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Building Codes, Standards, and Regulations: Frequently Asked Questions

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A *building code* provides rules and standards for the design, construction, alteration, materials, maintenance, and performance of buildings. The main purpose of building codes is to protect public health, safety, and general welfare in the construction and occupancy of buildings. Building codes are adopted and enforced by state, local, tribal, and territorial (SLTT) entities. The federal government is responsible for the adoption and enforcement of building codes for federal buildings, military buildings, and manufactured housing.

In general, building codes do not apply to infrastructure. *Infrastructure* consists of physical networks (systems and facilities) that provide functions and services to the community such as electricity and water. Where infrastructure connects to or runs through a building, some building codes, standards, and regulations may apply to some components of infrastructure (e.g., electrical wiring, plumbing). For more information about codes, standards, and regulations specifically for infrastructure, see CRS Report R47666, *Infrastructure Codes, Standards, and Regulations: Frequently Asked Questions*.

Historically and most commonly, the federal government and SLTTs have not developed their own building codes but rather have adopted part or all of model building codes. A *model building code* is a collection of promulgated criteria and standards most often developed and maintained by a standards developing organization (SDO) and designed to be adopted by a jurisdiction. In general, model building codes are updated on a regular basis (e.g., every three years) and some editions may incorporate additional building performance objectives such as energy efficiency or natural hazards resistance.

Questions about building codes have arisen in the wake of recent disasters, such as the condominium collapse in Surfside, FL, in 2021, in which 98 people died; the Amazon warehouse collapse in Edwardsville, IL, in December 2021, in which six people died; and the January 2022 Bronx, NY, apartment fire, in which 17 people died. Some in Congress are interested in developing and promoting adoption of more efficient, resilient building codes to protect people and property and to avoid financial loss. A study led by the Federal Emergency Management Agency (FEMA), entitled *Building Codes Save: A Nationwide Study*, looked at 18.1 million mostly residential buildings constructed between 2000 and 2016 and estimated the amount of damage these structures might incur from the three most common hazards: floods, hurricanes, and earthquakes. FEMA found that about half the buildings (roughly 9.1 million of the 18.1 million in the study) were built to more recent and resilient model building codes and would avoid losses of approximately \$1.6 billion (annualized average in 2020 dollars).

Although SDOs typically lead efforts to enhance codes through regular updates to model building codes and standards, the federal government has contributed to codes' enhancement. In 2022, the Biden Administration announced a National Initiative to Advance Building Codes; it outlines some federal agency activities to enhance codes. The activities include research and development toward enhanced model building codes, assisting SLTTs in adopting and enforcing enhanced codes, and expanding the federal government's adoption and enforcement of enhanced codes for federal buildings and military buildings.

Congress has directed federal agencies to help to enhance model building codes and to assist SLTTs in adopting and enforcing enhanced building codes. The National Institute of Standards and Technology (NIST) building science programs research and develop more resilient design standards that the agency can propose to SDOs. Accepted proposals are included in the next edition of a model building code. FEMA requires homeowners to follow more flood-resistant design standards used in recent editions of model building codes compared with some older building codes to qualify for flood insurance under the National Flood Insurance Program. Given that building performance can be enhanced through more efficient and resilient codes, standards, certifications, and/or regulations, Congress may consider the current status of SLTTs' building codes, model building codes, federal building codes, and other mandatory or voluntary rules and guidelines in developing any additional policies and incentives to enhance building performance in the United States and its territories.

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Introduction

Americans on average spend about 90% of their time indoors. They look to the buildings they occupy to provide safe shelter, offer a healthy indoor environment, and function for the purposes that the building was constructed (e.g., residential versus commercial functions).¹ Standards developing organizations (SDOs) have developed model building codes, standards, and regulations in the United States to try to ensure consistent building performance, protect occupants' health and safety, and ensure building function.² Federal, state, local, tribal, and territorial entities may adopt and enforce all or a portion of these model building codes and standards and may apply them to buildings in their jurisdiction. Thus, there is no single national building code to which all entities must adhere (except for manufactured housing, for which there is a national code); instead, entities are able to choose which elements of a model building code to adopt and enforce. As a result, building codes vary greatly by jurisdiction. Generally, the federal government has few code requirements and states may impose some requirements, but the most detailed code requirements are adopted and enforced at the local government level.

Often, after disasters involving buildings (e.g., building collapse, fire, or failure), officials examine the building code for their jurisdiction to determine if the code is adequate to protect people and property. This examination often leads to questions about which building codes are in place; who is responsible for enforcing the code; who has authority to change, adopt, and enforce building codes; and what actions the federal government can take to change, adopt, enforce, or mandate certain model building codes. In some cases, Congress passes federal laws imposing requirements that may influence model building codes and standards and adopted building codes and standards. Under authorities provided by Congress, some federal agencies work to enhance model building codes to improve building performance (e.g., resiliency, efficiency, environmental impact reduction). For example, federal agencies may incentivize building owners and communities to adopt enhanced model building codes through financial and technical assistance for building construction, operation and maintenance, or repair.

This report covers frequently asked questions on codes, standards, and regulations for buildings. It does not address questions about codes, standards, and regulations of infrastructure, such as energy facilities, communication networks, or dams.³ This report also addresses questions about how some laws enacted by Congress and some implementation of legislation by federal agencies impact building codes throughout the United States.

¹ Environmental Protection Agency (EPA), "Indoor Air Quality," at <https://www.epa.gov/report-environment/indoor-air-quality>.

² Jim Rossberg and Roberto T. Leon, *Evolution of Codes in the USA*, 2013, at https://www.nehrp.gov/pdf/UJNR_2013_Rossberg_Manuscript.pdf.

³ For more information about codes, standards, and regulations specifically for infrastructure, see CRS Report R47666, *Infrastructure Codes, Standards, and Regulations: Frequently Asked Questions*, coordinated by Linda R. Rowan.

Building Codes

What Is a Building Code and What Is Its Purpose?

A *building code* is a set of regulations governing the design, construction, alteration, and maintenance of structures and equipment. Building codes specify how buildings and equipment must be constructed or perform and are written in mandatory, enforceable language.⁴ Building code is defined in federal statute (42 U.S.C. §6832(3)) as “a legal instrument which is in effect in a State or unit of general purpose local government, the provisions of which must be adhered to if a building is to be considered to be in conformance with law and suitable for occupancy and use.”⁵

The main purpose of building codes is to protect public health, safety, and general welfare as the codes relate to the construction and occupancy of buildings.⁶ The rules for design, construction, alteration, materials, maintenance, and performance of buildings ensure a minimum level of safety, public health, and welfare. Architects, builders, owners, or others must ensure buildings conform to a building code (i.e., minimum requirements for the design, construction, alteration, materials, maintenance, and performance of buildings) to obtain planning permission, usually from a local entity. A building code becomes law of a particular jurisdiction when formally enacted by an authority having jurisdiction or private authority. Jurisdictions officially adopt codes and establish enforcement measures to ensure official building codes are followed.

What Structural Elements and Design Requirements Do Building Codes Cover?

Building codes generally cover the following structural elements and design requirements:⁷

- Standards for structure, placement, size, usage, wall assemblies, arrangement of doors and windows, size/locations, egress rules, size/location of rooms, foundations, floor assemblies, roof structures/assemblies, energy efficiency, stairways and hallways, mechanical, electrical, plumbing, site drainage and storage, appliance, lighting, fixtures standards, occupancy rules, and swimming pool regulations
- Rules regarding parking and traffic impact

⁴ Department of Energy (DOE), Building Science Education, “Codes and Standards,” at <https://bsesc.energy.gov/training-modules/codes-and-standards>; and National Institute of Standards and Technology (NIST), “Understanding Building Codes,” at <https://www.nist.gov/buildings-construction/understanding-building-codes>.

⁵ Section 303 of the Energy Conservation and Production Act (P.L. 94-385, as amended) (42 U.S.C. §6832(3)).

⁶ Federal Emergency Management Agency (FEMA), Building Codes Adoption Playbook for Authorities Having Jurisdiction, FEMA P-2196, August 2022, at https://www.fema.gov/sites/default/files/documents/fema_building-codes-adoption-playbook-for-authorities-having-jurisdiction.pdf (hereinafter, FEMA, Building Codes Adoption, 2022). The 10th Amendment of the U.S. Constitution gives states the right to legislate for the protection of the public health, safety, and welfare. States may pass laws such as building codes and have the authority to enact and enforce these codes. A state may delegate a portion of its authority to local governments, such that local governments can enact and enforce building codes. Council of American Building Officials, *An Introduction to Model Codes*, April 1997, at https://certi.us/Downloads/RRNC/Sample_Ordinances/Model_Bldg_codes.pdf.

⁷ Francis D. K. Ching and Steven R. Winkel, *Building Codes Illustrated: A Guide to Understanding the 2021 International Building Code*, 7th edition (Hoboken, New Jersey: John Wiley and Sons, Inc., 2021).

- Fire code rules to minimize the risk of a fire and ensure safe evacuation in the event of a fire
- Requirements for earthquake, hurricane, flood, and other hazard resistance, where appropriate
- Requirements for specific building uses (e.g., storage of flammable substances, large apartment buildings)
- Provisions for energy consumption
- Specifications on components
- Allowable installation methodologies
- Standards for minimum and maximum room ceiling heights, exit sizes, and locations
- Qualification requirements of individuals or corporations doing the work
- For high structures, anti-collision markers for the benefit of aircraft

Building codes are generally separate from zoning ordinances. Exterior restrictions (such as *setbacks*) may fall into either category, depending on the jurisdiction and its rules.⁸

Building departments may review building design plans and issue permits before construction or renovations, and inspectors may verify compliance to these codes and standards after construction has begun. Some building codes cover only new construction, whereas other codes also may cover specified renovations and/or existing buildings.

Do Building Codes Apply to Infrastructure?

In general, SLTT building codes and model building codes do not apply to infrastructure. For purposes of this report, *infrastructure* consists of physical networks (systems and facilities) that provide functions and services to a community.⁹ Where infrastructure connects to or runs through a building, some building codes and standards may apply to some components of infrastructure. For example, electrical, plumbing, parking, and building access have building codes and standards, because these components are part of the building structure.

Some definitions of infrastructure include buildings, but this report does not. For information about codes, standards, and regulations for infrastructure, see CRS Report R47666, *Infrastructure Codes, Standards, and Regulations: Frequently Asked Questions*.

What Are the Differences Between Building Codes, Standards, and Guidelines?

Building codes are a set of requirements for the design, construction, operation, and maintenance of new or existing buildings that are officially adopted and may be enforced by a jurisdiction. *Standards* are technical criteria on a specific topic, such as a material composition, the size of a water pipe, or a structure's load capacity. Standards may be a component of building codes or independent of a building code. The National Institute of Standards and Technology (NIST)

⁸ *Setbacks* are vertical heights or horizontal distances used to keep development out of harm's way. According to FEMA, setback standards establish minimum distances that structures must be positioned (or set back) from river channels and coastal shorelines. FEMA, "Setback," at <https://www.fema.gov/glossary/setback>.

⁹ NIST, *Community Resilience Planning Guide for Buildings and Infrastructure Systems*, NIST SP 1190GB-16, October 2020, p. 3, at <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1190GB-16.pdf>.

describes standards as the building blocks of building codes, whereas the Department of Energy (DOE) couples building codes and standards into a single term, *energy codes*.¹⁰ The National Fire Protection Association describes a *code* as a set of rules (i.e., what you need to do) and a *standard* as a detailed elaboration of the rules (i.e., how you need to do it).¹¹ *Guidelines* may be developed on topics to provide additional clarity or guidance. Guidelines are generally written in nonmandatory language for education and guidance and are not for adoption as a standard or component of a building code.¹² In addition to these differences between codes, standards, and guidelines, various organizations use different procedures to develop and revise their codes, standards, and guidelines (see “Model Building Codes,” “Standards,” and “Certifications” sections).¹³

Who Adopts and Enforces Building Codes?

State, local, tribal, and territorial entities (SLTTs) may be responsible for adopting and/or enforcing building codes and related standards.¹⁴ A state may adopt a set of building codes for the entire state. In some cases, local entities are required to adopt the statewide codes; in other cases, local entities may adopt other codes, may develop their own codes, or may not adopt any codes. As sovereign nations, federally recognized tribes may adopt and enforce building codes on tribal lands.¹⁵ Building departments at the state, local, tribal, or territorial level are most often responsible for adopting and enforcing building codes and standards. Other agencies that are responsible for zoning, land use, and other aspects of the built environment may be involved in the adoption or enforcement of building codes and standards, especially when considering the location of and/or access to a structure. Tribes may adopt nationally recognized model building codes or develop their own building codes. A tribe’s governing body sets the policies guiding code development.¹⁶ Tribes may face unique considerations in adopting and enforcing building codes, such as whether an adopted tribal building code meets federal requirements to receive

¹⁰ DOE, Building Science Education, “Codes and Standards,” at <https://bsesc.energy.gov/training-modules/codes-and-standards>; and NIST, “Understanding Building Codes,” at <https://www.nist.gov/buildings-construction/understanding-building-codes>.

¹¹ National Fire Protection Association (NFPA), “Reporter’s Guide: About Codes and Standards,” at <https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/Reporters-Guide-to-Fire-and-NFPA/About-codes-and-standards>.

¹² International Code Council (ICC), *Introduction to the Code Council’s Regulatory Publications and Support Documents*, at https://www.iccsafe.org/wp-content/uploads/22-21040_CORP_Intro_to_Regulatory_Docs_FLR_FINAL_HIRES.pdf.

