

The 2020 NEHRP Recommended Seismic Provisions for New Buildings and Other Structures

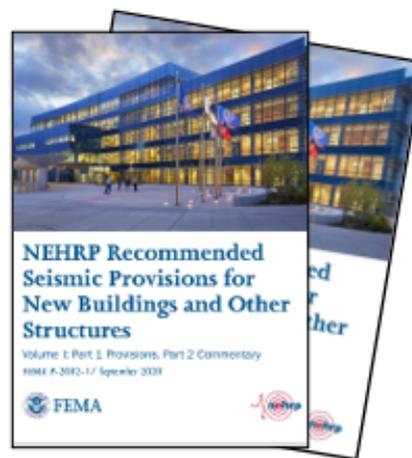
The Federal Emergency Management Agency (FEMA) coordinated with the National Earthquake Hazards Reduction Program (NEHRP) and the earthquake engineering community to publish the *2020 NEHRP Recommended Seismic Provisions for New Buildings and Other Structures* (FEMA P-2082). NEHRP is composed of four federal agencies: FEMA, National Institute of Standards and Technology (NIST), National Science Foundation (NSF), and U.S. Geological Survey (USGS). This seismic code resource document marks a new milestone of NEHRP's continued support to enhance seismic code and standard regulations.

The two-volume document contains 37 recommended changes to ASCE/SEI 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, a full commentary, and a collection of nine white papers. The recommendations represent a five-year collective effort by the Provisions Update Committee (PUC), its Issue Teams and Project 17 Committee to help translate new science and research results for improving seismic code requirements and design practices.

The PUC and member organizations of the Building Seismic Safety Council (BSSC) at the National Institute of Building Sciences (NIBS) evaluated and approved the changes through a formal consensus process. Over 100 subject matter experts participated.

Earthquakes can cause significant losses, building damage and disruption of operations. It is essential that building codes ensure sound and reliable building seismic performance. The national model building codes and referenced design standards provide regulatory requirements for the design, construction, alteration and maintenance of buildings and structures. State and local governments adopt and enforce them to protect communities from potential earthquake losses.

However, this was not always the case. Forty years ago, state and local governments did not adopt the same nationwide seismic-resistant regulations, causing inconsistencies in levels of protection across the nation.



Volume 1 and 2 of FEMA P-2082, *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures*.

Today, the national model building codes and standards like the International Building Code (IBC) and the International Residence Code (IRC) and ASCE/SEI 7 have been widely adopted by states, local governments, territories, and tribes.

The improvements recommended by the *2020 Provisions* are expected to be incorporated into ASCE/SEI 7-22 and subsequently adopted by reference into the 2024 IBC and IRC. Communities prone to earthquake hazards will benefit from these improved seismic-resistant code and standard requirements once the state and local governments adopt the updated model codes.

Each edition of the *NEHRP Provisions* represents the latest knowledge- and technology-based seismic code resource developed for improving current national model building codes and standards. Although the *NEHRP Provisions* are non-regulatory, they provide important technical information. This includes: building seismic performance criteria, updated national seismic design maps, new seismic-force-resisting systems, upgrade to seismic code provisions, and reviews to seismic design requirements for new construction techniques and material standards.

FEMA has contracted with NIBS to regularly update the *NEHRP Provisions* every three to six years. The *2020 Provisions* are the 10th edition since the first published edition in 1985.

The *2020 Provisions* introduce the following major changes and other improvements, modifications, new concepts, and additional background information:

- New seismic design ground motion values and maps based on the 2018 USGS National Seismic Hazard Model. The USGS model includes new seismic ground motion models for the central and eastern United States, basin effect modeling for the Los Angeles, Seattle, San Francisco and Salt Lake City areas. It also includes updates to the catalog of past earthquakes.
- New multi-period response spectra that improves the accuracy of earthquake design ground motion criteria. It also corrects underestimated earthquake impacts for mid- to high-rise buildings at soft soil sites near major faults.
- A new design force formula for non-structural components that improves seismic resistance for major architectural, mechanical and electrical components in a building.
- New alternate design procedures for improving the seismic performance of large one-story commercial and industrial buildings constructed with rigid walls and flexible roof diaphragms. Such buildings are commonly used as warehouses and large department or grocery stores.
- New provisions for concrete and composite steel coupled shear wall buildings, which have been shown to provide good seismic performance for high-rise buildings in high seismic hazard areas.

As assigned by the NEHRP Reauthorization Act of 2018 (Public Law 115-307), each of the NEHRP agencies, FEMA, NIST, NSF and USGS, has its designated area of responsibilities as depicted in Figure 1.

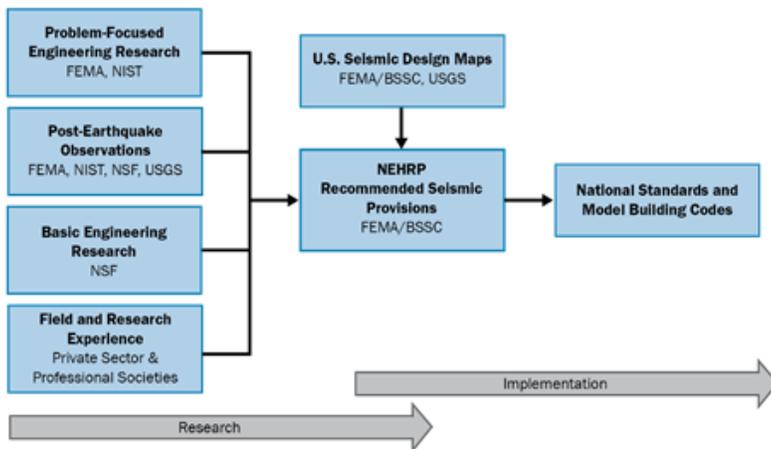


Figure 1: NEHRP agency roles.

The NEHRP agencies also collaborate to advance best building design practices. The *2020 Provisions* drew from several FEMA, BSSC, NIST, and USGS technical and scientific resources. They include: the *BSSC Project 17 Final Report: Development of the Next Generation of Seismic Design Value Maps for the 2020 NEHRP Provisions*, FEMA P-2078, *Procedures for Developing Multi-Period Response Spectra at Non-Conterminous United States Sites*, FEMA P-2012, *Assessing Seismic Performance of Buildings with Configuration Irregularities*, and NIST GCR 18-917-43, *Recommendations for Improved Seismic Performance of Nonstructural Components* (as shown in Figure 2 below).



Figure 2: Technical and scientific resources the *2020 NEHRP Provisions* drew from.

Many changes in the *2020 Provisions* were developed based on NSF and private sector sponsored research and testing such as studies on metal deck diaphragms, coupled shear wall systems and cross-laminated timber systems. New concepts and approaches were proposed in the *2020 Provisions* for consideration such as the white paper on Resilience-Based Design and the NEHRP Provisions. The *2020 Provisions* went through rigorous process development to ensure their credibility and wide acceptance by the building industry. They reinforce state and local governments' confidence in adopting the latest seismic-resistant building codes and standards. The *2020 Provisions* are one of the most important NEHRP products in the United States and internationally.

Although we can't prevent earthquakes, it has been proven that code-compliant buildings can help save lives and reduce losses. As seismic-preparedness experts often remind us, "Earthquakes don't kill people, buildings do." The success of the *2020 Provisions* reflect a broad and continued support for more seismic-resilient buildings in communities exposed to earthquake risks.

The *2020 NEHRP Provisions* are available at <https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes/earthquakes>.

For more information visit www.nehrp.gov.



FEMA

NIST

National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce



USGS
science for a changing world