

Once Again Pushing the Envelope

The 2009 *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures*

Since it was first published in 1985, the *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures* (the *Provisions*) has always sought to push the envelope of earthquake safety by advancing the effectiveness and acceptance of seismic design standards. Early on, the envelope was empty and easily pushed, because seismic design provisions were largely absent from industry standards and from the model building codes adopted by states and localities.

Successive editions of the *Provisions*, published by the Federal Emergency Management Agency (FEMA), began to fill the envelope with code-ready design requirements. The envelope swelled further as industry groups such as the American Concrete Institute and the American Institute of Steel Construction incorporated seismic measures into their national design standards. By the early 2000s, the envelope bulged with the addition of the increasingly complete seismic requirements included in *Minimum Design Loads for Buildings and Other Structures* (ASCE/SEI 7), the preeminent U.S. structural design standard maintained by the American Society of Civil Engineers (ASCE).

FEMA found the envelope harder to push as *Provisions* updates became preoccupied with the congruence between the *Provisions* and ASCE/SEI 7. This led to a major change in the 2009 edition of the *Provisions* (FEMA P-750). By adopting the latest (2005) edition of ASCE/SEI 7 as the reference standard to be updated in the 2009 *Provisions*, instead of revising the previous (2003) edition of the *Provisions*, the developers of FEMA P-750 enabled the *Provisions* to again push the envelope and “resume its role as the resource for introducing new knowledge, innovative concepts, and design methods to improve national seismic standards and codes.”¹

A Collaborative and Voluntary Tour De Force

In 2004, FEMA contracted with the Building Seismic Safety Council (BSSC) through the council’s parent organization, the National Institute of Building Sciences, to develop the 2009 *Provisions*. A unique national resource established in 1979, the BSSC is a voluntary council of representatives from more than 60 organizations interest-

ed in the seismic safety of the built environment. BSSC members include organizations representing the building materials industries, trade and professional groups, code- and standards-developers, public agencies, researchers, and other interests.



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FEMA P-750 / 2009 Edition



By 2005, the BSSC had recruited more than 200 national experts to assist in updating the *Provisions*. These volunteers were organized into the 2009 Provisions Update Committee (PUC) and a dozen associated technical subcommittees and ad hoc issue teams. It was these volunteers, working with the BSSC’s Board of Direction, member organizations, and staff, as well as with personnel from FEMA and NEHRP, who developed the 2009 *Provisions*. “Americans unfortunate enough to experience the earthquakes that will inevitably occur in the future will owe much, perhaps even their lives, to the contributions and dedication of these individuals.”² Consensus on the *Provisions* was achieved through ballots conducted at subcommittee, PUC, and BSSC-member levels.

¹ FEMA, from the abstract describing the 2009 *Provisions* in the online FEMA Library at www.fema.gov/library/viewRecord.do?id=4103.

² FEMA, Foreword to the 2009 *Provisions*, accessed via www.fema.gov/library/viewRecord.do?id=4103.

Major Enhancements to the Provisions

The incorporation, by reference, of ASCE/SEI 7 is not the only major change made to the *Provisions* in 2009. While earlier editions comprised multiple volumes, the 2009 edition is a single, 388-page volume organized into three parts. Part 1 pushes the envelope by proposing specific modifications to ASCE/SEI 7-05 (the 2005 edition of the ASCE/SEI structural design standard). The recommended changes are presented in standard-ready language and are accompanied by commentary explaining the rationale for them and how they should be interpreted and used.

One of the most noteworthy advances recommended in Part 1 is a new set of national seismic design maps. Based on the U.S. National Seismic Hazard Maps released by the U.S. Geological Survey (USGS) in 2008, the new design maps incorporate technical changes that reflect the *Provisions'* adoption of risk-targeted, maximum-direction, near-source-84th-percentile ground motions for seismic design. USGS, which developed the maps in collaboration with the BSSC, has also issued a new web-based application (<http://earthquake.usgs.gov/designmaps/usapp>) that can be used to identify, by location (address or latitude and longitude), the parameters for the earthquake ground motions that new structures should be designed to withstand.

The main commentary for the *Provisions* is presented in Part 2. In a significant departure from earlier commentaries, Part 2 focuses on how to use the current reference standard (ASCE/SEI 7-05) to design seismic-resistant structures, rather than on documenting the history of how the standard was developed. This new formulation provides a valuable educational resource for young engineers and university students. Part 3 comprises 13 resource papers on special topics in seismic design. Here the *Provisions* again pushes the envelope with some of these papers presenting potential future *Provisions* requirements for consideration by the seismic design community.

An Immediate Impact

Part 1 of the 2009 *Provisions* is already well on its way toward improving building codes across the Nation. The new, 2010 edition of the ASCE/SEI 7 standard (ASCE/SEI 7-10), recently published by ASCE, incorporates most of the modifications to ASCE/SEI 7-05 proposed in the 2009 *Provisions*, including the ground motion

parameters derived from the new seismic design maps. And the seismic provisions of ASCE/SEI 7-10, in turn, are expected to be substantially adopted, by reference, into the next (2012) editions of the national model building codes. The model codes, which include the *International Building Code (IBC)* and *International Residential Code (IRC)* maintained by the International Code Council and the *NFPA 5000: Building Construction and Safety Code* maintained by the National Fire Protection Association, are the primary design codes adopted and enforced by states and localities throughout the United States.

Free copies of the 2009 *Provisions* can be ordered from FEMA's publication distribution facility (call 800-480-2520 and request FEMA P-750). Each print copy includes a CD containing digital versions of the *Provisions*, the seismic design maps, an introduction to the USGS web application, and a BSSC report on research needed to help future *Provisions* further advance seismic safety. Digital copies of the 2009 *Provisions* (PDF or text files) can also be downloaded from FEMA or the BSSC (at www.fema.gov/library/viewRecord.do?id=4103 or www.nibs.org/index.php/bssc/publications/2009/).



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