¹³ Consensus means that decisions are reached through consensus among those affected. American National Standards Institute (ANSI), *United States Standards Strategy*, 2020, at <https://share.ansi.org/Shared%20Documents/Standards%20Activities/NSSC/USSS-2020/USSS-2020-Edition.pdf>, p.2. For example, the ICC uses a governmental-consensus process to revise or develop codes and an ANSI consensus process to revise and develop standards. ICC, *Introduction to the Code Council’s Regulatory Publications and Support Documents*, at https://www.iccsafe.org/wp-content/uploads/22-21040_CORP_Intro_to_Regulatory_Docs_FLR_FINAL_HIRES.pdf.

¹⁴ FEMA, “Nationwide Building Code Adoption Tracking,” at <https://www.fema.gov/emergency-managers/risk-management/building-science/bcat>.

¹⁵ A *federally recognized tribe* is an American Indian or Alaska Native (AI/AN) entity recognized as having a government-to-government relationship with the United States. For a searchable database of *tribal codes*, see National Indian Law Library, “Researching Tribal Codes and Constitutions,” at <https://www.narf.org/nill/triballaw/codes.html>. *Tribal codes* are legislative enactments of tribal councils and may contain information about the adoption and enforcement of building codes in a tribal jurisdiction.

¹⁶ Department of Housing and Urban Development, “Tribal Legal Code Project,” Part 6, p. 1, at https://www.hud.gov/sites/documents/DOC_8789.PDF.

federal assistance and how an adopted tribal building code addresses historic buildings or traditional construction practices.¹⁷

In general, SLTT building departments enforce their building codes through an application, permit, and inspection process for new construction or remodel/repair construction. A builder or relevant professional applies for a permit by describing the construction, and the building department approves or disapproves the permit. Then, for approved permits, the construction is inspected during or after construction. Some construction projects require multiple inspections at different times during building construction. Once construction is complete, additional inspections, especially related to fire safety codes, may be required throughout the lifecycle of the building to check on the operation and maintenance of building safety features.¹⁸

What Is the Role of the Federal Government in Adoption and Enforcement of Building Codes?

The federal government historically has had limited involvement in the adoption or enforcement of building codes by SLTT jurisdictions. Some examples of federal involvement include the following:

- Establishment of national manufactured housing construction standards (see “What building codes apply to manufactured housing?” section)¹⁹
- Implementation of regulatory requirements that certain consensus-based model building codes be followed
- Imposition of building codes and standards for federal public buildings (see “What building codes apply to federal buildings?” section)²⁰
- Establishment of requirements tied to certain federal grants and loan agreements (see “Federal Role: Code Requirements” section)²¹
- Enactment of statutory requirements that directly or indirectly affect state and local building codes (see “What Federal Laws May Influence Building Codes?” section)

Additionally, Congress has directed federal agencies to provide technical assistance to SLTTs to help entities adopt and enforce the latest edition of any nationally recognized model building codes. The objective of this assistance is to improve building performance in terms of energy efficiency and conservation and hazard-resistance and resilience, as well as to reduce the impact of buildings on the environment (see “Federal Role: Enhancing Codes” section).

¹⁷ Department of Housing and Urban Development, “Tribal Legal Code Project,” Part 6, p. 2-4, at https://www.hud.gov/sites/documents/DOC_8789.PDF; and Environmental Protection Agency, *Tribal Green Building Toolkit*, at <https://www.epa.gov/system/files/documents/2023-06/tribal-green-building-toolkit-mobile.pdf>.

¹⁸ Tara Lukasik, “Bring on Building Safety: Code Enforcement Explained,” *Building Safety Journal*, ICC, April 30, 2018, at <https://www.iccsafe.org/building-safety-journal/bsj-dives/bring-on-building-safety-code-enforcement-explained/>.

¹⁹ A uniform standard reduces the costs and burdens to manufacturers of ensuring compliance with multiple different codes, since manufactured homes constructed in one state may be shipped to other states to be installed.

²⁰ For example, federal entities are required to construct new buildings or alter existing buildings (owned or leased) using the latest edition of one of the “nationally recognized model building codes” (40 U.S.C. §3312).

²¹ For example, FEMA may grant funding to jurisdictions to adopt and enforce the “latest published editions of relevant consensus-based codes, specifications, and standards that incorporate the latest hazard-resistant designs” (42 U.S.C. §5172(e)(1)(A)).

What Federal Laws May Influence Building Codes?

Some federal laws impose standards that may influence model building codes and the building codes that are adopted by SLTTs. For example, the Americans with Disabilities Act (ADA, P.L. 101-336) of 1990 and the Fair Housing Act of 1968 (P.L. 90-284) impact codes and standards.

The ADA generally requires public buildings to be accessible to persons with disabilities.²² The U.S. Access Board administers the 2010 ADA Standards for Accessible Design, and the Department of Justice (DOJ)—and, in some cases, the Department of Transportation—are empowered to issue regulations to implement the ADA.²³ The ADA’s design standards are primarily enforced by DOJ.

The Fair Housing Act, as amended, requires most residential complexes of four or more dwelling units constructed after March 13, 1991, to be adaptable for use by persons with disabilities. In addition, it requires communal and public use portions of the buildings to be accessible to and usable for individuals with disabilities.²⁴ The Department of Housing and Urban Development (HUD) has published technical guidance and a design manual for designing covered multifamily dwellings in accordance with the Fair Housing Act.²⁵ Buildings meeting the design manual’s standards serve as HUD-recognized safe harbors for compliance with the law. HUD regulations incorporate by reference various editions of model building codes for accessible and usable buildings (see “Model Building Codes” section).²⁶

In response to a congressional directive,²⁷ in March 2000, HUD published in the *Federal Register* a review of model building codes intended to identify variances between the selected codes and the design and construction requirements of the Fair Housing Act.²⁸ In its review, HUD found that the model building codes it reviewed reflected most of the technical requirements of the Fair Housing Act and identified areas where the codes need to be revised to ensure consistency with the act. The Fair Housing Act can be enforced by HUD and DOJ or through private litigation.

What Types of Building Codes Are Adopted and Enforced?

SLTTs may develop and adopt their own building codes or may adopt part or all of model building codes (see “Model Building Codes” section). According to FEMA and some other

²² CRS In Focus IF12227, *The Americans with Disabilities Act: A Brief Overview*, by Abigail A. Graber.

²³ The 2010 ADA Standards for Accessible Design set minimum requirements – both scoping and technical – for newly designed and constructed or altered State and local government facilities, public accommodations, and commercial facilities to be readily accessible to and usable by individuals with disabilities. See ADA.gov, “2010 ADA Standards for Accessible Design,” at <https://www.ada.gov/law-and-regs/design-standards/2010-stds/>. U.S. Access Board, “Americans with Disabilities Act,” at <https://www.access-board.gov/ada/>.

²⁴ 42 U.S.C. §3604(f)(3). See also CRS Report 95-710, *The Fair Housing Act (FHA): A Legal Overview*, by David H. Carpenter.

²⁵ Department of Housing and Urban Development (HUD), “Final Fair Housing Accessibility Guidelines,” 56 *Federal Register* 9472, March 6, 1991; HUD, “Supplement to Notice of Fair Housing Accessibility Guidelines: Questions and Answers About the Guidelines,” 59 *Federal Register* 33362, June 24, 1994; and HUD, *Fair Housing Act Design Manual: A Manual to Assist Designers and Builders in Meeting the Accessibility Requirements of the Fair Housing Act*, revised April 1998, at <https://www.huduser.gov/portal/publications/PDF/FAIRHOUSING/fairfull.pdf>.

²⁶ 24 C.F.R. 100.205(e). For example, the ICC Accessible and Usable Buildings and Facilities standards satisfy the Fair Housing Act’s adaptable design requirements.

²⁷ U.S. Congress, *House Committee on Appropriations, Report Accompanying Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Bill, 2000*, 106th Cong., 1st sess., H.Rept. 106-286, December 31, 1999.

²⁸ HUD, “Final Report of HUD Review of Model Building Codes,” 65 *Federal Register* 15739, March 23, 2000.

federal agencies, the commonly adopted and enforced (in part or entirely) model building codes are those from the International Code Council (ICC) and the National Fire Protection Association (NFPA; see “Federal Role: Enhancing Codes” section). The ICC suite of model codes includes building energy codes and fire codes, whereas the NFPA suite of model codes includes fire codes (see “Fire Codes” and “Building Energy Codes” sections).

Some federal statutes or requirements that mention building codes require use of the latest edition of any nationally recognized model building codes or the most recent edition of any relevant, consensus-based model building codes (see “Federal Role: Code Requirements” section).²⁹ In general, the ICC and the NFPA model building codes are nationally recognized and consensus-based.

Building codes adopted and enforced by SLTT jurisdictions vary. FEMA tracks building codes in use by communities and notes that some of these codes include hazard resistant design elements, which may improve a building’s ability to withstand a disaster.³⁰ Various SLTT jurisdictions may adopt and enforce building energy codes for energy efficiency and conservation for commercial and residential buildings. DOE tracks energy codes in use by states (see “Building Energy Codes” section).³¹ In addition to federal agencies, third-party organizations (e.g., ICC Code Adoptions, a searchable platform for building codes for jurisdictions in the United States and other countries) track the building codes adopted and enforced by SLTTs.³²

Model Building Codes

What Is a Model Building Code? What Is Its Purpose?

A *model building code* is a collection of promulgated criteria and standards that is developed and maintained by a standards developing organization independent of a jurisdiction responsible for adopting and enforcing any building codes.³³ Model building codes provide codes and standards for building design, construction, alteration, materials, maintenance, and performance to provide a minimum level of safety, public health, and welfare (see “Standards” section). Critical structures such as hospitals may have additional requirements beyond these minimum levels, such as protecting occupancy and function in an emergency (e.g., requiring a generator to protect from a power outage).³⁴ Increasingly, model building codes may go beyond safety, health, and welfare

²⁹ For example, federal entities are required to construct new buildings or alter existing buildings (owned or leased) using the latest edition of one of the “nationally recognized model building codes” (40 U.S.C. §3312). In another example, FEMA may grant funding to communities to adopt and enforce the “latest published editions of relevant consensus-based codes, specifications, and standards that incorporate the latest hazard-resistant designs” (42 U.S.C. §5172(e)(1)(A)).

³⁰ According to FEMA, *model building codes* refer to minimum design provisions and practices established by nationally recognized standards developing organizations (SDOs). FEMA, “Nationwide Building Code Adoption Tracking,” at <https://www.fema.gov/emergency-managers/risk-management/building-science/bcat>. See also FEMA, *Building Codes Adoption*, 2022.

³¹ Office of Energy Efficiency and Renewable Energy, “Building Energy Codes Program,” at <https://www.energycodes.gov/>.

³² ICC, “Code Adoptions,” at <https://www.iccsafe.org/adoptions/global-codes>.

³³ National Research Council, *Use of Building Codes in Federal Agency Construction*, The National Academies Press, 1989, <https://doi.org/10.17226/1385>, p. 4 and NIST, “Understanding Building Codes,” at <https://www.nist.gov/buildings-construction/understanding-building-codes>.

³⁴ See “Standards” section for a definition of *critical structures* based on risk categories.

to enhance resilience to natural hazards and other impacts.³⁵ A jurisdiction may officially adopt model building codes in part or in whole.³⁶ In addition, model building codes may be used in voluntary compliance programs, by the insurance industry to estimate and manage risk, in the certification of buildings or construction-related products, for facilities management, as best practices benchmarks, in education, or as reference works.³⁷

Some federal statutes mentioning building codes require use of the latest edition of any nationally recognized model codes or the most recent edition of any relevant, consensus-based model codes.³⁸ The approach to codes and standards development in the United States is unique—in many countries, a ministry or government agency sets national building codes and standards.³⁹ The most nationally recognized and commonly used model building codes in the United States are from two SDOs, the International Code Council and the National Fire Protection Association.⁴⁰

What Types of Buildings Are Covered by Model Building Codes?

The International Code Council publishes 15 model building codes to cover different types of buildings and different components of buildings. There are two types of buildings covered by the primary ICC codes:

1. Commercial, industrial, educational, government, and larger residential structures, such as apartment buildings, are covered by the International Building Code (IBC) for new construction and the International Existing Building Code (IEBC) for repair, alteration, addition, or change of occupancy for existing buildings.
2. One- and two-family dwellings and townhouses not more than three stories above grade are covered by the International Residential Code (IRC).

Residential buildings covered by IRC account for about 80% of the building stock in the United States.⁴¹

What Are Standards Developing Organizations?

Standards developing organizations are independent organizations in the United States standards development system. Most SDOs are private-sector, not-for-profit organizations and typically receive funding through membership dues, publication sales, and/or certification services. The

³⁵ NIST, *Community Resilience Planning Guide for Buildings and Infrastructure Systems, Volume II*, NIST Special Publication 1190, 2016, pp. 54-62, at doi: 10.6028/NIST.SP.1190v2 (hereinafter, NIST, *Resilience Guide II*).

³⁶ NIST, *Resilience Guide II*, p. 54.

³⁷ ICC, “Introduction to the Code Council’s Regulatory Publications and Support Documents,” at https://www.iccsafe.org/wp-content/uploads/22-21040_CORP_Intro_to_Regulatory_Docs_FLR_FINAL_HIRES.pdf.

³⁸ For example, federal entities are required to construct new buildings or alter existing buildings (owned or leased) using the latest edition of one of the “nationally recognized model building codes” (40 U.S.C. §3312) and FEMA may grant funding to communities to adopt and enforce the “latest published editions of relevant consensus-based codes, specifications, and standards that incorporate the latest hazard-resistant designs” (42 U.S.C. §5172(e)(1)(A)).

³⁹ For a 2016 list of other countries that have national building codes, see FM Global, “FM Global Country Building Codes Index,” May 2016, at https://www.fmglobal.com/~/_media/Files/FMGlobal/Resilience%20Index/P15105.pdf.

