action.

Seismic Rehabilitation of Buildings: Strategic Plan 2005 (FEMA 315)

Available in print

This publication discusses the mission, history, and results of FEMA’s Existing Building Program (EBP) and provides four objectives and 25 tasks to be carried out through the EBP. The four objectives are to (1) promote seismic rehabilitation and advance the implementation of previously developed material, (2) monitor the use of and refine existing material, (3) develop new seismic rehabilitation tools, and (4) consider new directions for the EBP. Estimated costs for the next 10–15 years and guidelines for plan implementation are also included.

Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50) and Seismic Retrofit Guidelines for Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50-1)

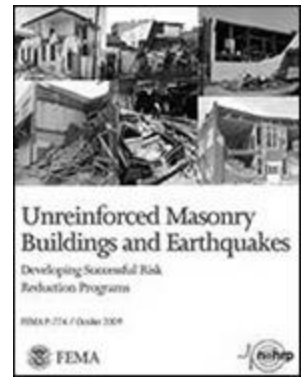
Available online and in print

FEMA P-50 explains how to use the Simplified Seismic Assessment Form to calculate a Seismic Performance Grade for a detached, single-family, wood-frame home. The grade is based on a Structural Score and Seismic Hazard Score, which are derived using location-specific data available through online websites. The companion publication FEMA P-50-1 describes low-cost seismic retrofitting techniques that can be used to address deficiencies identified on the Simplified Seismic Assessment Form, and shows how implementing those techniques could improve a home’s grade. These publications provide a tool that communities or other entities can use to encourage the seismic retrofitting of residential structures to reduce future earthquake losses.

Unreinforced Masonry Buildings and Earthquakes: Developing Successful Risk Reduction Programs (FEMA P-774)

Available online, in print, and on CD

This publication provides guidance on reducing the risks from unreinforced masonry (URM) buildings in seismically active areas. URM buildings are typically the most vulnerable to earthquake damage and the type of construction that is most commonly singled out for voluntary and mandatory seismic risk reduction programs. The document includes illustrations and photographs of URM buildings and describes their seismic vulnerabilities. It discusses policy and regulatory issues that often must be considered, such as retrofit costs, the economic viability of older buildings, numbers of occupants and types of use, and historic or architectural values. Rather than prescribing a rigid sequence of steps for URM risk reduction, FEMA P-774 documents a wide variety of successful approaches that have been developed across the United States.

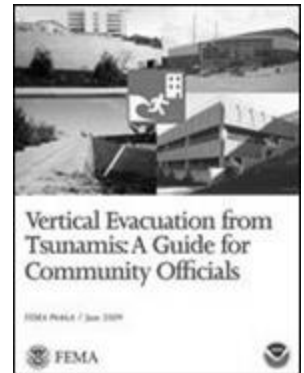


FEMA P-774

Vertical Evacuation from Tsunamis: A Guide for Community Officials (FEMA P646A)

Available online and in print

This document provides guidance for local officials on how to implement the design guidelines detailed in “Guidelines for Design of Structures for Vertical Evacuation from Tsunamis” (FEMA P646). It examines how communities can plan, fund, construct, operate, and maintain vertical evacuation refuges.



FEMA P646A

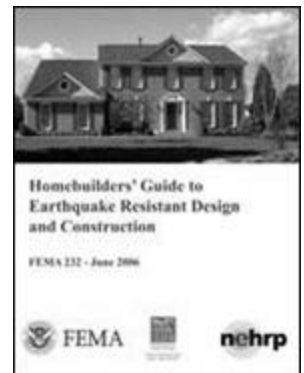
Building Professionals and Engineers

Residential Buildings

Homebuilders' Guide to Earthquake Resistant Design and Construction (FEMA 232 and 232CD)

Available online, in print, and on CD

This illustrated guide presents seismic design and construction guidance for one- and two-family light frame residential structures that can be utilized by homebuilders, knowledgeable homeowners, and other non-engineers, and provides information supplemental to the 2003 edition of the “International Residential Code.” The guide presents background information on the principles of seismic resistance and how earthquake forces impact conventional residential construction and more detailed information on architectural considerations (site selection, foundations and foundation details, floors, shear walls, and roofs). Also included are discussions of masonry and stone elements, examples of typical floor plans for earthquake-resistant one- and two-story homes, excerpts of seismic requirements from building codes, and checklists for homebuilders. The guide also presents a series of “above-code recommendations” that provide low-cost measures that would increase the performance of the building and help keep it functional after an earthquake. The CD-ROM, FEMA 232CD, contains both English- and Spanish-language versions of the FEMA 232 publication, as well as related training materials.



FEMA 232

Seismic Rehabilitation Training for One- and Two-Family Dwellings: Program and Slide Presentations (FEMA P-593CD)

Available online and on CD

This product contains PowerPoint slide presentations, an instructional guide, and speaker's notes for training contractors, code officials, and other parties interested in the seismic retrofitting of existing light-frame dwellings. It has been used by the International Code Council as the basis for a series of webinars that have been presented to its membership.



FEMA P-593CD

Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50) and Seismic Retrofit Guidelines for Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50-1)

Available online and in print

FEMA P-50 explains how to use the Simplified Seismic Assessment Form to calculate a Seismic Performance Grade for a detached, single-family, wood-frame home. The grade is based on a Structural Score and Seismic Hazard Score, which are derived using location-specific data available through online websites. The companion publication FEMA P-50-1 describes low-cost seismic retrofitting techniques that can be used to address deficiencies identified on the Simplified Seismic Assessment Form, and shows how implementing those techniques could improve a home's grade. These publications provide a tool that communities or other entities can use to encourage the seismic retrofitting of residential structures to reduce future earthquake losses. The California Earthquake Authority funded the development of the damage range descriptions used for each Seismic Performance Grade.

New Buildings ———

Communicating with Owners and Managers of New Buildings on Earthquake Risk (FEMA 389)

Available online

This publication facilitates the education of building owners and managers on the seismic risk management tools that can be effectively and economically employed during the building development phase. The document, which is intended primarily for design professionals, introduces and discusses (1) seismic risk management and the development of a risk management plan; (2) emerging concepts in performance-based seismic design; and (3) seismic design and performance issues related to six specific building occupancies: commercial office facilities, retail commercial facilities, light manufacturing facilities, health care facilities, local schools (K–12), and higher education (university) facilities. The document also provides guidance for identifying and assessing earthquake-related hazards during the site selection process.



FEMA 577

Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds: Providing Protection to People and Buildings (FEMA 577)

Available online and in print

This guide provides state-of-the-art knowledge on the variety of vulnerabilities faced by hospitals exposed to earthquakes, flooding, and high-winds risks, as well as the best ways to mitigate the risk of damage to and disruption of hospital operations caused by these events. It presents an exhaustive review of mitigation measures and design solutions that can improve the safety of hospitals in natural hazard events. However, this publication is not intended to be a comprehensive mitigation design manual that the reader can use to develop actual plans and specifications. It instead provides an introduction to the fundamental principles of natural-hazard risk reduction, with an emphasis on mitigation planning and the design of hospital buildings.



FEMA 424

Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds (FEMA 424)

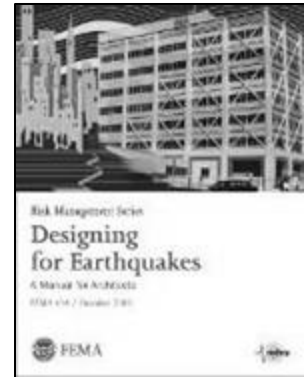
Available online, in print, and on CD

This publication provides design guidance for the protection of school buildings (K–12) and their occupants against natural hazards. It focuses on the design of new schools, but the repair, renovation, and expansion of existing schools are also addressed. The guide introduces two core concepts: multihazard design and performance-based design. It emphasizes that potential hazards and their frequencies must be considered and integrated with all other design concerns from the inception of the site-selection and building-design process.

Designing for Earthquakes: A Manual for Architects (FEMA 454)

Available online and on CD

This manual explains the principles of seismic design in ways that are easy to understand for those without a technical background in engineering and seismology. Although intended primarily for architects, the publication may also be of interest to building officials, owners, managers, and tenants as well as emergency management personnel, engineers, and others concerned with the seismic protection of buildings. Topics covered include the nature of seismic hazards, how buildings are affected by earthquake-induced ground motion, building site selection and assessment, how design decisions affect building seismic performance, seismic codes and performance-based design, the historical development of earthquake-resistant design, common retrofit techniques for existing buildings, protection of nonstructural components, and how earthquake protection relates to protection from other hazards.



