



# 2009 NEHRP Recommended Seismic Provisions: Training and Instructional Materials

FEMA P-752 CD / June 2013



**FEMA**



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*Prepared by the*  
**National Institute of Building Sciences**  
**Building Seismic Safety Council**

*For the*  
**Federal Emergency Management Agency**  
**of the Department of Homeland Security**

## DISCLAIMER

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The opinions expressed herein regarding the requirements of the *NEHRP Recommended Seismic Provisions*, the referenced standards, and the building codes are not to be used for design purposes. Rather the user should consult the jurisdiction's building official who has the authority to render interpretation of the code.

# FOREWORD

As one of the National Earthquake Hazard Reduction Program (NEHRP) agencies, the Department of Homeland Security's Federal Emergency Management Agency is committed to encouraging the engineering design and construction community to practice with the best knowledge, adequate technical provisions and up-to-date technology to address the seismic hazard and minimize the seismic risk of damage and injury. FEMA maintains the *NEHRP Recommended Seismic Provisions* as part of the agency's ongoing support to improve the seismic safety of design and construction practices in this country.

In support of users of the *NEHRP Recommended Seismic Provisions*, FEMA also publishes several additional supporting products.

FEMA P-752, *2009 NEHRP Recommended Seismic Provisions: Training and Instructional Materials* is one of the *NEHRP Provisions'* supporting products. It contains a set of slides for use with FEMA P-751, *2009 NEHRP Recommended Seismic Provisions: Design Examples*, another *NEHRP Provisions'* supporting product. The training materials are developed in 15 units to provide background and complementary information for corresponding design examples in FEMA P-751 and an introduction on the latest versions of the NONLIN and EQ Tools, two free software programs for computation of dynamic response analysis of simple linear and nonlinear structures and design earthquake ground motions.

These training materials also provide a means for gaining additional knowledge of earthquake engineering and recent research results adopted in the *2009 NEHRP Recommended Seismic Provisions for New Buildings and Other Structures* (FEMA P-750) and the referenced *ASCE 7 Standard* and national model building codes IBC and IRC. This FEMA publication, FEMA P-752 CD, supersedes the previous FEMA 451B CD. The slides can be presented to engineers/architects by qualified professionals with expertise in the practice of earthquake engineering. They can also be used by individuals who wish to enhance their understanding of earthquake engineering or can be applied by engineering academics as the basis for classroom instruction on earthquake-resistant design. The CD contains a series of unit folders. In each folder are PDF files of the PowerPoint presentation, the notes pages, and student handouts.

FEMA wishes to express its gratitude to the authors identified at the beginning of each unit presentation for their efforts in and contribution to preparing the materials published in this FEMA document and to the Building Seismic Safety Council (BSSC) Board of Direction and staff who made this possible.

*Department of Homeland Security/  
Federal Emergency Management Agency*

# PREFACE

This set of training and instructional materials is intended for those structural designers who are interested in learning more about the field of earthquake-resistant design and the *2009 NEHRP (National Earthquake Hazards Reduction Program) Recommended Seismic Provisions for New Buildings and Other Structures*. By extension, it also applies to use of the current model codes and standards because the *Provisions* is the key resource for updating seismic design requirements in most of those documents including ASCE 7 Standard, *Minimum Design Loads for Buildings and Other Structures*; and the *International Building Code (IBC)*. Furthermore, the *2009 NEHRP Provisions (FEMA P-750)* adopted ASCE7-05 by reference and the *2012 International Building Code* adopted ASCE7-10 by reference; therefore, seismic design requirements are essentially equivalent across the *Provisions*, ASCE7 and the national model code.

The training and instructional materials, updated in this edition from the previously released *FEMA 451B Training and Instructional Materials*, reflect the technical changes in the *2009 NEHRP Recommended Provisions and corresponding changes in the Design Examples*. The widespread use of the *NEHRP Recommended Provisions* in the past and the essential equivalency of ASCE7, the *Provisions* and the national model codes at present attested to the success of the NEHRP at the Federal Emergency Management Agency and the efforts of the Building Seismic Safety Council to ensure that the nation's building codes and standards reflect the state of the art of earthquake-resistant design.

In developing this updated set of training and instructional materials, many of the units from the previous edition of the training and instructional materials were updated by the authors to illustrate design requirements that have changed from the past edition and to better align with the Chapters of the *Design Examples* publication. In addition to the update of materials from the previous edition, new units were created to cover the introductory material as well as new units on Ground Motions, Composite/Steel Construction, Pre-Cast Design and Seismically Isolated Structures were created to support corresponding chapters in the *Design Examples*. Because it obviously is not possible to present, in a volume of this type, complete coverage of all the building design situations and features, only key principles and portions of designs are covered.

All users of the *Training and Instructional Materials* are recommended to obtain and familiarize themselves with the *2003* and *2009 NEHRP Recommended Seismic Provisions (FEMA 450 and FEMA P-750)* or ASCE7. Users are also encouraged to read the *FEMA P-749 Earthquake-Resistant Design Concepts* for a quick introduction to the basic concepts and new changes in the *2009 NEHRP Provisions*. Copies of the *Provisions* and the introduction are available free of charge from FEMA by calling 1-800-480-2520 (order by FEMA Publication Number). Currently available are the 2003 and 2009 editions of the design concepts as follows:

*NEHRP (National Earthquake Hazards Reduction Program) Recommended Seismic Provisions for New Buildings and Other Structures*, 2009 Edition, FEMA P-750, 1 volume with maps (issued as paper document with a CD attached)

*NEHRP (National Earthquake Hazards Reduction Program) Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*, 2003 Edition, 2 volumes and maps, FEMA 450 (issued as a paper document).

*Earthquake-Resistant Design Concepts – An Introduction to the NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, FEMA P-749 /December 2009*

In addition to the *Provisions*, users will require a copy of the *2009 NEHRP Recommended Provisions: Design Examples*, FEMA publication P-751.

The 2003 and 2009 edition of the *Provisions* and the *Design Examples* can also be downloaded from the BSSC website at [www.nibs.org/bssc](http://www.nibs.org/bssc). Also see the website for information regarding BSSC projects and publications or write to the BSSC at [bssc@nibs.org](mailto:bssc@nibs.org) or at the National Institute of Building Sciences, 1090 Vermont Avenue, NW, Suite 700, Washington, DC 20005 (telephone 202-289-7800).

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