⁴⁰ ICC, “Building Confidence, Building Community,” at <https://www.iccsafe.org/>; ICC, “Code Adoptions,” at <https://www.iccsafe.org/adoptions/global-codes>; and NFPA.org, “The National Fire Protection Association,” at <https://www.nfpa.org/>.

⁴¹ ICC, “Overview of the International Residential Code (IRC),” at <https://www.iccsafe.org/products-and-services/i-codes/2018-i-codes/irc/>.

International Code Council and National Fire Protection Association are SDOs. Each SDO has the autonomy to decide which standards to develop, to set policies, and to pursue American National Standards Institute (ANSI) accreditation and approval. Unlike other national standard bodies, ANSI does not have the authority to assign specific SDOs to develop specific standards.⁴² Each SDO identifies and reacts to market needs as it sees fit. According to ANSI, most SDOs in the United States operate in an open, transparent, balanced, consensus-based model with due process for dissenting opinions.⁴³

What Are the International Code Council Model Building Codes?

The International Code Council develops and maintains a suite of model building codes in support of the organization's objectives for building safety and fire prevention.⁴⁴ Federal agencies describe the ICC codes as nationally recognized model building codes because they are commonly used model codes in the United States. The ICC publishes 15 model building codes, sometimes called *I-Codes*, including the International Building Code for new construction, the International Energy Conservation Code, the International Existing Building Code, the International Fire Code, the International Fuel Gas Code, the International Green Construction Code, the International Mechanical Code, the ICC Performance Code for performance-based design elements, the International Plumbing Code, the International Private Sewage Disposal Code, the International Property Maintenance Code, the International Residential Code, the International Swimming Pool and Spa Code, the International Wildland Urban Interface Code, and the International Zoning Code. The ICC updates its codes every three years.

What Are the National Fire Protection Association Model Building Codes?

The National Fire Protection Association is a global self-funded nonprofit organization established in 1896 that is devoted to eliminating death and injury, property, and economic loss due to fire, electrical, and related hazards.⁴⁵ The NFPA publishes more than 300 codes and standards intended to minimize the possibility and effects of fire and other risks (see “Fire Codes” section).⁴⁶

⁴² ANSI, “We Facilitate Standardization Solutions,” at <https://ansi.org/>.

⁴³ ANSI, “U.S. Standards System: SDOs (Private Sector),” at https://www.standardsportal.org/usa_en/standards_system/sdo_private.aspx.

⁴⁴ ICC, “Codes and Standards,” at <https://www.iccsafe.org/products-and-services/codes-standards/>. The ICC, established in 1994 to provide “a single set of national model construction codes,” is now the “largest international organization of building safety professionals,” with model codes and standards in use in more than 100 countries. The ICC originated in the United States from the merger of three different organizations that had developed three separate sets of model codes used in different regions of the country before 1994: Building Officials and Code Administrators International, Inc. (BOCA); International Conference of Building Officials (ICBO); and Southern Building Code Congress International, Inc. (SBCCI). ICC, “Who We Are,” at <https://www.iccsafe.org/about/who-we-are/>.

⁴⁵ NFPA.org, “NFPA Overview,” at <https://www.nfpa.org/overview>.

⁴⁶ For a list of NFPA codes, see NFPA.org, “List of NFPA Codes & Standards,” at <https://www.nfpa.org/Codes-and-Standards/All-Codes-and-Standards/List-of-Codes-and-Standards>.

What Is the Process for Developing, Changing, Adding, or Subtracting Elements to Model Building Codes?

Most organizations follow a consensus-based process for developing, changing, adding, or subtracting elements from model building codes. Federal agencies may offer code proposals and may take part in the consensus-based process. Below is an example of the International Code Council's process.

The ICC publishes 15 model building codes and develops or updates codes through a governmental consensus process. The ICC updates established codes every three years. The governmental consensus process meets the principles defined by the American National Standards Institute, United States Standards Strategy (USSS); the Office of Management and Budget (OMB) Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities," and the National Technology Transfer and Advancement Act of 1995 (P.L. 104-113).⁴⁷

The ICC model building code governmental consensus process begins with the ICC establishing code development committees.⁴⁸ Committee members represent general (government) interests, user interests, and producer interests.⁴⁹ Anyone can make a public comment or submit code change proposals, which are assigned to specific code development committees. The ICC describes the next steps as consensus. At committee action hearings, committee members vote to approve, approve with modifications, or disapprove a code change proposal. A simple majority from the committee decides the action on the proposal. After each committee action hearing, a public comment submission and review process provides an opportunity for participants to testify before the committee in support of or opposition to proposed code change.⁵⁰ A public comment hearing allows participants to discuss and eligible voters to vote on proposed changes to codes brought forward by the committee action hearings process.⁵¹ ICC describes the last step in the code development process as the online governmental consensus vote. Following the public comment hearing, eligible voters vote online on the individual changes discussed at the public comment hearing. The final vote count combines the in-person public comment hearing and online votes. The validation committee reviews and the ICC Board of Directors confirms the final results.

⁴⁷ ANSI, "United States Standards Strategy," at <https://www.ansi.org/resource-center/publications-subscriptions/uss#>; Office of Management and Budget (OMB), "Circular No. A-119 Revised: Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities," February 10, 1998, at https://obamawhitehouse.archives.gov/omb/circulars_a119_a119fr (hereinafter, OMB, Circular No. A-119); and ICC, "The Code Development Process," at <https://www.iccsafe.org/products-and-services/i-codes/code-development/>.

⁴⁸ ICC, "The Code Development Process," at <https://www.iccsafe.org/products-and-services/i-codes/code-development/>.

⁴⁹ General interests include government regulatory agencies; user interests include building owners, designers, insurance companies, private inspection agencies and academics; and producer interests include builders, contractors, manufacturers, and distributors.

⁵⁰ ICC has added a second committee action hearing and public comment and review process to its code development procedure for the 2027 editions of the ICC codes. ICC, *ICC Code Development Process How It Works*, <https://www.iccsafe.org/wp-content/uploads/ICC-CDP-How-It-Works.pdf>.

⁵¹ *Eligible voters* include regulators serving in a governmental unit, department, or agency engaged in the administration, formulation, implementation or enforcement of laws, ordinances, rules, or regulations relating to the public health, safety, and welfare and honorary members. ICC, *ICC Code Development Process How It Works*, <https://www.iccsafe.org/wp-content/uploads/ICC-CDP-How-It-Works.pdf>.

How Does a State or Other Entity Adopt a Model Building Code?

SLTTs may select and adopt part of or an entire model building code through ordinance to become legally enforceable in accordance with SLTT laws and regulations. SLTTs may develop their own codes through ordinance. In some cases, states select and adopt a model building code or part of a model building code for the entire state. Localities may adopt different model building codes and/or develop their own codes and standards to adopt, depending on state requirements. If a state has adopted and enforces a minimum building code and standards requirement for the entire state, then every locality must meet or in some cases may exceed the minimum building code and standards.

Standards

What Are Standards?

A *standard* is a set of guidelines and criteria against which a product can be judged.⁵² OMB Circular A-119 defines *standards* to include the common and repeated use of rules, conditions, guidelines, or characteristics for products or related processes and production methods.⁵³ Common standards related to building practices are created through consensus processes by organizations such as the American National Standards Institute; ASTM International; and American Society of Heating, Refrigerating and Air-Conditioning Engineers.⁵⁴ The International Organization for Standardization (ISO) governs standards and certifications by defining and developing worldwide standards that frequently become law or form the basis of industry norms. ISO defines a *standard* as “a document, established by consensus, approved by a recognized body that provides for common and repeated use as rules, guidelines, or characteristics for activities or their results.”⁵⁵

Requirements found in standards may either be *prescriptive* (identifying methods of achievement) or *performance based* (stating expectations of end results).⁵⁶ Prescriptive design is used in most building codes and prescribes the design criteria (e.g., the maximum stud spacing on the first floor of a two-story house). Performance-based design sets the criteria based on the performance of the building element (e.g., the compressive stress of the lumber may not exceed some maximum value for the floor). Consensus-based standards developed through a formal, voluntary consensus process that is exemplified by open and due process may have immediate acceptance, government support, or international influence.

The National Technology Transfer and Advancement Act of 1995 (NTTAA; P.L. 104-113, 15 U.S.C. §272(b)); OMB Circular A-119; and other federal laws, regulations, and international agreements guide the federal role in the development and use of standards and conformity

⁵² Whole Building Design Guide, “Green Building Standards and Certification Systems,” at <https://www.wbdg.org/resources/green-building-standards-and-certification-systems>.

⁵³ OMB, Circular A-119.

⁵⁴ ANSI, “American National Standards Institute,” at <https://www.ansi.org/>; American Society for Testing and Materials (ASTM), “ASTM International,” at <https://www.astm.org/>; and American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), “ASHRAE,” at <https://www.ashrae.org/>; and International Organization for Standardization (ISO), “ISO,” at <https://www.iso.org/home.html>.

⁵⁵ ISO and IEC, *Standardization and related activities - General vocabulary*, 2004, https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_iec_guide_2_2004.pdf.

⁵⁶ Siamak Sattar et al., *Research Needs to Support Immediate Occupancy Building Performance Objective Following Natural Hazard Events*, NIST, NIST Special Publication 1224, August 2018, at <https://doi.org/10.6028/NIST.SP.1224>.

assessments.⁵⁷ NTTAA directs federal agencies to adopt voluntary consensus standards wherever possible (avoiding development of unique government standards) and establishes reporting requirements. NTTAA directs NIST to “determine properties of building materials and structural elements, and encourage their standardization and most effective use” (15 U.S.C. §272(c)(17)).

What Are Minimum Design Load Standards?

Minimum design load refers to the minimum hazard intensity that a building should be able to withstand without impacting building life safety or, for critical buildings such as hospitals, without impacting occupancy and function. For example, a minimum design load may be a wind speed of 100 miles per hour that a two-story house should be able to withstand without damage or collapse that would impact the safety of the building inhabitants. A building could be designed to withstand a higher wind speed event; the code specifies only a minimum wind speed (i.e., minimum design load).

The American Society of Civil Engineers (ASCE) established and updates commonly used minimum design standards for hazards in the United States. The International Code Council model building codes reference many of the ASCE standards. The ASCE’s Structural Engineering Institute (SEI) has developed standards for hazard load(s) (e.g., snow, wind, seismic loads) for general design construction called *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7).⁵⁸ The latest edition, from 2022 (ASCE 7-22), includes minimum design load standards for tornado winds, new flood load provisions to protect against 500-year flood events, and a new requirement for relative sea level change as it relates to an individual structure.⁵⁹

The ASCE 7 provides minimum design loads for a building based on the building’s assigned risk category.⁶⁰ The four categories are as follows:

- **Risk Category I:** Buildings that pose a low risk to human life in the event of failure (e.g., storage facilities, barns)
- **Risk Category II:** All buildings except those classified as Risk Categories I, III, and IV (e.g., includes most commercial and residential buildings)
- **Risk Category III:** Buildings designed to accommodate a high number of occupants, potentially posing substantial risk to human life in the event of failure (e.g., schools, theatres)
- **Risk Category IV:** Buildings classified as essential facilities, the failure of which could pose substantial hazard to the community (e.g., hospitals).

ASCE publishes a Flood Resistant Design and Construction (ASCE/SEI 24) standard for flood loads for new and substantially improved buildings (and structures) constructed in flood hazard

⁵⁷ NIST, Standards.Gov, “What We Do,” at <https://www.nist.gov/standardsgov/what-we-do>; and OMB, Circular A-119.

⁵⁸ American Society of Civil Engineers (ASCE), “ASCE 7,” at <https://www.asce.org/publications-and-news/asce-7>. The ASCE/SEI 7 also may be referred to as ASCE 7, ASCE 7-22, or ASCE/SEI 7-22 where the 22 refers to the year of the design edition. SEI refers to the Structural Engineering Institute, a group organized within the ASCE. ASCE, “Structural Engineering Institute (SEI),” at <https://www.asce.org/communities/institutes-and-technical-groups/structural-engineering-institute>. ASCE/SEI 7-22 is the latest edition and was published in 2022. Hereinafter, this report refers to ASCE 7 or ASCE 7-22 when there is a need to specify which edition of the ASCE is being discussed.

⁵⁹ ASCE, “ASCE 7,” at <https://www.asce.org/publications-and-news/asce-7>.

⁶⁰ Engineering Express, “ASCE Risk Categories Explained,” at <https://www.engineeringexpress.com/wiki/asce-risk-categories-explained/>.

areas, with provisions for coastal and inland flood considerations as well as erodible soils. According to FEMA, ASCE/SEI 24 meets or exceeds the minimum design requirements of the National Flood Insurance Program for buildings and structures.⁶¹

ASCE publishes a *Seismic Evaluation and Retrofit of Existing Buildings, Standard ASCE/SEI 41-17*, that describes deficiency-based and systematic procedures that use performance-based design principles to evaluate and retrofit existing buildings to withstand the effects of earthquakes. This standard is somewhat different from some other standards, because it provides guidance for the evaluation of the existing building and then performance-based design standards for a seismic retrofit based on the evaluation.⁶²

What Are Construction Material Standards?

Model building codes reference material-specific standards that include requirements for designing building systems (e.g., walls, floors, stairs) using common construction materials and practices. **Table 1** provides examples of some of the current material-specific standards used in the United States for conventional construction materials with large market shares. In some cases, material-specific criteria are developed for certain hazards.⁶³ For example, the American Concrete Institute publishes special design criteria for concrete to resist earthquake hazards, the American Institute of Steel Construction publishes special design criteria for steel to resist earthquake hazards; and the American Wood Council publishes special criteria for wood to resist wind and earthquake hazards.