FEMA 454

Earthquake-Resistant Design Concepts: An Introduction to the NEHRP Recommended Seismic Provisions (FEMA P-749)

Available online and in print

This document provides a readily understandable explanation of the intent and requirements of seismic design in general and the “NEHRP Recommended Seismic Provisions for New Buildings and Other Structures” (FEMA P-750) in particular. FEMA P-750 and the building codes and standards based on its recommendations are technical documents intended primarily for use by design and construction professionals. However, understanding the basis for the seismic regulations contained in the Nation’s building codes and standards is important to many people outside this technical community. This publication is designed for elected officials, members of the insurance and financial communities, individual business owners, and other interested individuals.



FEMA P-749

NEHRP Recommended Provisions and Commentary for Seismic Regulations for New Buildings and Other Structures. 2003 Edition (FEMA 450 and 450CD)

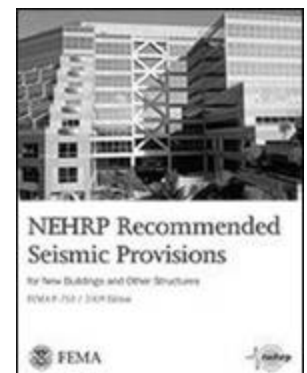
Available online, in print, and on CD

The 2003 edition of the NEHRP Recommended Provisions presents criteria for the design and construction of new buildings, of additions and alterations to existing buildings, and non-building structures to enable them to resist the effects of earthquake ground motions. This edition has been superseded by the 2009 edition (FEMA P-750) but is still available to comply with Executive Order 12699. This edition consists of two volumes: FEMA 450-1 (Part 1: Provisions) and FEMA 450-2 (Part 2: Commentary). Most of this material was adopted into the ASCE/SEI 7-05 standard and the 2006 edition of the “International Building Code.” The CD-ROM, FEMA 450CD, contains FEMA 450-1 and FEMA 450-2 and the related seismic design maps, including the maximum considered earthquake (MCE) maps. The CD also includes the USGS design map value calculation software as well as two earlier editions of the NEHRP Recommended Provisions (1997 and 2000).

NEHRP Recommended Seismic Provisions for New Buildings and Other Structures. 2009 Edition (FEMA P-750)

Available online, in print, and on CD

The NEHRP Recommended Seismic Provisions is a resource document for improving national seismic design standards and model building codes. It has been the primary source of seismic design requirements for various model building codes and design standards since the early 1990s. This 2009 edition is significantly different from previous editions in that the ASCE/SEI 7-05 standard, “Minimum Design Loads for Buildings and Other Structures,” and the standards therein are adopted by reference, allowing this edition of the NEHRP Recommended Seismic Provisions to focus on introducing new concepts and design methods and translating research results for practical implementation. The document consists of three parts: Part 1 presents recommended modifications to ASCE/SEI 7-05, including new seismic design maps based on the USGS national seismic hazard maps; Part 2 is a completely rewritten commentary following the ASCE/SEI 7 chapter structure; and Part 3 contains 13 resource papers on emerging seismic design concepts and issues.



FEMA P-750

2009 NEHRP Recommended Seismic Provisions: Design Examples (FEMA P-751)

Available online and on CD

This publication provides a series of design examples, based on the 2009 edition of the NEHRP Recommended Seismic Provisions (FEMA P-750), for different types of construction materials and building configurations. These examples demonstrate the design procedures used in FEMA P-750, which serves as the basis for the seismic provisions in the Nation's building codes, and make an excellent training tool. The examples are appropriate for a broad technical audience. College professors and students specializing in earthquake engineering, engineers studying for their license, and practicing engineers who want to keep up with the latest changes in design standards, should all find this document to be a useful accompaniment to FEMA P-750.

NEHRP Recommended Provisions for New Buildings and Other Structures: Training and Instructional Materials (FEMA P-752)

Available online and on CD

These instructional materials are for use with the "2009 NEHRP Recommended Seismic Provisions: Design Examples" (FEMA P-751) and provide a means for gaining additional knowledge about earthquake engineering as presented in the 2009 edition of the NEHRP Recommended Seismic Provisions (FEMA P-750). These materials can be presented to engineers or architects by a qualified speaker with expertise in the practice of earthquake engineering, used by an individual who wishes to enhance his or her understanding of earthquake engineering, or applied by engineering academics as the basis for classroom instruction on earthquake-resistant design.



FEMA P-695

Quantification of Building Seismic Performance Factors (FEMA P-695)

Available online, in print, and on CD

This publication presents a recommended methodology for reliably quantifying building system performance and response parameters for use in seismic design. The parameters or "seismic performance factors" addressed include the response modification coefficient (R factor), system overstrength factor, and deflection amplification factor. The methodology is a refinement of an earlier preliminary methodology, and is based on a review of relevant research on nonlinear response and collapse simulation, benchmarking studies of selected structural systems, feedback from an expanded group of experts and potential users, and evaluations of additional structural systems conducted to verify the technical soundness and applicability of the approach.



FEMA P-795

Quantification of Building Seismic Performance Factors: Component Equivalency Methodology (FEMA P-795)

Available online, in print, and on CD

Published in 2011, this document builds upon an earlier FEMA publication, FEMA P-695 (see above). Although the methodology contained in FEMA P-695 provides a means to evaluate complete seismic-force-resisting systems proposed for adoption into building codes, a component-based methodology was needed to reliably evaluate structural elements, connections, or subassemblies proposed as substitutes for equivalent components in established seismic-force-resisting systems. The Component Equivalency Methodology presented in this document fills this need by maintaining consistency with the probabilistic, system-based collapse assessment concepts of FEMA P-695 while providing simple procedures for comparing the tested performance of different components. It is intended to be of assistance to organizations, such as the International Code Council Evaluation Service, that need to compare the seismic performance of alternate components to that of components in established seismic-force-resisting systems.

Existing Buildings —

Incremental Seismic Rehabilitation Publications (FEMA 395–400 and P-420)

Available online and in print

These publications present an innovative approach that involves implementing a series of discrete rehabilitation, or retrofitting, actions in phases over a period of several years. Incremental seismic rehabilitation is an effective, affordable, and non-disruptive mitigation strategy, and can be integrated into ongoing facility maintenance and capital-improvement operations to minimize costs and disruption. The publications address different occupancies, including schools, hospitals, apartment buildings, office buildings, and hotels, and target building owners, facility managers, financial and risk managers, and others who have a role in building safety and loss reduction. A companion manual targeted to engineers and design professionals (FEMA P-420) is also available.

FEMA 395, Incremental Seismic Rehabilitation of School Buildings (K–12)

This manual provides school administrators and board members with the information they need to assess the seismic vulnerability of existing school buildings and to implement a program of incremental seismic rehabilitation.

FEMA 396, Incremental Seismic Rehabilitation of Hospital Buildings

This manual provides health care administrators and board members with the information they need to assess the seismic vulnerability of hospitals and other existing health care facilities, and to implement a program of incremental seismic rehabilitation.

FEMA 397, Incremental Seismic Rehabilitation of Office Buildings

Office buildings may be owned by partnerships, individuals, pension funds, real estate investment trusts, and other entities. This manual provides the information that these owners need to assess the seismic vulnerability of their buildings and to implement a program of incremental seismic rehabilitation.

FEMA 398, Incremental Seismic Rehabilitation of Multifamily Apartment Buildings

This manual is designed for partnerships, individuals, pension funds, real estate investment trusts, and other entities who own Class A, B, or C multifamily buildings. It provides the information that these owners need to assess the seismic vulnerability of their buildings and to implement a program of incremental seismic rehabilitation.

FEMA 399, Incremental Seismic Rehabilitation of Retail Buildings

This manual is targeted to partnerships, individuals, pension funds, real estate investment trusts, and other entities who own Class A, B, or C retail buildings. It provides the information that these owners need to assess the seismic vulnerability of their buildings and to implement a program of incremental seismic rehabilitation.

FEMA 400, Incremental Seismic Rehabilitation of Hotel/Motel Buildings

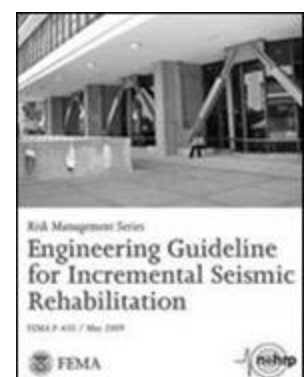
This manual provides the owners of hotels and motels with the information they need to assess the seismic vulnerability of their buildings and to implement a program of incremental seismic rehabilitation.

