2009 NEHRP Recommended Seismic Provisions: Design Examples

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National Institute of Building Sciences
Building Seismic Safety Council

For the
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For further information on the Building Seismic Safety Council, see the Council’s website — www.bssconline.org — or contact the Building Seismic Safety Council, 1090 Vermont, Avenue, N.W., Suite 700, Washington, D.C. 20005; phone 202-289-7800; fax 202-289-1092; e-mail bssc@nibs.org.
FOREWORD

One of the goals of the Department of Homeland Security’s Federal Emergency Management Agency (FEMA) and the National Earthquake Hazards Reduction Program (NEHRP) is to encourage design and building practices that address the earthquake hazard and minimize the resulting risk of damage and injury. The 2009 edition of the *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures* (FEMA P-750) affirmed FEMA’s ongoing support to improve the seismic safety of construction in this country. The *NEHRP Provisions* serves as a key resource for the seismic requirements in the ASCE/SEI 7 Standard *Minimum Design Loads for Buildings and Other Structures* as well as the national model building codes, the *International Building Code (IBC), International Residential Code (IRC) and NFPA 5000 Building Construction Safety Code*. FEMA welcomes the opportunity to provide this material and to work with these codes and standards organizations.

This product provides a series of design examples that will assist the users of the 2009 *NEHRP Provisions* and the ASCE/SEI 7 standard the *Provisions* adopted by reference.

FEMA wishes to express its gratitude to the authors listed elsewhere for their significant efforts in preparing this material and to the BSSC Board of Direction and staff who made this possible. Their hard work has resulted in a guidance product that will provide important assistance to a significant number of users of the nation’s seismic building codes and their reference documents.

*Department of Homeland Security/
Federal Emergency Management Agency*
PREFACE

This volume of design examples is intended for those experienced structural designers who are relatively new to the field of earthquake-resistant design and to 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 design examples, updated in this edition, reflect the technical changes in the 2009 NEHRP Recommended Provisions. The original design examples were developed from an expanded version of an earlier document (entitled Guide to Application of the NEHRP Recommended Provisions, FEMA 140) which reflected the expansion in coverage of the Provisions and the expanding application of the Provisions concepts in codes and standards. 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 set of design examples, the BSSC initially decided on the types of structures; types of construction and materials; and specific structural elements that needed to be included to provide the reader with at least a beginning grasp of the new requirements and critical issues frequently encountered when addressing seismic design problems. Many of the examples are from the previous edition of the design examples but updated by the authors to illustrate issues or design requirements not covered or that have changed from the past edition. Because it obviously is not possible to present, in a volume of this type, complete building designs for all the situations and features that were selected, only portions of designs have been used.

All users of the Design Examples are recommended to obtain and familiarize themselves with the 2003 and 2009 NEHRP Recommended Provisions (FEMA 450 and FEMA P-750) or ASCE7. Copies of the Provisions 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 as follows:


and publications or write to the BSSC at bssc@nibs.org or at the National Institute of Building Sciences, 1090 Vermont Avenue, NW, Suite 700, Washington, DC 20005 (telephone 202-289-7800).

Updated education/training materials to supplement this set of design examples will be published as a separate FEMA product, *2009 NEHRP Recommended Seismic Provisions: Training Material*, FEMA P-752.

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*Jim. W. Sealy, Chairman*

*BSSC Board of Direction*
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