Table 1. Examples of Material-Specific Standards for Conventional Construction Materials with Large Market Shares

Material	Organization	Standard	Edition
Structural Concrete	American Concrete Institute (ACI)	ACI 318: Building Code Requirements for Structural Concrete and Commentary	2014
Structural Steel	American Institute of Steel Construction (AISC)	AISC 360: Specifications for Structural Steel Buildings	2016
Cold-formed Steel	American Iron and Steel Institute (AISI)	AISI S100: North American Specification for the Design of Cold-Formed Steel Structural Members	2016
Wood	American Wood Council	National Design Specification for Wood Construction	2018

⁶¹ FEMA, “American Society of Civil Engineers - Flood Resistant Design and Construction,” <https://www.fema.gov/node/american-society-civil-engineers-flood-resistant-design-and-construction>. ASCE/SEI 24 may be called ASCE 24 or ASCE/SEI 24-14 (the latest edition of ASCE/SEI 24 was published in 2014). Numerous changes distinguish ASCE 24-14 from earlier version of the ASCE 24. International Building Codes (IBCs) and IRCs starting in 2015 have referenced ASCE 24-14. At times, some states and localities that generally adopt IBCs and IRCs have chosen to not adopt the entirety or to strike portions of flood hazard provisions set forth in the IBCs, IRCs, and ASCE 24.

⁶² ASCE, “Seismic Evaluation and Retrofit of Existing Buildings,” at <https://ascelibrary.org/doi/book/10.1061/9780784414859>.

⁶³ For example, in 2022, the General Services Administration (GSA) announced new low-embodied carbon concrete and environmentally preferable asphalt standards that are required for any new GSA activities. GSA, “GSA Lightens the Environmental Footprint of Its Building Materials,” at <https://www.gsa.gov/about-us/newsroom/news-releases/gsa-lightens-the-environmental-footprint-of-its-building-materials-03302022>. The standards are available from GSA, “Facilities Standards (P100) Overview,” at <https://www.gsa.gov/real-estate/design-and-construction/engineering-and-architecture/facilities-standards-p100-overview>.

Material	Organization	Standard	Edition
Masonry	The Masonry Society (TMS)	TMS 402/602: Building Code Requirements and Specifications for Masonry Structures	2016

Source: Siamak Sattar et al., *Research Needs to Support Immediate Occupancy Building Performance Objective Following Natural Hazard Events*, National Institute of Standards and Technology (NIST), NIST Special Publication 1224, August 2018, at <https://doi.org/10.6028/NIST.SP.1224>, Table 1.

What Hazardous Materials Are Covered by Standards?

Some commonly recognized hazardous materials in the context of building codes and standards include lead, asbestos, radon, carbon monoxide, and mold. Lead and asbestos may be present in materials used to construct, repair, or renovate buildings, whereas radon, carbon monoxide, or mold may infiltrate a building interior, creating a hazardous indoor environment. The use, removal, and/or disposal of these hazardous materials related to buildings are primarily regulated by laws rather than building codes. The Environmental Protection Agency (EPA) is often the federal agency in the United States authorized to implement these laws by issuing and enforcing regulations. Some SLTTs have adopted additional local rules and regulations for hazardous materials. Below are two examples of how lead paint and radon are regulated by laws.

Congress has passed laws to regulate the use of lead. These laws address lead in paint; dust; or soil, air, and water, as well as the disposal of lead waste (e.g., disposal of lead-based paint or lead-acid automobile batteries).⁶⁴ The use of lead paint in residential buildings was restricted beginning in 1978, and there are rules, regulations, and guidelines for disclosing the existence of lead paint or for renovating and disposing of existing lead paint in residential buildings constructed before 1978.

In the United States, the use of lead paint is legal and allowed for outdoor and industrial structures (e.g., bridges, water towers, pipes, highways, guard rails, utility poles). Some SLTTs have adopted local rules and regulations regarding the use of lead paint in nonresidential structures. Internationally, the Global Alliance to Eliminate Lead Paint has called on governments to phase out the use of lead paint, calling lead 1 of the 10 chemicals of major public concern.⁶⁵

For radon, EPA participates in the development of radon-related model building codes and standards with American National Standards Institute and the American Association of Radon Scientists and Technologists (AARST).⁶⁶ EPA is governed by the National Technology Transfer and Advancement Act of 1995 (P.L. 104-113) and Circular A-119, which favor the federal government’s reliance on standards developing organization consensus-based standards over the federal government developing federal standards.⁶⁷ EPA notes the most common model building codes that address radon-resistant building techniques, including those of the International Code Council (e.g., the International Green Construction Code, International Residential Code 2015, and National Green Residential Standard [ICC-700]) and the American National Standards

⁶⁴ EPA, “Lead Policy and Guidance,” at <https://www.epa.gov/lead/lead-policy-and-guidance>.

⁶⁵ World Health Organization, “Global Alliance to Eliminate Lead Paint,” at <https://www.who.int/initiatives/global-alliance-to-eliminate-lead-paint>. The other nine chemicals of major public concern include arsenic, asbestos, benzene, cadmium, dioxins, inadequate or excess fluoride, mercury, and highly hazardous pesticides.

⁶⁶ American Association of Radon Scientists and Technologists Consortium/ANSI, “National Consensus Standards for Every Building Type,” at <https://standards.aarst.org/>.

⁶⁷ EPA, “Radon Standards of Practice,” at <https://www.epa.gov/indoor-air-quality-iaq>.

Addressing Radon in New Construction (e.g., ANSI/AARST RRNC-2020).⁶⁸ SLTTs may choose to adopt and enforce some or all of these model codes, use other model codes, develop their own codes, or not address radon-resistant building techniques. EPA's Indoor Air Quality mission provides information and guidance about other hazardous materials that may impact indoor air quality.⁶⁹

What Natural Hazards Are Covered by Design Load Standards?

In the United States, building codes may commonly include design standards to withstand snow load, wind load, flood water, fire, or earthquake shaking in regions where these hazards may pose the greatest risk (see “What Are Minimum Design Load Standards?” section). For example, Florida has specific hurricane-resistant design standards for specific areas of the state that are most at risk from hurricane hazards, and California has specific earthquake-resistant design standards for specific areas of the state that are most at risk from earthquake hazards.⁷⁰

The American Society of Civil Engineers has an online hazard tool that provides minimum design load standards based on location, building risk category, and hazard type (e.g., wind speed minimum design load requirements to build a one-family dwelling at a given street address, based on ASCE 7).⁷¹ A builder, homeowner, or other stakeholder can view the minimum design load criteria for many different hazards at a location to gain knowledge about hazard risks and building performance design elements for these hazards.

Engineering and construction professionals may need to move from prescriptive design to performance-based design for some building elements because those elements must perform to some specified level for a specific hazard (e.g., a steel beam must perform to a certain strength and stiffness to resist a specified shaking intensity caused by an earthquake).⁷² For example, *Seismic Evaluation and Retrofit of Existing Buildings, Standard ASCE/SEI 41-17*, describes deficiency-based and systematic procedures that use performance-based design principles to evaluate and retrofit existing buildings to withstand the effects of earthquakes.⁷³

What Natural Hazards Are Covered in the Most Recent Model Building Codes?

The 2021 edition of the International Code Council model building codes covers snow load, wind load (except tornadoes), flood water, fire and wildfire, and earthquake shaking hazards. Most of

⁶⁸ EPA, “Building Codes and Standards for Radon-Resistant New Construction (RRNC),” at <https://www.epa.gov/radon/building-codes-and-standards-radon-resistant-new-construction-rrnc>. Like some of the other specific codes mentioned in this report, ANSI/AARST RRNC-2020 may be referenced as RRNC. ANSI/AARST, *Rough-In of Radon Control Components in New Construction of 1 & 2 Family Dwellings and Townhouses*, 2020, at <https://standards.aarst.org/RRNC-2020/>.

⁶⁹ EPA, “Indoor Air Quality (IAQ),” at <https://www.epa.gov/indoor-air-quality-iaq>.

⁷⁰ Florida Department of Business and Professional Regulation, “Building Code Information System,” at <https://floridabuilding.org/c/default.aspx>; and California Department of General Services, “Building Standards Commission,” at <https://www.dgs.ca.gov/BSC/Codes>.

⁷¹ ASCE, “ASCE-7,” at <https://www.asce.org/publications-and-news/asce-7>. See ASCE, “ASCE 7 Hazard Tool,” at <https://asce7hazardtool.online/>. See footnote 58 for a description of ASCE 7.

⁷² See Section “What Are Standards?” for definitions of prescriptive versus performance-based design. Siamak Sattar et al., *Research Needs to Support Immediate Occupancy Building Performance Objective Following Natural Hazard Events*, NIST, NIST Special Publication 1224, August 2018, at <https://doi.org/10.6028/NIST.SP.1224>.

⁷³ ASCE, “Seismic Evaluation and Retrofit of Existing Buildings,” at <https://ascelibrary.org/doi/book/10.1061/9780784414859>.

the design load standards are from ASCE 7-16 (i.e., the 2016 edition of the American Society of Civil Engineers' *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*).⁷⁴ The 2022 edition of these standards (ASCE 7-22) includes minimum design loads for tornado winds for the first time. The wind characteristics and interactions with structures in tornadic storms differ from traditional winds, and the ASCE 7-22 committee decided to include specifications for tornadoes in the design criteria.⁷⁵ ASCE 7-22 standards are included in the 2024 edition of the ICC codes.⁷⁶

What State, Local, Tribal, or Territorial Entities Have Adopted Building Codes That Provide Resistance to Hazards?

According to FEMA's Nationwide Building Code Adoption Tracking, a low-to-medium percentage (22%-56%) of building stock in about 22,000 jurisdictions in the United States is resistant to specific hazards (**Table 2**).⁷⁷ A study led by FEMA, entitled *Building Codes Save: A Nationwide Study*, looked at 18.1 million buildings constructed between 2000 and 2016 (more than 85% of these buildings were residential construction) and estimated the amount of damage these structures might incur from the three most common hazards: floods, hurricanes, and earthquakes.⁷⁸ The findings showed that about half the buildings (roughly 9.1 million) were built to International Code Council model building codes (ICC codes from 2000 or later editions) and would avoid average annualized losses of approximately \$1.6 billion (2020 dollars).⁷⁹ The study noted that recent ICC codes (2015 or 2018 editions) were designed for life safety and to reduce property damage up to a defined risk threshold to increase the number of hazard-resistant buildings in communities nationwide. Some states chose to limit local adoption of amendments to state building codes (or set requirements for local amendments). In some instances, such state limitations may deter local adoption of more hazard-resilient or restrictive requirements for buildings.⁸⁰

⁷⁴ ASCE, "ASCE-7," at <https://www.asce.org/publications-and-news/asce-7>. See footnote 58 for a description of ASCE 7.

⁷⁵ ASCE, Standards, "ASCE 7-22 Wind Load Standard Adds Tornado Chapter," February 14, 2022, at <https://www.asce.org/publications-and-news/civil-engineering-source/civil-engineering-magazine/article/2022/02/asce-7-22-wind-load-standard-adds-tornado-chapter>.

⁷⁶ ICC released the 2024 editions of their suite of codes in August through October, 2023. ICC, "International Code Council Unveils 2024 International Plumbing Code and 2024 International Mechanical Code," at <https://www.iccsafe.org/about/periodicals-and-newsroom/international-code-council-unveils-2024-international-plumbing-code-and-2024-international-mechanical-code/>. See also, ICC, "New Design for the 2024 International Codes," at <https://www.iccsafe.org/about/2024-i-code-updates/>.

⁷⁷ The 22,000 jurisdictions cover most but not all of the United States. FEMA, "Nationwide Building Code Adoption Tracking," at <https://www.fema.gov/emergency-managers/risk-management/building-science/bcat>.

⁷⁸ The 18.1 million new buildings in the study may be divided into about 15.4 million one- and two-family dwellings; 0.5 million other residential buildings; 0.7 million commercial and industrial buildings; and 1.6 million other buildings, such as educational, religious, and government buildings. Numbers from , FEMA, Table 3-3 in *Building Codes Save: A Nationwide Study of Loss Prevention*, November 2020, at <https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes-save-study> (hereinafter, FEMA, *Building Codes Save*, 2020). The most recent codes at the time of this study were from 2018. The ICC has since updated its codes, so the most recent editions are from 2021 and 2024. ICC, "IBC Reference," at <https://shop.iccsafe.org/international-codes/ibc-references.html>.

⁷⁹ The losses are for physical damage to buildings and do not include any economic, social, cultural, or government losses related to the loss of function of the buildings. FEMA, *Building Codes Save*, 2020.

⁸⁰ ICC and FEMA, *Reducing Flood Losses Through the International Codes: Coordinating Building Codes and Floodplain Management Regulations*, 5th edition, 2019, <https://www.fema.gov/node/reducing-flood-losses-through-international-codes>. Part 5-3 of the report provides examples of sample amendments to I-Codes to provide for a higher standard of flood resilience.

Table 2. Hazard-Resistant Code Adoption Statistics, FY2023, Second Quarter
 (the resistant percentage is the percentage of building codes in use by jurisdictions that include hazard-resistant designs for specific hazards)

Hazard	Resistant Percentage of Building Stock (%)
Damaging Wind	40
Hurricane Wind	56
Tornado	22
Flood ^a	32
Earthquake	48
Combined	27

Source: Federal Emergency Management Agency (FEMA), “Nationwide Building Code Adoption Tracking,” at <https://www.fema.gov/emergency-managers/risk-management/building-science/bcat>.