FEMA P-420, Engineering Guideline for Incremental Seismic Rehabilitation

This publication provides guidance for engineers and architects on implementing programs of incremental seismic rehabilitation for building owners. It reviews all FEMA publications that contain information on seismic evaluation and rehabilitation of existing buildings, and provides guidance on how to apply that information to incremental seismic rehabilitation programs.



FEMA 396



FEMA P-420

Prestandard and Commentary for the Seismic Rehabilitation of Buildings (FEMA 356)

Available online and in print

This prestandard serves as a nationally applicable tool for design professionals, code officials, and building owners undertaking the seismic rehabilitation, or retrofitting, of existing buildings. Chapters address requirements; analytical procedures; foundations and geologic site hazards; steel; concrete; masonry; wood and light-metal framing; seismic isolation and energy dissipation; simplified rehabilitation; architectural, mechanical, and electrical components; and use of the prestandard for risk mitigation programs. This prestandard has been superseded by the American Society of Civil Engineers ASCE 41 standard, “Seismic Rehabilitation of Buildings,” but is being maintained by FEMA as a reference document.

Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook. Second Edition (FEMA 154 and 154CD)

Available online, in print, and on CD

The Rapid Visual Screening (RVS) handbook can be used by trained personnel to identify potentially hazardous buildings **before an earthquake**. The RVS procedure comprises a method and several forms that help users quickly identify, inventory, and rank such buildings according to their expected safety and usability during and after earthquakes. The target audiences for this guide are building officials, engineers, architects, building owners, emergency managers, and interested citizens.

The CD-ROM, FEMA 154CD, contains PowerPoint slides with instructor notes; the “RVS Student Manual” (FEMA 154SM); data collection forms; and PDF- and text-file versions of FEMA 154.



FEMA 154

Rapid Observation of Vulnerability and Estimation of Risk (FEMA P-154 ROVER CD)

Available on CD

ROVER is mobile software that automates the pre-earthquake rapid visual screening procedure presented in FEMA 154 (see above) and the ATC-20 procedures for post-earthquake safety evaluations of buildings. The software is a client-server package and the server software can be installed to support both web-based and smartphone-app clients. ROVER is available on compact disc only; the FEMA P-154 ROVER CD includes the client software installation file (for Windows Mobile smartphones), the server software installation file (for Windows, Mac, and Linux operating systems), a user’s guide, a quick-start guide, a video introduction to ROVER, a readme file, and a disclaimer.



FEMA P-154 ROVER CD

Rapid Visual Screening of Buildings for Potential Seismic Hazards: Supporting Documentation. Second Edition (FEMA 155)

Available in print

This companion document to the Rapid Visual Screening (RVS) handbook (FEMA 154) provides the technical basis for the RVS procedure. The document summarizes user feedback and describes the development of the Basic Structural Hazard Score and the Score Modifier.

Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories (FEMA P-807)

Available online and in print

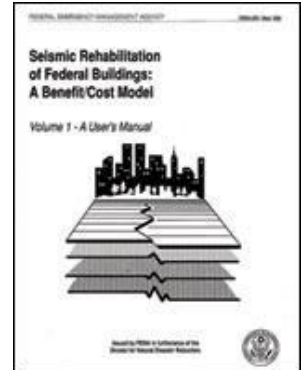
Multi-unit, wood-frame buildings with weak first stories represent a significant risk in highly seismic regions of the United States because of their high potential for collapse. This collapse potential is due primarily to soft or weak first-story walls, which have often been weakened by large numbers of openings, such as for garages or storefront windows. This publication provides guidelines for the seismic retrofitting of weak-story, wood-frame buildings in seismically active regions, with a focus on multi-family, multi-story buildings with weak first stories, such as those damaged in the 1989 Loma Prieta earthquake, and on apartment buildings with tuck-under parking, such as those damaged in the 1994 Northridge earthquake.

These are the first guidelines to focus solely on weak first stories and on incorporating just enough added strength to protect the first floor from collapse but not enough to drive earthquake forces into upper stories, placing them at risk of collapse. They are also the first guidelines to take into account the strength provided by existing nonstructural walls, which makes retrofitting more affordable. The print version of FEMA P-807 includes an attached CD containing a related spreadsheet tool.

Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model. Volume 1: A User's Manual (FEMA 255)

Available online and in print

This user's manual and accompanying software present a second-generation benefit-cost model for the seismic rehabilitation of Federal and other government buildings. The benefit-cost methodology provides facility managers, design professionals, and other decision makers with estimates of the benefits (avoided damages, losses, and casualties) of seismic rehabilitation and the costs of implementing rehabilitation. The methodology also generates detailed scenario estimates of damages, losses, and casualties. A tutorial and benefit-cost analyses of eight Federal buildings are included. (Note: Computers must have Windows and Quattro Pro in order to operate the software, which is provided on 3½-inch diskettes.)



FEMA 255

Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model. Volume 2: Supporting Documentation (FEMA 256)

Available online and in print

This document contains background information related to FEMA 255, including information on valuing public-sector services, discount rates and multipliers, the dollar value of human life, and technical issues that affect benefit-cost analysis, such as seismic risk assessment and sensitivity analysis.

Seismic Rehabilitation Training for One- and Two-Family Dwellings: Program and Slide Presentations (FEMA P-593CD)

Available online and on CD

This product contains PowerPoint slide presentations, an instructional guide, and speaker's notes for training contractors, code officials, and other parties interested in the seismic retrofitting of existing light frame dwellings. It has been used by the International Code Council as the basis for a series of webinars that have been presented to its membership.



FEMA P-593CD

Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50) and Seismic Retrofit Guidelines for Detached, Single-Family, Wood-Frame Dwellings (FEMA P-50-1)

Available online and in print

FEMA P-50 explains how to use the Simplified Seismic Assessment Form to calculate a Seismic Performance Grade for a detached, single-family, wood-frame home. The grade is based on a Structural Score and Seismic Hazard Score, which are derived using location-specific data available through online websites. The companion publication FEMA P-50-1 describes low-cost seismic retrofitting techniques that can be used to address deficiencies identified on the Simplified Seismic Assessment Form, and shows how implementing those techniques could improve a home's grade. These publications provide a tool that can be used to encourage seismic retrofitting of residential structures to reduce future earthquake losses.



FEMA 547

Techniques for the Seismic Rehabilitation of Existing Buildings. 2006 Edition (FEMA 547)

Available online, in print, and on CD

This publication documents common seismic rehabilitation or retrofitting techniques used for buildings represented in the set of standard building types presented in FEMA seismic publications. It includes a wide variety of techniques that have been developed and used for repair and retrofitting of earthquake-damaged and seismically deficient buildings.

Typical Costs for Seismic Rehabilitation of Existing Buildings. Volume 1: Summary. Second Edition (FEMA 156)

Available online and in print

This publication provides a methodology to estimate the costs of seismic rehabilitation projects at various locations in the United States. This edition is based on a sample of almost 2,100 projects, with data collected using a standard protocol, strict quality control verification, and a reliability rating. A sophisticated statistical methodology applied to this database yields cost estimates of increasing quality and reliability as more and more detailed information on the building inventory is used in the estimation process. Guidance is also provided to calculate the range of uncertainty associated with this process.

Typical Costs for Seismic Rehabilitation of Existing Buildings. Volume 2: Supporting Documentation. Second Edition (FEMA 157)

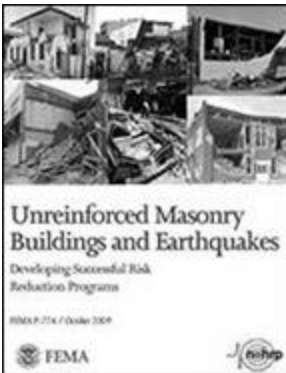
Available online and in print

This document is a companion volume to FEMA 156. It provides an in-depth discussion of the approaches and methodology that were used in developing the second edition of FEMA 156.

Unreinforced Masonry Buildings and Earthquakes: Developing Successful Risk Reduction Programs (FEMA P-774)

Available online, in print, and on CD

This publication provides guidance on reducing the risks from unreinforced masonry (URM) buildings in seismically active areas. URM buildings are typically the most vulnerable to earthquake damage and the type of construction that is most commonly singled out for voluntary and mandatory seismic risk reduction programs. The document includes illustrations and photographs of URM buildings and describes their seismic vulnerabilities. It discusses policy and regulatory issues that often must be considered, such as retrofit costs, the economic viability of older buildings, numbers of occupants and types of use, and historic or architectural values. Rather than prescribing a rigid sequence of steps for URM risk reduction, FEMA P-774 documents a wide variety of successful approaches that have been developed across the United States.



