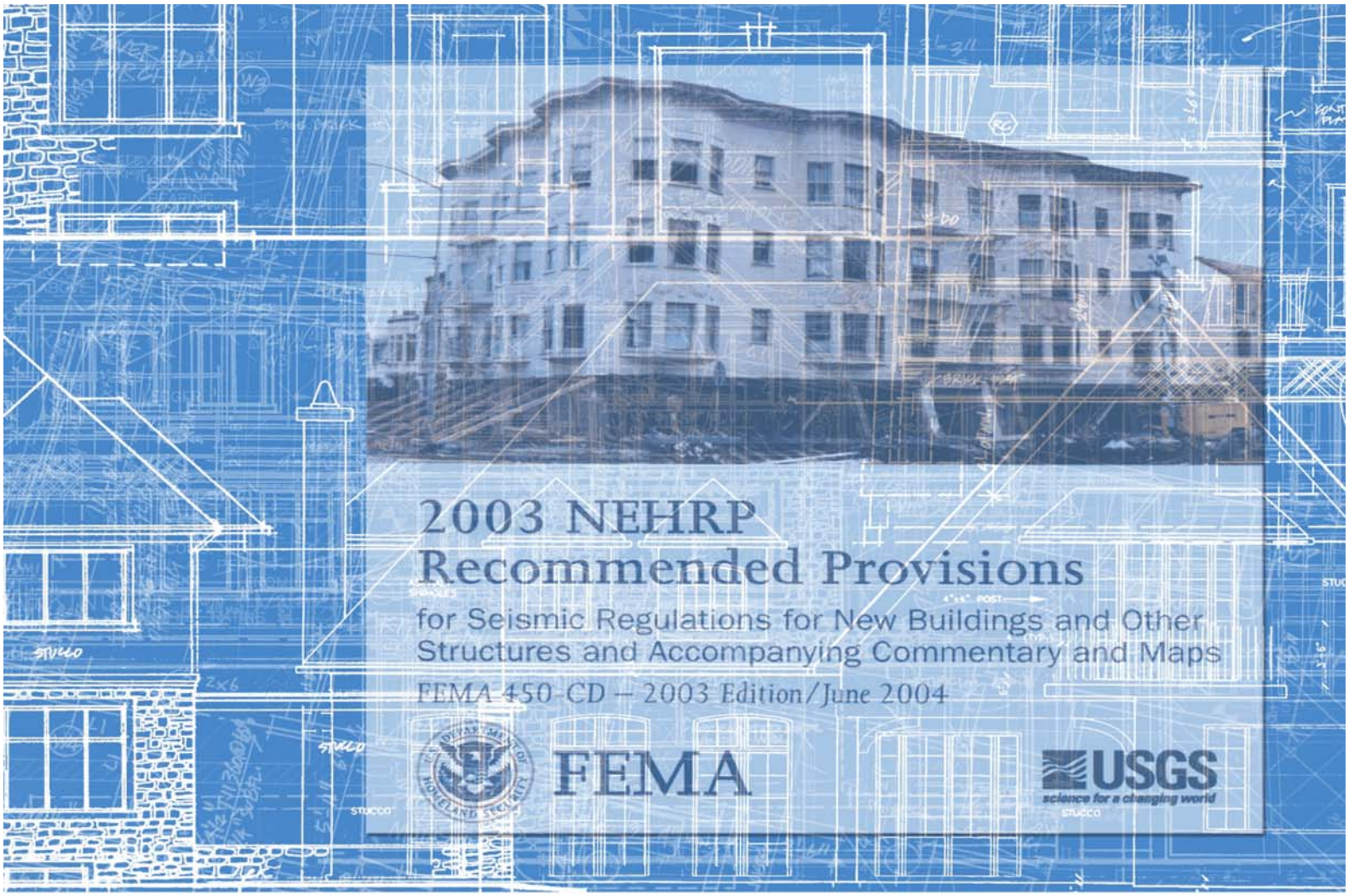

NEHRP Recommended Provisions: Design Examples

FEMA 451 - August 2006

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of the National Institute of Building Sciences

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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 2003 edition of the *NEHRP Recommended Provisions for Seismic Regulation of New Buildings and Other Structures* and its *Commentary* affirmed FEMA's ongoing support to improve the seismic safety of construction in this country. The *NEHRP Recommended Provisions* serves as the basis for the seismic requirements in the ASCE 7 *Standard Minimum Design Loads for Buildings and Other Structures* as well as both the *International Building Code* 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 user of the *NEHRP Recommended Provisions*. This material will also be of assistance to those using the ASCE 7 standard and the models codes that reference the standard.

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 be of significant assistance for 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 application of seismic requirements of the *NEHRP (National Earthquake Hazards Reduction Program) Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* and, by extension, the model codes and standards because the *Provisions* are the source of seismic design requirements in most of those documents including ASCE 7, *Standard Minimum Design Loads for Buildings and Other Structures*; the *International Building Code*; and the *NFPA 5000 Building Construction and Safety Code*.

This compilation of design examples is an expanded version of an earlier document (entitled *Guide to Application of the NEHRP Recommended Provisions,* FEMA 140) and reflects 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* signals the success of the Federal Emergency Management Agency and Building Seismic Safety Council efforts 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 first 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 impact the *NEHRP Recommended Provisions* has on frequently encountered design problems. Some of the examples draw heavily on a BSSC trial design project conducted prior to the publication of the first edition of the *NEHRP Recommended Provisions* in 1985 but most were created by the authors to illustrate issues not covered in the trial design program. Further, the authors have made adjustments to those examples drawn from the trial design program as necessary to reflect the 2000 Edition of the *NEHRP Recommended Provisions*. Finally, 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.

The BSSC is grateful to all those individuals and organizations whose assistance made this set of design examples a reality:

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Special thanks go to Mike Valley and Peter Somers for their work annotating the design examples to reflect the 2003 edition of the *Provisions* and updated versions of other standards referenced in the 2003 version. The BSSC Board is also grateful to FEMA Project Officer Michael Mahoney for his support and guidance and to Claret Heider and Carita Tanner of the BSSC staff for their efforts preparing this volume for publication and issuance as a CD-ROM.

Jim. W. Sealy, Chairman, BSSC Board of Direction

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