Notes: FEMA tracks hazard-resistant building code adoption status for state, local, tribal, and territorial governments with specific high-hazard risks (i.e., likelihood of an earthquake in a jurisdiction), covering approximately 22,000 jurisdictions across the United States. FEMA considers hazard-resistant codes as the adoption of the 2018 or later editions of the International Building Code (IBC) or the International Residential Code (IRC) for new construction, along with the hazard-resistant design standards from the American Society of Civil Engineers, Structural Engineering Institute’s *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-16 or later editions) and *Flood Resistant Design and Construction* (ASCE 24-14) standard for flood loads. FEMA notes that these codes and standards should not supersede any existing hazard-resistant standards that are more stringent (i.e., more hazard resistant). A jurisdiction that adopts IBC or IRC may choose to exclude some or parts of the ASCE design standards, so FEMA specifies the importance of adopting and enforcing the IBC or IRC and ASCE design standards in their hazard-resistant building code adoption tracking.

- a. In addition to the adoption of International Code Council codes, the percentages shown are representative of those jurisdictions with high flood risk that are in good standing with the National Flood Insurance Program and follow the 2018 or later edition of the IBC or IRC without weakening any other flood resistance standards in use in the jurisdiction. Therefore, the percentage shown is for those jurisdictions with high flood risks, not all 22,000 jurisdictions (FEMA, “Flood Resistance,” at <https://www.fema.gov/glossary/flood-resistance>).

Certifications

What Are Certifications?

According to the International Organization for Standardization, a *certification* is a “provision by an independent body of written assurance (a certificate) that the product, service or system in question meets specific requirements.”⁸¹ Building certifications are not mandatory and generally are not adopted or enforced as a component of a jurisdiction’s building codes. Some jurisdictions may encourage or require certain certifications for specific types of buildings (e.g., for a new public building, a jurisdiction may require a water efficiency or energy efficiency certification).

The federal government encourages or requires certain building certifications for federal buildings or for federal agencies. The General Services Administration (GSA), DOE, Department of Health and Human Services, and EPA, in particular play a role in incorporating energy efficiency and sustainability by following federal mandates and green building guidelines in the

⁸¹ ISO, “Certification,” at <https://www.iso.org/certification.html>.

design, construction, and renovation of federal facilities.⁸² The Energy Policy Act of 2005 (P.L. 109-58) requires federal agencies to buy either Energy Star products or products designated as energy efficient by the Federal Energy Management Program (FEMP).⁸³ In addition, the Council on Environmental Quality (CEQ) published “Guiding Principles for Sustainable Federal Buildings” in 2020.⁸⁴ The document outlines the sustainable building principles and practices (i.e., codes, standards, guidelines, and certifications) established through a number of statutory and executive policies that every federal agency is using (see “What Building Codes May Apply to Federal Buildings?” section).

What Types of Certifications Are Commonly Used in the United States?

Certifications focused on energy efficiency and hazard resistance leading to more resilient and sustainable buildings are among the commonly adopted certifications in the United States. Green building certifications may offer a certificate for energy efficiency, water efficiency, the use of nontoxic materials in an indoor environment, waste and pollution reduction (i.e., recycling, reuse, or reduction, including lowering carbon emissions), and lifecycle management (i.e., recycling, reuse, or reduction in the construction, operation, and/or maintenance of the building over the lifetime of the structure).⁸⁵ For federal buildings, CEQ published “Guiding Principles for Sustainable Federal Buildings” in 2020.⁸⁶ The document outlines the sustainable building principles and practices (i.e., codes, standards, guidelines and certifications) established through a number of statutory and executive policies that every federal agency is using (see “What Building Codes May Apply to Federal Buildings?” section). This guidance includes a list of green building certifications that federal agencies may use. **Table 3** lists the green building certifications from the guidance document which are among the commonly used green building certifications in the United States.

There are some hazard-resistant certifications available in the United States. For example, the Insurance Institute for Business and Home Safety (IBHS) has produced a suite of design standards labeled FORTIFIED Home consisting of performance-based engineering and building standards designed to help strengthen new and existing homes through the installation of specific building upgrades that reduce damage from hurricanes, hailstorms, low-level tornadoes, and

⁸² For more information on the green building, see CRS Report R46719, *Green Building Overview and Issues*, by Corrie E. Clark.

⁸³ From 42 U.S.C. §8259b, the term *Energy Star product* means “a product that is rated for energy efficiency under an Energy Star program,” and the term *FEMP designated product* means “a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of equivalent products for energy efficiency.” For information on the Energy Star program, see CRS In Focus IF10753, *ENERGY STAR Program*, by Corrie E. Clark. For more on DOE’s Federal Energy Management Program, see Office of Energy Efficiency and Renewable Energy, “Federal Energy Management Program,” at <https://www.energy.gov/eere/femp/federal-energy-management-program>.

⁸⁴ Council on Environmental Quality, *Guiding Principles for Sustainable Federal Buildings and Associated Instructions*, CEQ-OFS-2020-1, December 2020, at https://www.sustainability.gov/pdfs/guiding_principles_for_sustainable_federal_buildings.pdf (hereinafter, CEQ, *Sustainable Federal Buildings*).

⁸⁵ Energy Star, “Green Building and ENERGY STAR,” at https://www.energystar.gov/buildings/about_us/green_buildings_and_energy_star; and Office of Energy Efficiency and Renewable Energy, “Zero Energy Buildings Resources Hub,” at <https://www.energy.gov/eere/buildings/zero-energy-buildings-resource-hub>. See also CRS Report R46719, *Green Building Overview and Issues*, by Corrie E. Clark.

⁸⁶ CEQ, *Sustainable Federal Buildings*.

severe thunderstorms.⁸⁷ FORTIFIED is a voluntary construction and re-roofing program, offering a third-party verified designation certificate for homes and commercial buildings that are strengthened against severe weather such as high winds, hail, hurricanes, and tornadoes.⁸⁸ The IBHS also produces a *Rating the States* report to evaluate building code adoption and enforcement in 18 states that are vulnerable to hurricanes along the Atlantic and Gulf coasts.⁸⁹

Table 3. Examples of Green Building Certifications

Certification System	Type of Certification	Organization	Focus Areas
Energy Star	Green building or product rating and certification through the federal government relying on third-party data or testing from building or product manufacturers	U.S. Environmental Protection Agency (EPA) and Department of Energy (DOE)	Energy, indoor environment, waste reduction, lifecycle management, and more
WaterSense	Green building or product rating and certification through the federal government relying on third-party data or testing from building or product manufacturers	EPA	Water
Leadership in Energy and Environmental Design (LEED)	Green building rating and certification through independent third-party verification	U.S. Green Building Council	Energy, water, indoor environment, waste reduction, lifecycle management, and more
Building Research Establishment Environmental Assessment Method (BREEAM)	Green building and infrastructure rating and certification through independent third-party verification	BRE Global	Energy, water, indoor environment, waste reduction, lifecycle management, and more
Green Globes	Science-based building rating system for new construction and existing buildings	Green Building Initiative	Energy, water, indoor environment, waste reduction, lifecycle management, and more
Living Building Challenge	Performance-based standard and certification for landscape, infrastructure, buildings, and community design	International Living Future Institute	Energy, water, materials, place, health and happiness, equity, and beauty (must meet all the specified performance goals in these categories)

Source: Energy Star: ENERGY STAR, “The Simple Choice for Saving Energy,” at <https://www.energystar.gov/>. WaterSense: EPA, “WaterSense,” at <https://www.epa.gov/watersense>. LEED: U.S. Green Building Council, “LEED Rating System,” at <https://www.usgbc.org/leed>. BREEAM: BRE, “BREEAM USA,” at <https://bregroup.com/products/breeam/breeam-usa/>. Green Globes: Green Building Initiative, “Why Green Globes?,” at <https://www.greenbuildinginitiative.com/why-green-globes/>.

⁸⁷ The Insurance Institute for Business and Home Safety (IBHS) is a nonprofit organization supported by property insurers and reinsurers that conducts research to identify and promote the most effective ways to strengthen buildings and communities against natural disasters and other causes of loss. For more information about IBHS projects to help home owners and business owners protect their property from different hazards, see IBHS, “Diastersafety.org,” at <https://disastersafety.org/>.

⁸⁸ IBHS FORTIFIED, “What Is Fortified?,” at <https://fortifiedhome.org/solutions/>.

⁸⁹ IBHS, *Rating the States 2021: Hurricane Coast*, at <https://ibhs.org/public-policy/rating-the-states/>.

<https://thegbi.org/green-globes-certification/why-green-globes/>. Living Building Challenge: International Living Future Institute, “Help Create a Living Future for All,” at <https://living-future.org/>.

Fire Codes

What Are Fire Codes?

Fire codes set minimum requirements for fire prevention and fire protection systems in new and existing buildings. Their purpose is to (1) prevent fires and explosions and (2) protect people and property in case of fire or explosion.

Most fire codes define different fire safety requirements for different types of buildings (e.g., single-family homes, high-rise buildings, shopping centers, daycare facilities, nursing homes) and different activities (e.g., storage of explosive or hazardous materials, welding, open fires, large gatherings of people). Generally, fire codes may address the following:

- Requirements for fire access roads, fire hydrants, and water supply
- Installation of fire detection and alarm systems, sprinkler systems, and portable fire extinguishers
- Number of access doors, means of egress, and occupant load
- Permitting of special activities that present unique fire risks, such as storage of fireworks, use of hazardous materials, amusement rides, and battery storage facilities
- Emergency response planning, such as evacuation plans, notification of the fire department, and providing the fire department with a floor plan
- Inspection and enforcement duties of the fire official

What Is the Difference Between Building Codes and Fire Codes?

Generally, a building code defines minimum requirements for the design and construction of buildings to ensure the safety, health, and general welfare of the occupants of the building and the public.⁹⁰ They ensure the structural integrity of buildings and protect people from a wide array of hazards (e.g., fires, earthquakes).⁹¹ Among the many requirements in state and local building codes, most include requirements to avoid fire spread (e.g., requirements for firewalls, fire resistant materials, fire doors), for fire detection and suppression systems (e.g., smoke detectors, fire alarm systems, sprinkler systems), and for rapid evacuation (e.g., means of egress). Fire experts estimate that about 75% of an SLTT building code deals with fire safety.⁹² For example, a nightclub may be required to install a sprinkler system and include proper egress under the building code.⁹³ Thus, some fire code requirements are integrated into initial construction and inspected prior to occupancy. The fire code also may include occupancy limits and maintenance of sprinkler systems, which require ongoing inspection and enforcement. Although fire

⁹⁰ NFPA, “Reporter’s Guide: About Codes and Standards,” at <https://www.nfpa.org/Newsand-Research/Publications-and-media/Press-Room/Reporters-Guide-to-Fire-and-NFPA/About-codes-and-standards>.

⁹¹ See the “Building Codes” section of this report.

⁹² Glenn P. Corbett and Francis L. Brannigan, *Brannigan’s Building Construction for the Fire Service*, 6th ed. (Jones & Bartlett Learning, 2019), p. 87.

⁹³ *Ibid.*

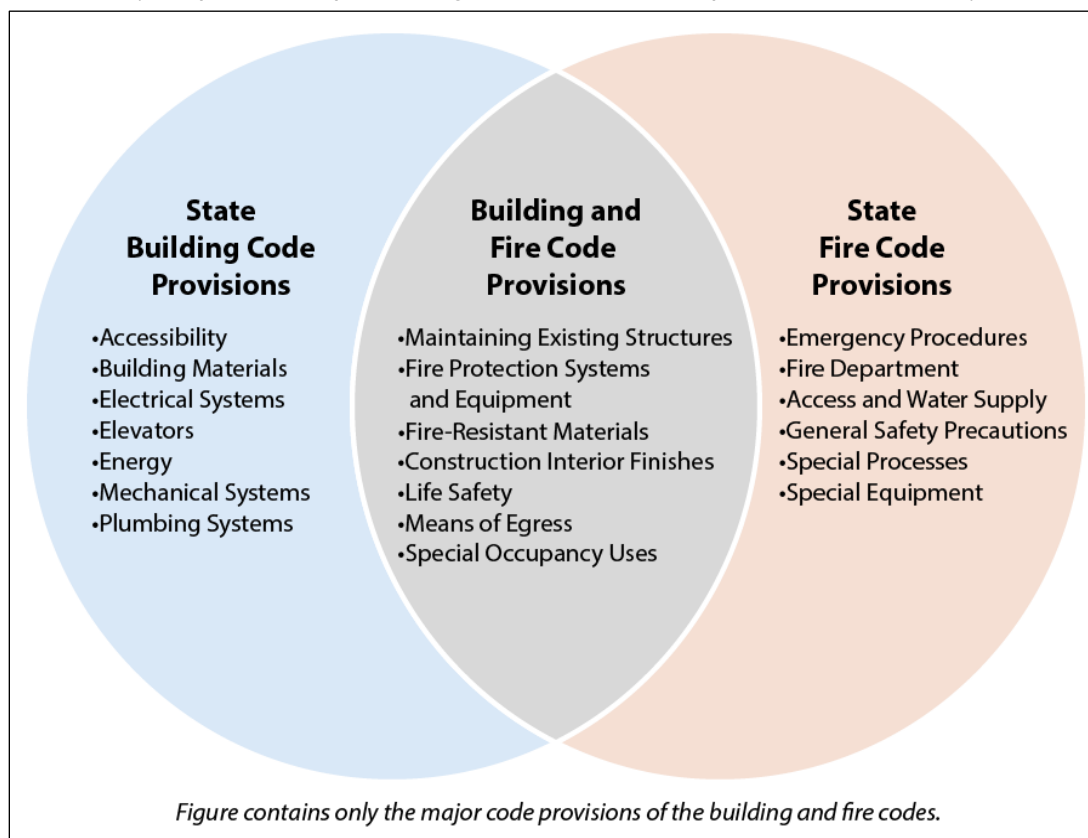
prevention and safety requirements are integrated into building codes, the specific requirements, certifications, and enforcement regimes are determined by the jurisdiction that has authority.