FEMA P-774

Progression of FEMA's Seismic Guidance Relating to Existing Buildings

Initial Rapid Visual Screening

- FEMA 154, "Rapid Visual Screening of Buildings for Potential Seismic Hazards"
 - A rapid survey of buildings to quickly determine which ones may present a hazard and which ones do not.
- Rapid Observation of Vulnerability and Estimation of Risk (FEMA P-154 ROVER)
 - A smartphone application that automates FEMA 154 procedures.
- FEMA P-50, "Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings"

Seismic Evaluation

- American Society of Civil Engineers consensus standard ASCE/SEI 31
 - A more detailed seismic evaluation to determine the level of risk.
- Based on FEMA 310, "Handbook for the Seismic Evaluation of Buildings"
 - No longer available from FEMA, but is available from the National Institute of Building Sciences at <http://www.wbdg.org/ccb/DHS/ARCHIVES/fema310.pdf>.

Seismic Retrofitting

- American Society of Civil Engineers consensus standard ASCE/SEI 41
 - How to seismically retrofit an existing hazardous building.
 - Referenced in the "International Existing Building Code" (IEBC).
- Based on FEMA 356, "Prestandard and Commentary for the Seismic Rehabilitation of Buildings" (still available from FEMA)

Seismic Retrofitting Techniques

- FEMA 547, "Techniques for the Seismic Rehabilitation of Existing Buildings"
 - A FEMA guide on different techniques for seismically retrofitting an existing building based on construction type and level of hazard.
- FEMA P-807, "Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories"
 - First guidelines to focus solely on weak first stories.
- FEMA P-50-1, "Seismic Retrofit Guidelines for Detached, Single-Family, Wood-Frame Dwellings"

Incremental Seismic Rehabilitation Series

- FEMA 395—Schools
- FEMA 396—Hospitals
- FEMA 397—Offices
- FEMA 420—Engineering Guideline
- FEMA 398—Apartments
- FEMA 399—Retail
- FEMA 400—Hotels

Guidance on Reducing Damage to Nonstructural Components and Contents

- FEMA E-74, "Reducing the Risks of Nonstructural Earthquake Damage"
 - Online guide provides techniques for reducing risk from damage.

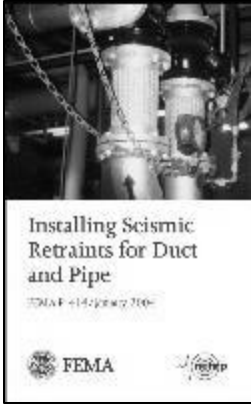
Guidance on Typical Costs of Retrofitting

- FEMA 156, "Typical Costs for Seismic Rehabilitation of Existing Buildings"

Nonstructural Components ———

Installing Seismic Restraints for Duct and Pipe (FEMA 414)

Available online and in print



FEMA 414

Installing Seismic Restraints for Electrical Equipment (FEMA 413)

Available online and in print

Installing Seismic Restraints for Mechanical Equipment (FEMA 412)

Available online and in print

These three fully illustrated guides show equipment installers how to attach mechanical equipment (FEMA 412), electrical equipment (FEMA 413), and duct and pipe (FEMA 414) to buildings to minimize earthquake damage. The guides describe various types of equipment and the methods used to install them, and for each installation method, identify the type of attachment needed. Step-by-step instructions and precautions for each type of attachment are included. Examples of anchoring and seismic-restraint devices; instructions for installing and attaching equipment in different configurations; and special cases for housekeeping pads, cable assemblies, supports for control panels, and residential equipment are also presented.

Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide. Fourth Edition (FEMA E-74)

Available online and on CD



FEMA E-74

This updated fourth edition of FEMA 74 has been redesigned for use online and expanded to include more examples that feature photos of actual damage and details illustrating correct mitigation measures. The online format makes it easy to browse and print out relevant details. The guide describes the sources of nonstructural earthquake damage and effective methods of reducing potential risks associated with such damage. It assists in identifying potential hazards and provides specific guidance on upgrades. The guide also contains a glossary, references, and an annotated bibliography for those who desire additional information. A nonstructural inventory form, a checklist of nonstructural earthquake hazards, and an explanation of nonstructural risk ratings are included as appendices. Target audiences for the guide include building owners, facility managers, maintenance personnel, homeowners, store or office managers, business proprietors, organizational department heads, and others concerned with building safety and the continuation of business. The online version of FEMA E-74 is located at <http://www.fema.gov/plan/prevent/earthquake/fema74/index.shtm>.

Seismic Considerations for Steel Storage Racks Located in Areas Accessible to the Public (FEMA 460)

Available online and in print



FEMA 460

This report highlights issues for consideration in the seismic design, installation, ongoing inspection, maintenance, and use of steel pallet storage racks located in areas of retail warehouse stores and other facilities accessible to the general public. (The considerations apply only to single selective steel pallet storage racks with contents elevated 8 feet or more above the ground.) Included are a review of the performance of storage racks in past earthquakes; a history of the development of codes and standards used for storage-rack design; information on current storage-rack design practices; guidance on recommended performance goals and design requirements for storage racks; guidelines for implementation responsibilities associated with the specification, procurement, and installation of pallet storage racks; suggested guidance for securing contents; recommendations for operations and use; suggested guidance for quality assurance programs; a discussion of current and past storage-rack research and testing; suggestions for post-earthquake inspections; and proposed modifications to seismic design provisions and standards for racks. Most of the report is intended for all readers with an interest in the seismic protection of steel single selective pallet storage racks and their contents. Chapters 4 through 6 and Appendices A through D are very technical and will be of interest primarily to rack-design engineers and seismic code and standards writers.

Lifelines —

Collocation Impacts on the Vulnerability of Lifelines during Earthquakes with Applications to the Cajon Pass, California (FEMA 226)

Available online and in print

This report presents a new analytical method for identifying the increase in the seismic vulnerability of individual lifeline systems (communication systems, electric power systems, fuel pipelines, and transportation lifelines) due to their proximity to other lifelines in the Cajon Pass. The method calculates a parameter that can be used to adjust the damage-state values for shaking as determined by the Applied Technology Council's ATC-13 damage probability matrices. The primary objective of the study was to determine how the time to restore full service would be affected by the collocation of several types of lifelines in the same congested corridor. The new method is applied to the Cajon Pass lifelines. The design program AutoCAD is used to develop overlays of the lifeline routes with seismic and geologic information presented in the inventory report (FEMA 225).

Collocation Impacts on the Vulnerability of Lifelines during Earthquakes with Applications to the Cajon Pass, California: Study Overview (FEMA 221)

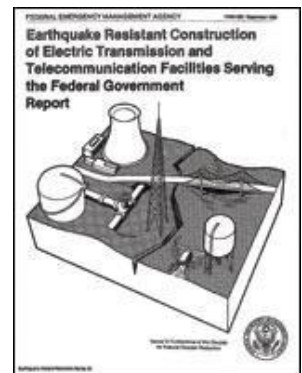
Available online and in print

This report summarizes a study of lifeline systems located along the Cajon Pass in southern California. The study included analysis of communication, electric power, fuel pipeline, and transportation lifelines. This study overview describes how collocation may influence each lifeline's seismic vulnerability. A brief description of the screening tool developed during the study is provided.

Earthquake Resistant Construction of Electric Transmission and Telecommunication Facilities Serving the Federal Government (FEMA 202)

Available online and in print

This report summarizes a National Institute of Standards and Technology study that reviewed measures implemented by Federal agencies to protect electric power transmission and telecommunication lifelines against seismic hazards. The report examines the seismic vulnerability of these lifelines and discusses current standards and design criteria. Seismic retrofitting techniques for components and systems are reviewed, including the benefits of retrofitting versus gradual replacement. A summary of Federal practices in the design of new facilities and the retrofit of existing facilities is included.



FEMA 202

Earthquake Resistant Construction of Gas and Liquid Fuel Pipeline Systems Serving or Regulated by the Federal Government (FEMA 233)

Available online and in print

This document summarizes the vulnerability of gas and liquid-fuel pipeline systems to damage in past earthquakes. It lists the available standards and technologies that can protect such facilities against earthquake damage. An overview of measures taken by various Federal agencies to protect pipeline systems is presented. The appendix presents summaries of statements made by representatives of Federal agencies and other organizations contacted during the study.

Inventory of Lifelines in the Cajon Pass, California (FEMA 225)

Available online and in print

This publication provides an inventory of the major lifeline systems in the Cajon Pass, and describes the earthquake and geologic analysis tools available to identify and define the level of seismic risk to those lifelines. It evaluates the vulnerabilities resulting from the siting of multiple lifeline systems in confined and at-risk areas and from potential interactions among these systems in natural and man-made disasters. Potential mitigation techniques for communication, electric power, fuel pipeline, and transportation lifelines are identified. Detailed maps indicate lifeline locations. The report also discusses seismic hazards and predictive models for evaluating the damage potentials associated with these hazards.

Seismic Vulnerability and Impact of Disruption of Lifelines in the Conterminous United States (FEMA 224)

Available online and in print

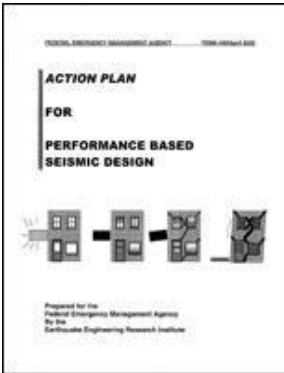
This report provides a national overview of lifeline seismic vulnerability and the impacts of lifeline disruptions. Both site-specific lifelines and extended lifeline networks are examined. Included is a review of electrical, water, transportation, and emergency-service systems. The vulnerability estimates and impacts are presented in terms of estimated direct damage losses and indirect economic losses. The report also presents hazard mitigation measures and their expected benefits as well as recommendations for future work.

Performance-Based Seismic Design

Action Plan for Performance Based Seismic Design (FEMA 349)

Available online and in print

This document, published as a “final draft,” explores the steps required to successfully implement performance-based seismic design (PBSD). Topics discussed include the need for changes in current seismic design practice, the definition of performance-based design, and the products necessary for its effective adoption. These products include (1) a Planning and Management Program, (2) Structural Performance Products, (3) Nonstructural Performance Products, (4) Risk Management Products, (5) PBSD Guidelines, and (6) a Stakeholders’ Guide. The costs involved in obtaining both a basic framework for PBSD implementation and full implementation of PBSD are also outlined. This document has been superseded by FEMA 445, but is being maintained by FEMA for reference purposes.



FEMA 349

Effects of Strength and Stiffness Degradation on Seismic Response (FEMA P-440A)

Available online and in print

This document is a follow-on publication to “Improvement of Nonlinear Static Seismic Analysis Procedures” (FEMA 440). It provides information that will improve nonlinear analysis for cyclic response, considering cyclic and in-cycle degradation of strength and stiffness. Recent work has demonstrated that it is important to be able to differentiate between cyclic and in-cycle degradation in order to more accurately model degrading behavior, while current practice only recognizes cyclic degradation, or does not distinguish between the two. The material contained within this publication is expected to improve nonlinear modeling of structural systems, and ultimately make the seismic retrofit of existing hazardous buildings more cost-effective.



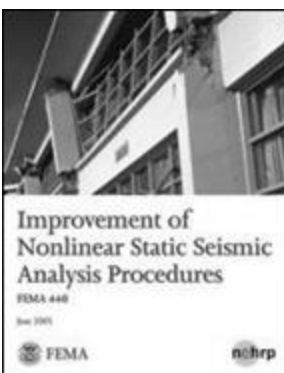
FEMA P-440A

Improvement of Nonlinear Static Seismic Analysis Procedures (FEMA 440)

Available online, in print, and on CD

This state-of-the-art resource captures the latest advances in nonlinear static analysis. It evaluates FEMA and Applied Technology Council (ATC) procedures for estimating the response of structures to ground shaking and attempts to address the significantly different results in estimates of maximum displacement that these procedures generate. This report sets the stage for future improvements to FEMA 356 or the ATC report, “Seismic Evaluation and Retrofit of Concrete Buildings” (ATC-40).

The CD-ROM, FEMA 440CD, June 2005, contains the document (FEMA 440) and supplementary summaries in PDF files.



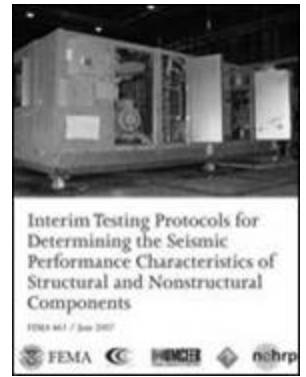
FEMA 440

Interim Testing Protocols for Determining the Seismic Performance Characteristics of Structural and Nonstructural Components (FEMA 461)

Available online and in print

This publication was developed under FEMA’s next-generation performance-based seismic design (PBSD) project with the Applied Technology Council, and is one of the first major accomplishments achieved under the program plan described in FEMA 445. FEMA 461 provides methodologies that can be used to measure the seismic performance of buildings’ structural or nonstructural components in a consistent and comparable manner. It describes in

detail two laboratory testing protocols that determine fragility functions for various building systems and components. The first protocol, Quasi-Static Cyclic Testing of Structural and Nonstructural Components and Systems, can be used to test shear walls, beam-column assemblies, drywall partitions, cladding panels, pipes, ducts, and other elements whose behavior is sensitive to the relative motion of several floors or vertical connections within a building. The second protocol, Shake Table Testing of Structural and Nonstructural Components and Systems, is designed for testing mechanical and electrical equipment and other elements that are sensitive to the dynamic effects of motion imparted at a single point of attachment. Although these protocols are intended as interim methods that will be finalized over time as they are used and evaluated by researchers nationwide, they are nevertheless a significant step forward in the development of PBSB.



FEMA 461

Next-Generation Performance-Based Seismic Design Guidelines: Program Plan for New and Existing Buildings (FEMA 445)

Available online and in print

This publication is a step-by-step program plan for the FEMA project with the Applied Technology Council to develop next-generation performance-based seismic design procedures and guidelines for structural and nonstructural components in new and existing buildings. The plan provides background information on current code design procedures, introduces performance-based seismic design concepts, identifies improvements needed in current seismic design practice, and outlines the tasks and projected costs for a two-phase program to develop next-generation performance-based seismic design procedures and guidelines.



FEMA 445

Seismic Performance Assessment of Buildings: Volume 1—Methodology (FEMA P-58-1)

Available online and in print

This publication presents a methodology for assessing how well a building is likely to perform in an earthquake. The methodology expresses performance as the probable losses (casualties, repair costs, repair time, environmental impacts) resulting from earthquake-induced building damage. It takes into account the uncertainty that is inherent in predictions of future outcomes, and enables the sources of losses to be identified, which facilitates the refinement of building designs. Seismic performance assessments developed with this methodology will allow decision makers to more easily perform cost-benefit analyses and select appropriate performance goals for seismic design projects.

Seismic Performance Assessment of Buildings: Volume 2—Implementation Guide (FEMA P-58-2)

Available online and in print

Intended for building design professionals, this publication explains how to use the seismic performance assessment methodology that is described in FEMA P-58-1 (see above).

Seismic Performance Assessment of Buildings: Volume 3—Supporting Materials (FEMA P-58 CD)

Available on CD

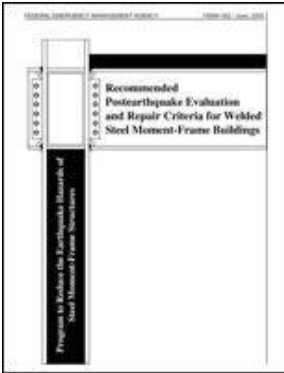
The FEMA P-58 CD contains the performance assessment methodology document (FEMA P-58-1) and the accompanying implementation guide (FEMA P-58-2), as well as supporting electronic materials and background documents, including the Performance Assessment Calculation Tool (PACT) spreadsheet and information about environmental benefits.

Special Construction Types: Steel Moment-Resisting-Frame Buildings

A Policy Guide to Steel Moment-Frame Construction (FEMA 354)

Available online and in print

This guide addresses the social, economic, and political issues related to the earthquake performance of steel moment-frame buildings. Written for building owners, local community officials, and other non-technical audiences, the guide also discusses the relative costs and benefits of implementing the design criteria recommended in FEMA 350 through FEMA 353.



FEMA 352

Recommended Postearthquake Evaluation and Repair Criteria for Welded Steel Moment-Frame Buildings (FEMA 352)

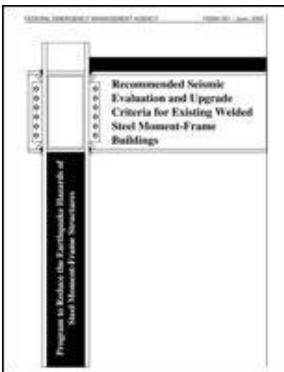
Available online and in print

This report provides recommendations for performing inspections to detect damage in steel moment-frame buildings following an earthquake; evaluating the safety of damaged buildings in a postearthquake environment; and repairing damaged buildings. Chapters cover inspection and classification of damage; preliminary postearthquake assessment; detailed postearthquake evaluations; and postearthquake repair. The appendices include procedures for performance evaluation; sample placards that may be used to post buildings following preliminary post-earthquake evaluations; and sample inspection forms that may be used to record damage detected in beam-column connections as part of a detailed postearthquake inspection program.