Model building codes often reference model fire codes and standards. The standards referenced may dictate acceptable fire suppression equipment (e.g., sprinklers) and proper installation of fire suppression equipment. In turn, SLTT building codes may reference model fire codes and specific standards governing installation or other factors. SLTT governments can amend these model codes to suit their needs.⁹⁴

Often, the building code is enforced by government building code officials with the support of fire officials (e.g., review of site plans, review of design and construction plans, inspection and testing of fire detection and suppression systems preoccupancy), whereas the fire code is often implemented and enforced by fire officials. Since fire officials inspect for some requirements in the building code, there is often overlap in requirements in the building code and fire code or reference to building code requirements in the fire code (**Figure 1**). The intent is to take fire prevention and safety into account during and after construction.

⁹⁴ As an example, see the New York City Buildings Department, “Project Categories: Building Systems Installation & Modifications: Sprinkler,” <https://www.nyc.gov/site/buildings/dob/project-categories-sprinkler.page>. (It states, “The New York City Building Code requires the installation of automatic sprinklers be based on several factors, such as the height and size of the building, occupancy classifications, fire areas, occupant loads, the layout of partitions, fire-rated construction, and the contents or hazards present in the building. In general, Building Code Chapter 9 and Building Code Appendix Q, which amends references to various National Fire Protection Association (NFPA) standards, governs the sprinkler system application, installation, and design.”)

Figure I. Overlap in Building Code and Fire Code
 (example of overlap in building code and fire code requirements in Minnesota)



Source: Congressional Research Service (adapted from the Office of the Legislative Auditor, Program Evaluation Division, “State Building Code,” at <https://www.auditor.leg.state.mn.us/ped/1999/sbc99.htm>).

Notes: This graphic shows the overlap in requirements between the 2020 Minnesota Building Code, based on the 2018 International Building Code, and the 2020 Minnesota State Fire Code, based on the 2018 International Fire Code.

What Are Fire Standards?

A fire standard may be a technical standard, such as how manufacturers must build smoke alarms or carbon monoxide detectors and how they must perform. A fire standard also may apply to a building element, system, or instrument installed in the building. The National Fire Protection Association notes that model codes describe *when* to implement a requirement, whereas standards describe *how* to implement a requirement (see “Model Building Codes” and “Standards” sections). In some cases, standards may be cited in model codes. For example, the International Building Code stipulates that when installing smoke detectors in high-rise buildings, property owners should periodically test the systems in accordance with certain standards—the NFPA 4 Standard for Integrated Fire Protection and Life Safety System Testing.⁹⁵ In NFPA 70, the National Electrical Code references many standards, including the NFPA 75 Standard for the Fire Protection of Information Technology Equipment.

⁹⁵ ICC, “Chapter 9: Fire Protection and Life Safety Systems,” in *2018 International Building Code*, at <https://codes.iccsafe.org/content/IBC2018/chapter-9-fire-protection-and-life-safety-systems>. (See 901.6.2.1 High-rise building.)

Who Develops Standards for Fire Safety and Performance?

Standards developing organizations, such as the Underwriters Laboratories and the National Fire Protection Association, help develop technical standards for fire safety and performance. Federal agencies, such as the Consumer Product Safety Commission and NIST, contribute to standards development.⁹⁶ For example, NIST conducts structural testing of beams and floors to discover how real-world structures could collapse during building fires.⁹⁷ The results of laboratory testing by industry and federal agencies help inform model codes and standards. A standard also may refer to an optimal way of installing technologies. For example, when automatic sprinkler systems were first developed, there were nine different pipe sizes; industry stakeholders, such as manufacturers and the insurance industry, developed a uniform standard (i.e., measures) for sprinklers and standards for the installation of sprinklers.⁹⁸ Like model codes, standards are not law. States and localities are not required to adopt them or use standards (see “Standards” section).

Can State, Local, Tribal, or Territorial Entities Require Certain Fire Protections for Buildings?

In home rule states, where the state’s constitution grants municipalities and counties the authority to pass laws to govern themselves, local governments may write and adopt their own fire code.⁹⁹ For non-home rule states, states take different approaches. Some states have adopted mandatory statewide codes, which means local jurisdictions must follow the code adopted by the state legislature. Other states have adopted minimum statewide codes, which means local government must follow at least those minimum requirements and may choose to adopt more stringent requirements or additional requirements not in the statewide code. Some states adopt and enforce a statewide code, whereas other states leave enforcement to local jurisdictions. Some states may reference model codes in state law, or apply those codes to state-owned buildings or certain types of buildings (e.g., factories), but allow localities to write and adopt their own code; in some cases, localities adopt the state code in full or with amendments.¹⁰⁰

Like states, U.S. territories and tribal nations also may adopt model fire codes. They often leverage the same model codes and adopt them in full, in part, or with amendments to meet their local needs and preferences.¹⁰¹

⁹⁶ U.S. Consumer Product Safety Commission, “Smoke Alarms,” July 10, 2012, at [https://www.cpsc.gov/Regulations-Laws—Standards/Voluntary-Standards/Topics/Smoke Alarms#](https://www.cpsc.gov/Regulations-Laws—Standards/Voluntary-Standards/Topics/Smoke%20Alarms#).

⁹⁷ NIST, “How Fire Causes Office-Building Floors to Collapse,” press release, March 24, 2020, at <https://www.nist.gov/newsevents/news/2020/03/how-fire-causes-office-building-floors-collapse>.

⁹⁸ NFPA, “Reporter’s Guide: About Codes and Standards,” at <https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/Reporters-Guide-to-Fire-and-NFPA/About-codes-and-standards>.

⁹⁹ For an overview of states and the different approaches to code applicability, see Insurance Institute for Business and Home Safety, “Building Codes by State,” <https://ibhs.org/public-policy/building-codes-by-state/>.

¹⁰⁰ For example, see NFPA Code Finder, at <https://codefinder.nfpa.org/?country=United%20States%20of%20America&state=Arizona&nfpnumber=1>, which notes where states have adopted certain NFPA codes, and where municipalities and counties reference those codes.

¹⁰¹ As an example, see EPA, “Tribal Green Building Code Guidance,” last updated January 30, 2023, at <https://www.epa.gov/green-building-tools-tribes/tribal-green-building-code-guidance#bc>. The guidance discusses the Kayenta Township, Navajo Nation adoption of building codes.

How Do State, Local, Tribal, and Territorial Entities Adopt a Fire Code?

SLTTs typically develop fire codes using language from model fire codes created by standards developing organizations. SLTT governments may adopt the model code in full or amend the model code to suit their needs and preferences.¹⁰² This means that fire codes often vary from jurisdiction to jurisdiction.¹⁰³ States often reference the model fire code they use and indicate if they made amendments to that code. For example, North Carolina lists its latest fire code, the *2018 North Carolina Fire Prevention Code*, as based on the International Fire Code 2015, with North Carolina amendments.¹⁰⁴

Which Model Fire Codes Do State, Local, Tribal, and Territorial Entities Use?

The two commonly adopted model fire codes in the United States are the International Fire Code by the International Code Council and the National Fire Protection Association 1: Fire Code (NFPA-1).¹⁰⁵

Do State, Local, Tribal, and Territorial Entities Update Their Fire Codes?

Standards developing organizations update their model fire codes every three years. SLTTs may, from time to time, update their fire codes to incorporate new model code provisions and standards.

Do Fire Codes Vary by Building Type?

Most SLTTs regulate buildings in their jurisdiction based on occupancy and the activities expected to occur in the building. Occupancy often drives which fire codes apply. For example, while there are comprehensive fire suppression systems such as smoke detectors, fire alarms, and sprinkler systems to suppress or extinguish fires, model codes do not recommend use of these systems in all buildings or for all spaces.¹⁰⁶ For example, SLTT codes may require sprinkler systems in dormitories but not in single-family homes. Standards developing organizations may recommend requirements for sprinklers in single-family homes to save lives and protect property,

¹⁰² Quick Response Fire Supply, “#226 – The Conflict over Residential Fire Sprinkler Requirements, Part 1,” July 12, 2019, at <https://blog.qrfs.com/226-the-conflict-over-residential-fire-sprinkler-requirements-part-1/>. (Discussing a new recommendation in an ICC code to require sprinkler systems in one- and two-family dwellings, and how some states are adopting it and other states are prohibiting its implementation through legislation.)

¹⁰³ The code adoption process also varies from jurisdiction to jurisdiction. See ICC, “Code Adoption Process by State,” at https://www.iccsafe.org/wp-content/uploads/adoption_ordinances/HowStatesAdopt_I-Codes.pdf.

¹⁰⁴ ICC, “Code Adoptions,” at <https://www.iccsafe.org/adoptions/global-codes>.

¹⁰⁵ ICC, *2021 International Fire Code*, at <https://codes.iccsafe.org/content/IFC2021P2>; and NFPA, “Codes and Standards,” at <https://www.nfpa.org/Codes-and-Standards/All-Codes-and-Standards/List-of-Codes-and-Standards>.

¹⁰⁶ For example, see ICC, Section 903.2, in *2018 International Fire Code (IFC)*, at <https://codes.iccsafe.org/content/IFC2018/chapter-9-fire-protection-and-life-safety-systems>.

but it is ultimately up to the state or local jurisdiction to specify which fire safety systems apply to various buildings in the jurisdiction.¹⁰⁷

Are Changes to Fire Codes Retroactive?

Fire codes can be retroactive, if jurisdictions adopt language making them retroactive. In some cases, jurisdictions may require that buildings comply with certain requirements within a certain period of time (e.g., requiring fire alarm systems in schools). In most cases, SLTTs apply fire codes to new buildings and typically do not require that existing buildings meet new or updated fire codes adopted by the jurisdiction. However, if the owner sells or significantly renovates the building, then new and updated fire codes may apply.¹⁰⁸ In addition, if a fire official identifies a hazard (e.g., blockage of fire lanes, exceeding occupancy load), fire officials can, in many cases, require that the building owner correct the hazard.

Who Enforces Fire Codes?

Typically, fire officials—a fire marshal or fire chief—are responsible for enforcing the fire code. SLTTs often specify roles and responsibilities of the fire official in their fire code and codify those roles and responsibilities in state law or local ordinance. In many jurisdictions, SLTTs direct fire officials to review and approve building plans before permits for construction are issued, to inspect and test fire safety systems pre-occupancy, and to conduct ongoing inspection and enforcement of the fire code post-construction.¹⁰⁹ However, just as fire codes vary across jurisdictions, so do the roles of the fire marshal and the levels of enforcement.¹¹⁰

Building Energy Codes

What Are Building Energy Codes?

Building energy codes specify minimum energy efficiency standards for new buildings and major renovations. Building energy codes commonly mandate certain energy efficiency characteristics for building technologies. Beyond certain federally mandated minimum requirements, it is left to states to determine the contents of the codes that regulate buildings within their jurisdictions. This allows flexibility with the codes to meet a specific region’s priorities.

The Energy Policy Act of 1992 (EPA 92; P.L. 102-486) established a baseline for energy efficiency in building codes. In addition to establishing a baseline for energy efficiency, EPA 92

¹⁰⁷ As an example, see EPA, “Tribal Green Building Code Guidance,” last updated January 30, 2023, at <https://www.epa.gov/green-building-tools-tribes/tribal-green-building-code-guidance#bc>. (Noting that the Kayenta Township, Navajo Nation, chose to adopt a 2006 ICC code rather than a 2009 ICC code because the 2009 code required residential fire sprinklers, which the township did not think were appropriate for new homes in its jurisdiction.)

¹⁰⁸ Robin Zevotek, “Do All Buildings Have to Comply with the Latest Code?,” *NFPA Today* (blog), NFPA, May 27, 2022, at <https://www.nfpa.org/News-and-Research/Publications-and-media/Blogs-Landing-Page/NFPA-Today/Blog-Posts/2022/05/27/Do-all-buildings-have-to-comply-with-the-latest-code>.

¹⁰⁹ For example, see Prince William County (VA), Fire Marshal’s Office, “ePlans: Plan Review and Inspections (New Construction),” at <https://www.pwcva.gov/departments/fire-marshals-office/eplans>. (See the process flow chart delineating the role of the customer [building owner/builder], the building department, and the Fire Marshal.)

¹¹⁰ For an example of overlapping jurisdiction and enforcement responsibilities, see transcript from field hearing on fire safety in federally assisted housing, at U.S. Congress, House Committee on Financial Services, Subcommittee on Housing, Community Development, and Insurance, *A Matter of Life and Death: Improving Fire Safety in Federally Assisted Housing*, 117th Cong., 2nd sess., April 20, 2022, Serial No. 117-79.

authorized DOE to provide technical assistance to states to support the implementation of model residential and commercial building energy codes (42 U.S.C. §6833).

What Are Voluntary Building Energy Codes?

Voluntary building energy codes are effectively model building energy codes or standards that are developed and maintained by a standards developing organization (see “Standards” section). A *voluntary building energy code* is defined in 42 U.S.C. §6832(14) as “a building energy code developed and updated through a consensus process among interested persons, such as that used by the Council of American Building Officials; the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE); or other appropriate organizations.” ASHRAE is responsible for maintaining Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, which can be used for commercial buildings and multifamily residential buildings.¹¹¹ The International Code Council is responsible for maintaining the International Energy Conservation Code, which contains separate provisions for commercial buildings and low-rise residential buildings (see “Model Building Codes” section).

Section 307 of the Energy Conservation and Production Act (ECPA; P.L. 94-385), as amended, directs the DOE to periodically review the technical and economic basis of voluntary building energy codes, recommend amendments to the codes, seek the adoption of technologically feasible and economically justified energy efficiency measures, and participate in any industry process for review and modification of the codes.

What Is the Department of Energy’s Role in Building Energy Codes and Standards?