Recommended Seismic Design Criteria for New Steel Moment-Frame Buildings (FEMA 350)

Available online and in print

This resource document for organizations engaged in the development of building codes and standards provides recommended guidelines for the design and construction of steel moment-frame buildings and alternative performance-based design criteria. It supplements the “NEHRP Recommended Seismic Provisions for New Buildings and Other Structures” (FEMA P-750). A series of prequalified connection details, as well as a detailed procedure for performance evaluation, are included.



FEMA 351

Recommended Seismic Evaluation and Upgrade Criteria for Existing Welded Steel Moment-Frame Buildings (FEMA 351)

Available online and in print

This publication provides recommended methods for evaluating the probable performance of existing steel moment-frame buildings in future earthquakes. It presents guidelines on how to retrofit these buildings for improved performance, a simplified procedure for estimating the probable postearthquake repair costs, and methods for developing building-specific vulnerability and loss functions for steel moment-frame buildings.

Recommended Specifications and Quality Assurance Guidelines for Steel Moment-Frame Construction for Seismic Applications (FEMA 353)

Available online and in print

This two-part publication provides recommended specifications for the fabrication and erection of steel moment-frames for seismic applications. Part One covers recommended specifications, including information on products, execution, welded joint and fabrication details, and quality control and assurance. Part Two outlines quality-assurance guidelines; contractor qualifications and quality tasks; quality-assurance agency qualifications and quality-assurance tasks; and recommended methods for determining whether structural steel materials, welded joints, and bolted joints meet the applicable standards. The recommended design criteria contained in FEMA 350, FEMA 351, and FEMA 352 are based on the standards presented in this document.

Seismic Design Criteria for Steel Moment-Frame Structures (FEMA 355CD)

Available on CD

This CD-ROM contains technical reports on the seismic design criteria, evaluation, repair, and specifications of steel moment-frame buildings. It includes four resource documents (FEMA 350 through FEMA 353) for the design, construction, repair, and upgrade of steel moment-frame structures subject to the effects of earthquakes. The CD also contains six reports (FEMA 355A–F) that provide detailed explanations of the basis for the design criteria and evaluation recommendations for base metals, welding, systems performance, connection performance, and past and predicted performance included in the resource documents.



FEMA 355CD

Special Construction Types: Evaluation and Repair of Concrete Buildings

Evaluation of Earthquake Damaged Concrete and Masonry Wall Buildings: Basic Procedures Manual (FEMA 306)

Available online and in print

This document provides practical criteria and guidance for evaluating earthquake damage to concrete- and masonry-wall buildings. Component Damage Classification Guides and Test and Investigation Guides are included. Detailed drawings accompany the text.

Evaluation of Earthquake Damaged Concrete and Masonry Wall Buildings: Technical Resources (FEMA 307)

Available online and in print

This publication provides background and theoretical information to be used in conjunction with FEMA 306. Analytical and experimental findings are included, as well as information on the Component Damage Classification Guides.

The Repair of Earthquake Damaged Concrete and Masonry Wall Buildings (FEMA 308)

Available online and in print

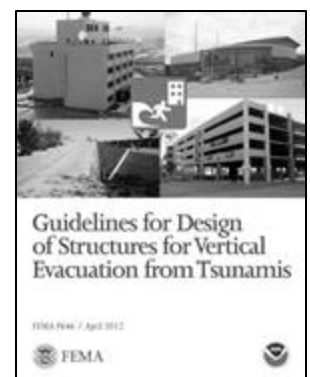
This document provides practical guidance for the repair and upgrade of earthquake-damaged concrete- and masonry-wall buildings. Target audiences include design engineers, building owners and officials, insurance adjusters, and government agencies. The publication contains sections on performance-based repair design, repair technologies, categories of repair, and nonstructural considerations. The last section includes repair guides, which provide outline specifications for typical repair procedures.

Special Construction Types: Tsunami-Resistant Construction

Guidelines for Design of Structures for Vertical Evacuation from Tsunamis (FEMA P646)

Available online and in print

Vertical evacuation is an issue raised by the National Tsunami Hazard Mitigation Program, and driven by the fact that there are many coastal communities that are vulnerable to a near-source tsunami and are located in areas that would be impossible to evacuate quickly enough to avoid a large loss of life. Vertical evacuation structures provide a means to create areas of refuge within the tsunami inundation zone for communities in which evacuation out of the zone is not feasible. This document provides information and guidance on the following topics to assist in the planning and design of tsunami vertical evacuation structures: the tsunami hazard and its history; determining the tsunami hazard, including tsunami depth and velocity; different options for tsunami vertical evacuation structures; siting, spacing, sizing, and elevation considerations; determining tsunami and earthquake loads and related structural design criteria; and structural design concepts and other considerations. This is the second edition of this publication, and includes lessons learned from the March 2011 Japan tsunami as well as corrections to errors found in the first edition's debris impact load calculations.



FEMA P646

Special Construction Types: Blast Resistance Benefits of Seismic Design ———

Blast Resistance Benefits of Seismic Design. Phase 1 Study: Performance Analysis of Reinforced Concrete Strengthening Systems Applied to the Murrah Federal Building Design (FEMA 439A)

Available online, in print, and on CD

This is one of two publications developed in response to the September 11, 2001, terrorist attacks that explore whether lessons learned from natural hazards could be applied to effectively protect building occupants from man-made threats. Important similarities between seismic and blast loadings lend themselves to such examination. This first publication was developed for reinforced concrete buildings using the bombing of the Alfred P. Murrah Federal Building in Oklahoma City in April 1995. That event was documented in “The Oklahoma City Bombing: Improving Building Performance Through Multi-Hazard Mitigation” (FEMA 277), which concluded that “application of mitigation strategies developed for FEMA for wind and earthquake can significantly improve blast resistance.” That conclusion was based on the fact that, had the Murrah Building been designed with seismic resistance features, its progressive collapse could have been avoided. This report demonstrates that, with such seismic design features in place, the structural system would have been better able to dissipate and manage the blast load effects.

Blast Resistance Benefits of Seismic Design. Phase 2 Study: Performance Analysis of Steel Frame Strengthening Systems (FEMA P-439B)

Available online, in print, and on CD

This is the second publication that was developed in response to the September 11, 2001, terrorist attacks to examine whether lessons learned from natural hazards could be applied to effectively protect building occupants from man-made threats (see FEMA 439A, above). The study described in this document duplicated the Phase 1 Murrah Federal Building study described in FEMA 439A, except that a steel frame building was examined instead of a reinforced concrete structure. A federally owned steel frame building located in an area of low seismic hazard was selected and a series of seismic strengthening designs was developed based on the original plans. The original building and the seismically strengthened designs were then evaluated using the same blast characteristics and modeling used in the Phase 1 study. The results were even more encouraging than in the first study and demonstrated that, at least for this one example, a seismically strengthened steel frame building can provide a significant amount of resistance and redundancy.