In addition to DOE’s role in voluntary building energy codes, DOE has a role in the development, adoption, and compliance of building energy codes. DOE requirements are specified under Section 304(a) of the Energy Conservation and Production Act (ECPA; P.L. 94-385) for residential buildings and under Section 304(b) of ECPA for commercial buildings.

Section 304(a) of ECPA, as amended, provides that when a model building energy code is revised, the Secretary of Energy must determine whether the revision would improve energy efficiency in residential buildings and must publish a notice of determination in the *Federal Register*. If the Secretary determines that a revision to the residential code would improve energy efficiency, then each state is required to certify to DOE that the state has compared its existing residential building code with the revised code and made a determination whether to revise the state’s code to meet or exceed the revised model building energy code.

Section 304(b) of ECPA, as amended, provides that when the American Society of Heating, Refrigerating, and Air-Conditioning Engineers Standard 90.1 (or any successor standard) is revised, the Secretary of Energy must determine whether the revision would improve energy efficiency in commercial buildings and must publish a notice of determination in the *Federal Register*. If the Secretary determines that a revision to the commercial standard would improve

¹¹¹ ASHRAE, “Standard 90.1-2022 – Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings,” at <https://www.ashrae.org/technical-resources/bookstore/standard-90-1>. Note that Standard 90.1 may be referred to as ANSI/IES/ASHRAE Standard 90.1, ANSI/ASHRAE Standard 90.1 or ASHRAE Standard 90.1 because it is ANSI approved and IES co-sponsored. ANSI is the American National Standards Institute and IES is the Industrial Electronics Society, a group organized within the Institute of Electrical and Electronics Engineers (IEEE). IEEE.org, “IEEE Advancing Technology for Humanity,” at <https://www.ieee.org/>. Hereinafter in this report, it is referred to as Standard 90.1.

energy efficiency, then each state is required to certify to DOE that the state has reviewed and updated its commercial building code in accordance with the revised standard.

ECPA, as amended, also provides for extensions, technical assistance, and incentive funding. Section 304(c) of ECPA, as amended, requires the Secretary of Energy to permit extensions of deadlines for certification of residential and commercial building codes regarding energy efficiency if a state demonstrates that it has “made a good faith effort to comply” and that it has made significant progress in compliance. Section 304(d) of ECPA, as amended, directs DOE to provide technical assistance to states to improve and implement energy efficiency codes or to “otherwise promote the design and construction of energy efficiency buildings.”¹¹²

Federal Role: Code Requirements

Federal programs—such as federally owned buildings, federal housing-related programs, and federal assistance programs for hazard insurance or mitigation grants—are often subject to certain model code requirements either in lieu of or in addition to the building codes and standards adopted by SLTTs. These additional requirements are generally intended to ensure federal program requirements are met and buildings satisfy health, safety, and other performance measures required by the programs. Some federal programs include periodic inspection for enforcement purposes. In addition, the federal government has set forth codes and standards for manufactured housing in lieu of SLTT building codes and standards.

What Building Codes May Apply to Federal Buildings?

Federal entities must construct new buildings or alter existing buildings (i.e., federal buildings that are owned or leased by the federal government) using the latest edition of one of the “nationally recognized model building codes” (Public Buildings Amendments of 1988; P.L. 100-678, 40 U.S.C. §3312). Federal agencies have policies in place to grant waivers or exemptions from certain building code requirements under some circumstances.¹¹³ GSA establishes design standards and performance criteria for the GSA Public Buildings Service in *Facilities Standards for the Public Buildings Service* (P100). P100 contains policy and technical criteria for the programming, design, and documentation of GSA buildings, including model building code criteria (see “Model Building Codes” and “Standards” sections).¹¹⁴

In addition, CEQ published *Guiding Principles for Sustainable Federal Buildings* in 2020. The document outlines the sustainable building principles and practices established through statutory and executive policies for federal buildings. The principles guide agencies in designing, locating, constructing, maintaining, and operating federal buildings in a sustainable manner that increases efficiency, optimizes performance, eliminates unnecessary use of resources, ensures the health of occupants, protects the environment, generates cost savings, and mitigates risks to assets. The six

¹¹² For more information on the Department of Energy’s (DOE’s) role in voluntary building energy codes, see DOE, “Building Energy Codes Program,” <https://www.energycodes.gov/>.

¹¹³ In particular, the federal statute regarding following nationally recognized model building codes (40 U.S.C. §3312) has a national security waiver.

40 U.S.C. §3312a(2) National security waiver.—

This section does not apply to a building for which the Administrator of General Services or the head of the federal agency authorized to construct or alter the building decides that the application of this section to the building would adversely affect national security. A decision under this subsection is not subject to administrative or judicial review.

¹¹⁴ GSA, “Facilities Standards (P100) Overview,” at <https://www.gsa.gov/real-estate/design-and-construction/engineering-and-architecture/facilities-standards-p100-overview>.

guiding principles are as follows: (1) Employ Integrated Design Principles, (2) Optimize Energy Performance, (3) Protect and Conserve Water, (4) Enhance the Indoor Environment, (5) Reduce the Environmental Impact of Materials, and (6) Assess and Consider Building Resilience. The guidance addresses climate change risks, natural hazards risks, and other risks. The guidance specifically mentions that federal buildings should conform to the 2018 International Green Construction Code, which are model building codes from the International Code Council, and includes a list of green building certifications that federal agencies may use (see “What Types of Certifications Are Commonly Used in the United States?” section).¹¹⁵

What Fire Safety Systems May Apply to Federal Buildings?

Under the authority of the Federal Fire Prevention and Control Act of 1974 (P.L. 93-498), as amended (15 U.S.C. §2227), no federal funds may be used for certain federal employee office buildings unless the buildings are protected by automatic sprinkler systems or an “equivalent level of safety.”¹¹⁶ In addition, no federal funds may be used for construction, purchase, lease, or operation by the federal government of housing for federal employees or their dependents unless the housing is protected by automatic sprinkler systems (or equivalent level of safety) and smoke detectors.¹¹⁷ Pursuant to the federal statute, the terms *automatic sprinkler system* and *smoke detector* are defined to be in accordance with certain National Fire Protection Association standards or any successor standards. The Administrator of the General Services, in cooperation with the United States Fire Administration, NIST, and the Department of Defense, is to promulgate regulations to further define the term *equivalent level of safety* and, to the extent practicable, to base those regulations on “nationally recognized codes.”

These requirements should not be construed to supersede any federal guidelines that call for a higher level of fire safety protection or to limit the power of any state or local jurisdiction that establishes requirements for fire prevention and control. In essence, nothing in the federal statute may reduce fire resistance.

What Building Energy Codes May Apply to Federal Buildings?

The Secretary of Energy is directed to establish, by rule, federal building energy efficiency standards under Section 305 of the Energy Conservation and Production Act (ECPA; 42 U.S.C. §6834). The federal building energy standards are to be technologically feasible and economically justified. The standards must contain energy savings and renewable energy specifications that meet or exceed those in the referenced International Energy Conservation Code (for residential buildings) or referenced Standard 90.1 (for commercial buildings).¹¹⁸ Energy efficiency performance standards established by DOE for new federal buildings must require, if life-cycle cost effective, that buildings be designed to achieve energy consumption levels that are at least 30% below energy consumption levels established in referenced codes and standards. Energy efficiency performance standards also must require that sustainable design principles be applied to the siting, design, and construction of all new and replacement buildings. No later than one year after the date of approval of each subsequent revision of a voluntary building energy code or standard, DOE must determine whether to amend the federal building energy efficiency standards

¹¹⁵ CEQ, *Sustainable Federal Buildings*; and ICC, “The International Codes (I-Codes),” at <https://www.iccsafe.org/products-and-services/i-codes/the-i-codes/>.

¹¹⁶ Excludes office buildings occupied by 25 or fewer federal employees.

¹¹⁷ Housing assistance does not include assistance provided by the Secretary of Veteran Affairs, FEMA, the Secretary of Housing and Urban Development and various other federal housing programs listed in 15 U.S.C. §2227(a) (5)(B).

¹¹⁸ See footnote 111 for more about Standard 90.1.

with the revised voluntary standard based on the cost-effectiveness of the revised voluntary standard (42 U.S.C. 6834(a)(3)(B)).

Section 306(a) of ECPA, as amended, directs the head of each federal agency, including the Architect of the Capitol, to adopt procedures to assure that new federal buildings meet or exceed the federal building energy standards established under Section 305. Section 306(b) of ECPA, as amended, permits heads of agencies to expend federal funds for the construction of new federal buildings only if the building meets or exceeds the appropriate federal building energy standard established under Section 305.¹¹⁹

What Building Codes May Apply to Military Buildings and Structures?

The Department of Defense (DOD) publishes building codes in a document known as the Uniform Facilities Criteria (UFC), or UFC 1-200-01.¹²⁰ The DOD's UFC applies to the Military Departments (Departments of the Army, Navy and Air Force), the Defense Agencies, and the DOD Field Activities.

The UFC directs the use of numerous consensus-based standards for building codes, including the International Code Council model building codes—the International Building Code, International Existing Building Code, and International Green Construction Code (see “Model Building Codes” section). Instances where DOD building codes vary from those standards are outlined in the UFC. Instances where UFC requires military-specific codes include the following:

- Physical security measures to protect specific personnel, equipment, or documents
- Anti-terrorism safety measures on buildings inside and outside the United States
- Facilities that involve the use or handling of ammunition or explosives

The UFC is overseen by the Deputy Assistant Secretary of Defense for Construction.

What Building Codes Apply to Manufactured Housing?

Unlike other types of homes, which are subject to state and local building codes, manufactured homes constructed on or after June 15, 1976,¹²¹ must comply with the federal Manufactured Home Construction and Safety Standards (MHCSS).¹²² The MHCSS, sometimes referred to as the “HUD Code,” are issued by HUD and established under the authority of the National Manufactured Housing Construction and Safety Standards Act of 1974, as amended (42 U.S.C. §§5401-5426). The purposes of the law, as amended, include protecting the quality, durability, safety, and affordability of manufactured homes and providing for the establishment of uniform

¹¹⁹ The current federal building energy efficiency performance standards are established in 10 C.F.R. 433 for new commercial and multi-family high-rise residential buildings and 10 C.F.R. 435 for new federal low-rise residential buildings.

¹²⁰ Department of Defense, Uniformed Facilities Criteria, USD (AT&L) Memorandum, May 29, 2002, at https://www.wbdg.org/FFC/DOD/ufc_implementation.pdf.

¹²¹ *Manufactured homes* are defined at 42 U.S.C. §5402. Unlike other types of factory-built homes, such as modular homes, manufactured homes are built on a permanent chassis. Modular and other types of factory-built homes are subject to the same local building codes as site-built homes.

¹²² HUD's regulations related to manufactured housing are at Title 24 C.F.R parts 3280, 3282, 3284, 3285, 3286, 3288, and 3800, at <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280?toc=1>. The construction and safety standards, specifically, are at 24 C.F.R. Part 3280.

standards for manufactured homes.¹²³ A uniform standard reduces the costs and burdens to manufacturers of ensuring compliance with multiple different codes, since manufactured homes constructed in one state may be shipped to other states to be installed.¹²⁴ HUD's development of the MHCSS was informed by existing codes and standards,¹²⁵ and updates to the MHCSS may take into account existing codes and standards.¹²⁶ Many MHCSS requirements refer to existing codes and standards that are incorporated *by reference*.¹²⁷

The MHCSS address various aspects of manufactured home construction, including planning and design; fire safety; body and frame construction; testing; thermal protection; plumbing systems; heating, cooling, and fuel burning systems; electrical systems; and transportation. Although HUD issues the MHCSS, DOE sets energy conservation standards for manufactured homes (see "What Energy Efficiency Standards Apply to Manufactured Housing?" section). The MHCSS preempt state and local requirements, meaning states and local governments cannot set different standards related to any aspect of manufactured housing performance addressed by the MHCSS.¹²⁸ HUD updates the MHCSS periodically with input from the Manufactured Housing Consensus Committee, which includes members representing manufactured housing producers or retailers, consumers, and general interest and public officials.¹²⁹

¹²³ 42 U.S.C. §5401.

¹²⁴ See, for example, HUD Office of Policy Development and Research, "HUD Standards for Manufactured Housing," *Evidence Matters*, Winter/Spring 2020, at <https://www.huduser.gov/portal/periodicals/em/WinterSpring20/highlight1-sidebar1.html>.

¹²⁵ In particular, the Manufactured Home Construction and Safety Standards (MHCSS) drew substantially from the existing National Fire Protection Association Standards for manufactured homes. The 1975 MHCSS proposed rule noted that

HUD determined that the most appropriate course of action ... would be to develop a complete Federal standard covering mobile home construction and safety rather than adopt, by reference, all or part of the standards or codes for mobile homes currently in use. HUD, however, considered it useful and appropriate to utilize existing codes and standards in the development process rather than writing Federal standards without considering available sources. HUD has, therefore, very carefully reviewed existing codes and standards and has, in the proposed Federal standards, made every effort to assure reasonable continuity in the requirements for mobile home design, construction and performance while at the same time meeting the statutory mandate for upgrading, where appropriate, to provide greater quality, durability, and safety.

See 40 *Federal Register* 26930. It also noted that "Although HUD utilized a variety of sources in arriving at the proposed Federal standard, significant portions of the standard have come from the 'Standard for Mobile Homes,' NFPA 501B." See 40 *Federal Register* 26931.