FEMA Earthquake Training Resources

New Buildings		
<p>Title FEMA P-749, Earthquake-Resistant Design Concepts: An Introduction to the NEHRP Recommended Seismic Provisions</p>	<p>Format</p> <ul style="list-style-type: none"> • Publication • Training materials 	<p>Target Audience</p> <ul style="list-style-type: none"> • Building officials • Engineers • Architects • Building owners • Emergency managers • Interested citizens
<p>Description This document provides a readily understandable explanation for non-technical users of the intent of seismic design in general and the “NEHRP Recommended Seismic Provisions for New Buildings and Other Structures” (FEMA P-750) in particular, and how they fit into the Nation’s codes and standards.</p>		
<p>Availability The publication is available online, and in print (FEMA P-749) from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=4711. It is also available online from the Building Seismic Safety Council at http://bssc.nibs.org/index.php/bssc/publications/2009/. The complementary training materials, which consist of PowerPoint presentation slides, are also available.</p>		
<p>Title FEMA P-750, NEHRP Recommended Seismic Provisions for New Buildings and Other Structures. 2009 Edition</p>	<p>Format</p> <ul style="list-style-type: none"> • Publication 	<p>Target Audience</p> <ul style="list-style-type: none"> • Structural engineers • Architects • Building officials
<p>Description This edition of the NEHRP Recommended Seismic Provisions adopts the ASCE/SEI 7–05 standard by reference, and is presented in a new one-volume format with three parts. The Part 2 Commentary is an excellent training guide that explains seismic design using the ASCE 7 reference standard. Part 1 is the actual design criteria and Part 3 is a series of papers on emerging seismic design concepts. An accompanying CD contains the Provisions, design maps, and supporting materials.</p>		
<p>Availability Available online, in print, and on CD from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=4103. Complementary design examples (FEMA P-751) and training materials (FEMA P-752) are also available (see below).</p>		
<p>Title FEMA P-751, 2009 NEHRP Recommended Seismic Provisions: Design Examples</p>	<p>Format</p> <ul style="list-style-type: none"> • Publication 	<p>Target Audience</p> <ul style="list-style-type: none"> • Structural engineers • Architects • Building officials
<p>Description This publication provides a series of design examples for different construction materials and building configurations that demonstrate the design procedures used in the 2009 NEHRP Recommended Seismic Provisions.</p>		
<p>Availability Available online and on CD from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=2520.</p>		
<p>Title FEMA P-752, NEHRP Recommended Provisions for New Buildings and Other Structures: Training and Instructional Materials</p>	<p>Format</p> <ul style="list-style-type: none"> • Training materials 	<p>Target Audience</p> <ul style="list-style-type: none"> • Structural engineers • Architects • Building officials
<p>Description This CD-ROM contains PowerPoint slides presenting earthquake engineering training based on the 2009 NEHRP Recommended Seismic Provisions. The slides can be presented to engineers or architects by a qualified speaker, used by individuals, or applied as the basis for classroom instruction on earthquake-resistant design.</p>		
<p>Availability Available on CD from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=2928. Also available online from the Building Seismic Safety Council at http://bssc.nibs.org/index.php/bssc/publications/2003/fema451btraining/.</p>		

Existing Buildings

<p>Title FEMA 154 and 154CD, Rapid Visual Screening of Buildings for Potential Seismic Hazards</p>	<p>Format</p> <ul style="list-style-type: none"> • Publication • Training materials • Training course 	<p>Target Audience</p> <ul style="list-style-type: none"> • Building officials • Engineers • Architects • Building owners • Emergency managers • Interested citizens
<p>Description The FEMA 154 handbook can be used by trained personnel to identify potentially hazardous buildings before an earthquake. The rapid visual screening (RVS) procedure helps users identify, inventory, and rank buildings according to their expected safety and usability after earthquakes.</p>		
<p>Availability The FEMA 154 handbook is available online, in print, and on CD (FEMA 154CD) from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=3556. Complementary training materials, including PowerPoint slides, a student manual, and sample data collection forms, are available on FEMA 154CD. The 1-day, instructor-led FEMA 154 training course is available to eligible, approved groups through the FEMA NETAP program.*</p>		
<p>Title ROVER, Rapid Observation of Vulnerability and Estimation of Risk (ROVER)</p>	<p>Format</p> <ul style="list-style-type: none"> • Software application • Training course 	<p>Target Audience</p> <ul style="list-style-type: none"> • Building officials • Engineers • Architects • Building owners • Emergency managers • Interested citizens
<p>Description ROVER is mobile software that automates the pre-earthquake rapid visual screening procedure presented in FEMA 154 (see above) and the ATC-20 procedures for post-earthquake safety evaluations of buildings. In addition to automating paper-based tasks, ROVER includes many productivity-enhancing features such as automated geo-location. The software is a client-server package and the server software can be installed to support both web-based and smartphone-app clients.</p>		
<p>Availability ROVER software is available on compact disc only; the FEMA P-154 ROVER CD includes the client software installation file (for Windows Mobile smartphones), the server software installation file (for Windows, Mac, and Linux operating systems), a user's guide, a quick-start guide, a video introduction to ROVER, a readme file, and a disclaimer. The ½-day, instructor-led ROVER training course is available to eligible, approved groups under the FEMA NETAP program.*</p>		
<p>Title FEMA 395, Incremental Seismic Rehabilitation of School Buildings (K–12)</p>	<p>Format</p> <ul style="list-style-type: none"> • Publication • Training materials 	<p>Target Audience</p> <ul style="list-style-type: none"> • School administrators • School board members • Facilities managers • Engineers
<p>Description FEMA 395 provides school administrators and board members with the information they need to assess the seismic vulnerability of existing school buildings and to implement a program of incremental seismic rehabilitation.</p>		
<p>Availability The FEMA 395 publication is available online and in print from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=1980. The complementary training material, which consists of a 1-hour recorded webinar, is available online at https://fema.connectsolutions.com/p13135639/.</p>		

* The FEMA National Earthquake Technical Assistance Program (NETAP) offers training courses and other assistance to state, local, and tribal governments and their earthquake mitigation partners in the community. Information about NETAP courses and how to request them is available at <http://www.fema.gov/national-earthquake-hazards-reduction-program/national-earthquake-technical-assistance-program>.

Existing Buildings (continued)

Title FEMA 547, Techniques for the Seismic Rehabilitation of Existing Buildings	Format <ul style="list-style-type: none"> • Publication • Training materials 	Target Audience <ul style="list-style-type: none"> • Structural engineers • Design professionals
Description The FEMA 547 publication and training videos describe various seismic retrofitting techniques used for standard building types. The techniques are presented by building type and cover a wide range of retrofitting situations and techniques.		
Availability The publication is available online, in print, and on CD from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=2393 . The training videos, a series of recorded seminars, can be purchased and downloaded from the Earthquake Engineering Research Institute at https://www.eeri.org/products-page/technical-seminars/ .		
Title FEMA E-74, Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide. Fourth Edition	Format <ul style="list-style-type: none"> • Electronic publication • Training course 	Target Audience <ul style="list-style-type: none"> • Building owners • Facilities managers • Building officials • Engineers • Homeowners
Description The fourth edition of FEMA 74 was significantly expanded and redesigned for use online. It features many more examples that include photos of actual damage and details illustrating correct mitigation measures.		
Availability The electronic publication is available online (http://www.fema.gov/plan/prevent/earthquake/fema74/index.shtm) and on CD (http://www.fema.gov/library/viewRecord.do?id=4626) from FEMA. The 1-day, instructor-led FEMA E-74 training course is available to eligible, approved groups under the FEMA NETAP program.*		

* The FEMA National Earthquake Technical Assistance Program (NETAP) offers training courses and other assistance to state, local, and tribal governments and their earthquake mitigation partners in the community. Information about NETAP courses and how to request them is available at <http://www.fema.gov/national-earthquake-hazards-reduction-program/national-earthquake-technical-assistance-program>.

Residential Buildings

<p>Title FEMA 232 and 232CD, Homebuilders' Guide to Earthquake Resistant Design and Construction</p>	<p>Format</p> <ul style="list-style-type: none"> • Publication • Training materials 	<p>Target Audience</p> <ul style="list-style-type: none"> • Homebuilders • Homeowners • Code officials • Architects
<p>Description This guide presents seismic design and construction guidance for one- and two-family light-frame residential structures that can be utilized by homebuilders, homeowners, and other non-engineers, and provides information that supplements the 2003 edition of the "International Residential Code." It includes background information on the principles of seismic resistance and how earthquake forces impact conventional residential construction, as well as more detailed information on architectural considerations.</p>		
<p>Availability The publication is available online, in print, and on CD (FEMA 232CD) from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=2103. Complementary training materials consisting of PowerPoint slides are available on FEMA 232CD.</p>		
<p>Title FEMA P-593, Seismic Rehabilitation Training for One- and Two-Family Wood-Frame Dwellings</p>	<p>Format</p> <ul style="list-style-type: none"> • Training materials • Training course 	<p>Target Audience</p> <ul style="list-style-type: none"> • Contractors • Building officials • Plans examiners • Architects • Engineers • Homeowners
<p>Description This training promotes seismic rehabilitation of one- and two-family dwellings, in order to reduce earthquake damage losses and increase dwelling habitability following moderate to major earthquakes. This is done by introducing the trainee to the effects of earthquakes on wood-frame dwellings and by identifying common seismic vulnerabilities, rehabilitation approaches, and available guidelines.</p>		
<p>Availability The training materials, which include PowerPoint presentations, an instructor's guide, and course handouts, are available online and on CD (FEMA P-593CD) from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=4554. The ½–1 day, instructor-led training course is available to eligible, approved groups under the FEMA NETAP program.*</p>		

* The FEMA National Earthquake Technical Assistance Program (NETAP) offers training courses and other assistance to state, local, and tribal governments and their earthquake mitigation partners in the community. Information about NETAP courses and how to request them is available at <http://www.fema.gov/national-earthquake-hazards-reduction-program/national-earthquake-technical-assistance-program>.

Special Topics

<p>Title FEMA 454, Designing for Earthquakes: A Manual for Architects</p>	<p>Format</p> <ul style="list-style-type: none"> • Publication 	<p>Target Audience</p> <ul style="list-style-type: none"> • Architects
<p>Description This publication provides information for architects in a form that is attractive and readable. It consists of chapters that provide the foundation for an understanding of seismic design, each authored by an expert in the field, and thus represents expert opinion rather than consensus. It is intended to explain the principles of seismic design for those without a technical background in engineering and seismology.</p>		
<p>Availability FEMA 454 is available online and on CD from FEMA; go to http://www.fema.gov/library/viewRecord.do?id=2418.</p>		
<p>Title FEMA P-767, Earthquake Mitigation for Hospitals</p>	<p>Format</p> <ul style="list-style-type: none"> • Training materials • Training course 	<p>Target Audience</p> <ul style="list-style-type: none"> • Hospital facilities managers • Hospital engineers • Hospital administrators • Other hospital personnel
<p>Description This training focuses on the mitigation of nonstructural components in hospitals, including special equipment and unique infrastructure systems. Components such as medical equipment, shelving, filing systems, parapets, and computer systems are susceptible to damage if not properly secured, and hospitals must remain operational during and after earthquakes. By using sound, cost-effective mitigation techniques, operations can be maintained and losses can be reduced.</p>		
<p>Availability The training materials, which consist of PowerPoint slides, are available on CD from the FEMA Distribution Center; call 1-800-480-2520. The 1-day, instructor-led training course is available to eligible, approved groups under the FEMA NETAP program.*</p>		
<p>Title FEMA P-909, Train-the-Trainer: Home and Business Earthquake Safety and Mitigation</p>	<p>Format</p> <ul style="list-style-type: none"> • Training materials • Training course 	<p>Target Audience</p> <ul style="list-style-type: none"> • Emergency managers • First responders • Business owners/managers • Risk managers • Leaders of voluntary, community-based organizations
<p>Description This training program has three components: a <i>Home and Business Earthquake Safety and Mitigation</i> course, a <i>Hands-On Interactive Mitigation Demonstration</i>, and a <i>Train-the-Trainer</i> course. The latter course is designed to prepare and equip individuals to present the home and business course and the related hands-on demonstration. The home and business course and demonstration convey basic knowledge about earthquakes and the steps that people can take to increase earthquake safety and mitigate seismic risks in homes and workplaces.</p>		
<p>Availability The training materials, which are provided to those who attend train-the-trainer courses, include PowerPoint slides, hands-on demonstration instructions, supply lists, scripts, quiz questions and answers, completion certificates, and posters. The instructor-led train-the-trainer course is available to eligible, approved groups under the FEMA NETAP program.*</p>		
<p>Title IS-325, Earthquake Basics: Science, Risk, and Mitigation</p>	<p>Format</p> <ul style="list-style-type: none"> • Training course 	<p>Target Audience</p> <ul style="list-style-type: none"> • Homeowners and renters • Business owners/managers • Risk managers • Members of voluntary, community-based organizations • Government employees
<p>Description This 30-minute independent study course presents basic information on earthquake science, risk, and mitigation. Students learn about what causes earthquakes, the difference between seismic hazards and seismic vulnerabilities, potential vulnerabilities in homes and workplaces, and ways of reducing vulnerabilities through structural and nonstructural mitigation.</p>		
<p>Availability Available online through the FEMA Emergency Management Institute's website at http://training.fema.gov/EMIWeb/IS/is325.asp.</p>		

* The FEMA National Earthquake Technical Assistance Program (NETAP) offers training courses and other assistance to state, local, and tribal governments and their earthquake mitigation partners in the community. Information about NETAP courses and how to request them is available at <http://www.fema.gov/national-earthquake-hazards-reduction-program/national-earthquake-technical-assistance-program>.

Index of FEMA Earthquake Publications

FEMA IS-22, “Are You Ready? An In-depth Guide to Citizen Preparedness.”
Federal Emergency Management Agency. Washington, D.C., 2004

FEMA P-50, “Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings.”
FEMA P-50-1, “Seismic Retrofit Guidelines for Detached, Single-Family, Wood-Frame Dwellings.”
Applied Technology Council. Redwood City, CA, 2012

FEMA P-58-1, “Seismic Performance Assessment of Buildings: Volume 1—Methodology.”
FEMA P-58-2, “Seismic Performance Assessment of Buildings: Volume 2—Implementation Guide.”
FEMA P-58 CD, “Seismic Performance Assessment of Buildings: Volume 3—Supporting Materials.”
Applied Technology Council. Redwood City, CA, 2012

FEMA E-74, “Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide.” Fourth Edition.
Applied Technology Council. Redwood City, CA, 2002

FEMA 83, “Seismic Considerations for Communities at Risk.”
National Institute of Building Sciences, Building Seismic Safety Council. Washington, D.C., 1995

FEMA 154, “Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook.” Second Edition.
Applied Technology Council. Redwood City, CA, 2002

FEMA P-154 ROVER CD, “Rapid Observation of Vulnerability and Estimation of Risk (ROVER).”
Applied Technology Council. Redwood City, CA, 2011

FEMA 155, “Rapid Visual Screening of Buildings for Potential Seismic Hazards: Supporting Documentation.” Second Edition.
Applied Technology Council. Redwood City, CA, 2002

FEMA 156, “Typical Costs for Seismic Rehabilitation of Existing Buildings. Volume 1: Summary.” Second Edition.
Hart Consultant Group, Inc. Santa Monica, CA, 1994

FEMA 157, “Typical Costs for Seismic Rehabilitation of Existing Buildings. Volume 2: Supporting Documentation.”
Second Edition.
Hart Consultant Group, Inc. Santa Monica, CA, 1995

FEMA 159, “Tremor Troop: Earthquakes—A Teacher’s Package for K–6.” Revised Edition.
National Science Teachers Association. Washington, D.C., 2000

FEMA 182, “Landslide Loss Reduction: A Guide for State and Local Government Planning.”
Colorado Division of Disaster Emergency Services and Colorado Geological Survey. Washington, D.C., 1989

FEMA 198, “Financial Incentives for Seismic Rehabilitation of Hazardous Buildings—An Agenda for Action. Volume 1:
Findings, Conclusions, and Recommendations.”
Building Technology, Inc. Silver Spring, MD, 1990

FEMA 199, “Financial Incentives for Seismic Rehabilitation of Hazardous Buildings—An Agenda for Action. Volume 2:
State and Local Case Studies and Recommendations.”
Building Technology, Inc. Silver Spring, MD, 1990

FEMA 202, “Earthquake Resistant Construction of Electric Transmission and Telecommunication Facilities Serving the
Federal Government.”
National Institute of Standards and Technology. Gaithersburg, MD, 1990

FEMA 221, "Collocation Impacts on the Vulnerability of Lifelines during Earthquakes with Applications to the Cajon Pass, California: Study Overview."
Federal Emergency Management Agency. Washington, D.C., 1991

FEMA 224, "Seismic Vulnerability and Impact of Disruption of Lifelines in the Conterminous United States."
Applied Technology Council. Redwood City, CA, 1991

FEMA 225, "Inventory of Lifelines in the Cajon Pass, California."
INTECH, Inc. Potomac, MD, 1992

FEMA 226, "Collocation Impacts on the Vulnerability of Lifelines during Earthquakes with Applications to the Cajon Pass, California."
INTECH, Inc. Potomac, MD, 1992

FEMA 232 and 232CD, "Homebuilders' Guide to Earthquake Resistant Design and Construction."
Building Seismic Safety Council. Washington, D.C., 2006

FEMA 233, "Earthquake Resistant Construction of Gas and Liquid Fuel Pipeline Systems Serving or Regulated by the Federal Government."
National Institute of Standards and Technology. Gaithersburg, MD, 1992

FEMA 253, "Seismic Sleuths: Earthquakes—A Teacher's Package for Grades 7–12."
American Geophysical Union. Washington, D.C., 1994

FEMA 255, "Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model. Volume 1: A User's Manual."
VSP Associates, Inc. Sacramento, CA, 1994

FEMA 256, "Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model. Volume 2: Supporting Documentation."
VSP Associates, Inc. Sacramento, CA, 1994

FEMA 266, "Creating a Seismic Safety Advisory Board: A Guide to Earthquake Risk Management."
Seismic Safety Commission of California. Washington, D.C., 1995

FEMA 275, "Planning for Seismic Rehabilitation: Societal Issues."
National Institute of Building Sciences, Building Seismic Safety Council. Washington, D.C., 1998

FEMA 306, "Evaluation of Earthquake Damaged Concrete and Masonry Wall Buildings: Basic Procedures Manual."
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