¹²⁶ For example, a HUD regulatory impact analysis prepared in relation to a 2021 final rule that amended the MHCSS noted that some of the amendments were made "to remain on par with several aspects of the International Residential Code (IRC), which serves as the basis for state and local building codes... Updates based on the IRC are generally safety-based and ensure manufactured homes contain the same or similar safety standards as site-built homes." See HUD, *Regulatory Impact Analysis of FR-6149-F-02: Manufactured Home Construction and Safety Standards*, December 16, 2020, at <https://www.regulations.gov/document/HUD-2020-0015-0047>. However, the preamble to the final rule notes, "While some language may be consistent between the IRC, state and local codes, and the requirements published in this rule, there are differences that remain and justify establishment of unique provisions rather than incorporating the IRC or any given state or local code in their entirety." See HUD, "Manufactured Home Construction and Safety Standards," 86 *Federal Register* 2496-2526, January 12, 2021.

¹²⁷ *By reference* generally means that a certain number of copies (typically one) of the codes or standards must be maintained by a government entity (typically a printed copy available at one or more specified building department offices). See for example, UT Municipal Technical Advisory, "Building Codes Adopted by Reference," at <https://www.mtas.tennessee.edu/reference/adopting-building-codes-reference>. See 24 C.F.R. §3280.4 for how HUD incorporates by reference.

¹²⁸ 42 U.S.C. 5403(d).

¹²⁹ For more information on the Manufactured Housing Consensus Committee, see HUD, "Manufactured Housing Consensus Committee," at https://www.hud.gov/program_offices/housing/rmra/mhs/cc1.

In 2000, Congress amended the statute to direct HUD to establish the Model Manufactured Home Installation Standards,¹³⁰ which went into effect in 2008.¹³¹ Unlike the MHCSS, the Model Manufactured Home Installation Standards do not preempt state requirements. Rather, they establish minimum standards for the installation of manufactured homes, but states can set installation requirements that exceed the Model Manufactured Home Installation Standards.¹³²

What Energy Efficiency Standards Apply to Manufactured Housing?

DOE is required to establish energy efficiency standards for manufactured housing under Section 413 of the Energy Independence and Security Act of 2007 (EISA; P.L. 110-140). EISA directs that, after notice and opportunity for comment by manufacturers and other interested parties and after consultation with HUD, DOE uses the most recent version of the International Energy Conservation Code (IECC), including supplements, except when the Secretary finds that the code is not cost-effective or that “a more stringent standard would be more cost-effective, based upon the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operating costs.” The energy efficiency standards must be updated not later than one year after any revision to the IECC.

Section 413 of EISA also provides for enforcement. Any manufacturer that violates the energy efficiency standards is liable for a civil penalty in an amount not to exceed 1% of the manufacturer’s retail list price of the manufactured housing.

DOE published a final rule establishing these standards in May 2022.¹³³ The compliance date for the rule was scheduled to be May 31, 2023; however, on May 30, 2023, DOE issued a final rule delaying compliance “to allow DOE more time to establish enforcement procedures that provide clarity for manufacturers and other stakeholders regarding DOE’s expectations of manufacturers and DOE’s plans for enforcing the standards.”¹³⁴

What Building Codes Apply to Federal Housing Programs?

The federal government supports the development and maintenance of housing through a range of programs and activities, including grants, loans, mortgage insurance, rental assistance, and tax credits. These programs may support new construction, rehabilitation, or acquisition of housing. HUD administers many of these programs, but some are administered by other federal agencies.

In general, the federal government requires housing that is newly constructed or substantially rehabilitated under most federal programs to meet one of the nationally recognized model building codes or a state or local building code that meets standards set by the relevant federal

¹³⁰ 42 U.S.C. §5404.

¹³¹ HUD, “Model Manufactured Home Installation Standards,” 72 *Federal Register* 59337-59395, October 19, 2007, at <https://www.federalregister.gov/documents/2007/10/19/07-5004/model-manufactured-home-installation-standards>. The model installation standards are at 24 C.F.R. part 3285.

¹³² For HUD’s discussion of public comments received related to the Model Manufactured Home Installation Standards and preemption, see HUD’s final rule promulgating the model installation standards at 72 *Federal Register* 59338.

¹³³ DOE, “Energy Conservation Program: Energy Conservation Standards for Manufactured Housing,” 87 *Federal Register* 32728-32824, May 31, 2022, at <https://www.federalregister.gov/documents/2022/05/31/2022-10926/energy-conservation-program-energy-conservation-standards-for-manufactured-housing>.

¹³⁴ Manufacturers have until July 1, 2025, to comply for Tier 2 homes and until 60 days after issuance of enforcement procedures for Tier 1 homes. DOE, “Energy Conservation Program: Energy Conservation Standards for Manufactured Housing; Extension of Compliance Date,” 88 *Federal Register* 34411-34419, May 30, 2023.

agency (such as being based on a nationally recognized model building code).¹³⁵ Federal programs may have additional requirements beyond SLTT codes and standards or the model building codes for property durability, accessibility, fire safety, energy efficiency, and broadband readiness that are established by federal laws and regulations.

For example, HUD has adopted Minimum Property Standards (MPS) that apply to newly constructed housing under certain programs (see textbox “HUD’s Minimum Property Standards”). Some of the MPS requirements may exceed SLTT codes and standards, such as minimum durability requirements for items such as doors, windows, gutters, kitchen cabinets, and carpeting intended to ensure HUD-assisted or Federal Housing Administration (FHA)-insured housing does not lose value because of deterioration of these items.

Other federal requirements that may apply include certain government-wide requirements applicable to federal buildings and programs, including, but not limited to, federally related housing. These include certain accessibility requirements (e.g., Section 504 of the Rehabilitation Act of 1973 (P.L. 93-112 and the ADA) and fire safety requirements (e.g., sprinkler systems, smoke detectors). Other laws or regulations establish requirements that apply to multiple housing programs within or across agencies, such as HUD requirements related to broadband readiness,¹³⁶ carbon monoxide detector requirements,¹³⁷ and energy efficiency requirements.¹³⁸ Finally, certain program-specific property standards may apply, as discussed for specific examples below.

¹³⁵ Although federal programs that support the acquisition of a property or provide rental subsidies to an existing property generally also involve minimum quality standards, this section focuses on programs supporting new construction or substantial rehabilitation.

¹³⁶ In 2016, HUD finalized a rule requiring the installation of broadband infrastructure in all HUD-funded new construction and substantial rehabilitation of multifamily housing. This requirement does not apply to properties that only receive HUD-insured financing (through a Federal Housing Administration-insured mortgage) but does apply to most major HUD grant-funded programs, including public housing, the Community Development Block Grant program, the HOME Investment Partnerships programs, homeless assistance programs, and the project-based rental assistance programs. There are exceptions to when the requirement applies, including when the cost of the installation would cause an undue financial burden or would be infeasible. HUD, “Narrowing the Digital Divide Through Installation of Broadband Infrastructure in HUD-Funded New Construction and Substantial Rehabilitation of Multifamily Rental Housing,” 81 *Federal Register* 92626, December 20, 2016.

¹³⁷ Recently enacted laws have expanded federal requirements related to carbon monoxide detectors in federally assisted housing. See the Carbon Monoxide Alarms Leading Every Resident to Safety Act of 2019, enacted in Section 101 of Title I of Division Q of P.L. 116-260.

¹³⁸ The Energy Independence and Security Act of 2007 (EISA, P.L. 110-140) amended the Cranston-Gonzalez National Affordable Housing Act of 1990 to require HUD and the U.S. Department of Agriculture (USDA) to adopt energy efficiency standards for newly constructed housing under certain programs. Such standards are to meet or exceed the requirements of the 2006 International Energy Conservation Code or, for multifamily high rises, ASHRAE Standard 90.1–2004, and HUD and USDA are to amend the standards to adopt revisions to these codes unless certain conditions are met. See 42 U.S.C. 12709 and HUD and UUSDA, “Final Affordability Determination-Energy Efficiency Standards,” 80 *Federal Register* 25901-25924, May 6, 2015, at <https://www.federalregister.gov/documents/2015/05/06/2015-10380/final-affordability-determination-energy-efficiency-standards>.

HUD's Minimum Property Standards

The U.S. Department of Housing and Urban Development (HUD) established and maintains Minimum Property Standards (MPS) that apply to buildings constructed under HUD housing programs, including new single-family and multifamily housing insured with Federal Housing Administration (FHA) financing and low-rent public housing.

Until the mid-1980s, HUD maintained separate MPS for different types of structures. Today, HUD instead generally accepts model building codes and their reference standards or state, local, tribal, or territorial building codes deemed acceptable by the HUD Secretary as fulfilling the requirements of MPS. Additionally, HUD has adopted into MPS durability standards that go beyond those found in model building codes for items including, but not limited to, doors, windows, gutters and downspouts, painting and wall covers, kitchen cabinets, and carpeting.

HUD's MPS can be found in *Minimum Property Standards for Housing, 1994 Edition*, HUD Handbook 4910.1, at https://www.hud.gov/program_offices/administration/hudclips/handbooks/hsg/4910.1. MPS regulations can be found at 24 C.F.R. 200 Subpart S. For more information, see HUD, "MPS Supplementing Model Building Codes," at https://www.hud.gov/program_offices/housing/ramh/mps/mhsmpsp.

What Building Codes Apply to Federal Mortgage Insurance and Loan Programs?

Multiple federal agencies—HUD's FHA, the Department of Veterans Affairs, and the U.S. Department of Agriculture's Rural Housing Service—provide mortgage insurance, loan guarantees, or direct loans for single-family or multifamily housing. In addition to complying with applicable SLTT building codes and standards, properties securing mortgages made by one of these entities also must comply with certain requirements set by the respective agency backing the mortgage. In addition to ensuring housing financed with these mortgages is safe for residents, these property standards are intended to ensure the housing is of sufficient quality to protect the agency's financial interests.

What Building Codes Apply to Federal Grant and Tax Credit Programs?

In addition to loans and mortgage insurance, the federal government provides support for affordable housing development via grants and tax credits. Examples of federal requirements applicable to various affordable housing programs are provided below.

- The HOME Investment Partnerships Program provides formula grants to states and localities that they can use for various affordable housing purposes. Although the specific requirements vary depending on the type of activity, in general, the housing must meet all applicable state and local codes, ordinances, and requirements (or, in the absence of local building codes, the International Residential Code (IRC), International Building Code (IBC), or International Existing Building Code (IEBC)).¹³⁹ For rental housing assisted with HOME funds, the jurisdictions administering the funds must establish ongoing property standards that apply for the duration of the affordability period and conduct periodic inspections throughout the affordability period.¹⁴⁰
- Another HUD formula grant program, the Community Development Block Grant (CDBG), provides funding to states and localities that can be used for a range of community development activities, including certain housing-related activities such as housing rehabilitation. Unlike HOME, there is no federal requirement for

¹³⁹ HOME property standards are at 24 C.F.R. §92.251.

¹⁴⁰ 24 C.F.R. §92.251(f) and 24 C.F.R. §92.504(d). The minimum required affordability periods for HOME-assisted rental housing range from 5 to 20 years, depending on the type of activity and the amount of HOME funds invested. See 24 C.F.R. §92.252(e).

- housing that is rehabilitated using CDBG funds to meet applicable state and local codes, although jurisdictions may set such requirements.¹⁴¹
- In response to certain disasters, Congress sometimes provides supplemental appropriations under CDBG authorities for long-term disaster recovery (CDBG-DR) and mitigation activities (CDBG-MIT). CDBG-DR and CDBG-MIT are not formally authorized, and rulemaking may vary in different disaster responses. HUD typically requires CDBG-DR grantees to describe, in their action plans, how they plan to support the adoption and enforcement of modern and/or resilient building codes that mitigate against natural hazard risks, including climate-related risks.¹⁴² HUD also has required that CDBG-MIT grantees describe plans to follow the latest edition of published disaster-resistant model building codes and standards (which could include the International Code Council’s wildland urban interface codes as well as American Society of Civil Engineers flood resistant standards, ASCE 24 and all hazard resistant standards, ASCE 7, see “Model Building Codes” and “Standards” sections).¹⁴³
 - Public housing is a form of affordable rental housing owned by local public housing authorities but funded by grants from, and governed by contracts with, the federal government. When federally funded public housing properties are being newly developed or redeveloped, they must meet HUD’s Minimum Property Standards (see text box above). After public housing is constructed, it is subject to periodic inspection by HUD inspectors, which evaluate the housing against HUD-established minimum quality standards.¹⁴⁴ These periodic inspections are intended to ensure HUD-assisted housing is decent, safe, sanitary, and in good repair.
 - The Low-Income Housing Tax Credit (LIHTC) program provides federal tax credits that developers can use to subsidize the development, rehabilitation, or acquisition of affordable rental housing. The program is administered by the Department of the Treasury, and its regulations require that, to qualify for credits under the LIHTC program, a property must be suitable for occupancy, taking into account local health, safety, and building codes.¹⁴⁵ State agencies are required to physically inspect LIHTC properties periodically throughout the program’s 15-

¹⁴¹ HUD, *HOME and CDBG Guidebook*, February 2012, pp. 31 and 63, at <https://files.hudexchange.info/resources/documents/HOME-CDBGGuidebook.pdf>.

¹⁴² For example, see HUD, “Allocations for Community Development Block Grant Disaster Recovery and Implementation of the CDBG-DR Consolidated Waivers and Alternative Requirements Notice,” 87 *Federal Register* 6364-6392, February 3, 2022, at <https://www.federalregister.gov/documents/2022/02/03/2022-02209/allocations-for-community-development-block-grant-disaster-recovery-and-implementation-of-the>. See also CRS Report R46475, *The Community Development Block Grant’s Disaster Recovery (CDBG-DR) Component: Background and Issues*, by Joseph V. Jaroscak.

¹⁴³ HUD, “Allocations, Common Application, Waivers, and Alternative Requirements for Community Development Block Grant Mitigation Grantees,” 84 *Register* 45838-45871, August 30, 2019, at <https://www.federalregister.gov/documents/2019/08/30/2019-18607/allocations-common-application-waivers-and-alternative-requirements-for-community-development-block>.

¹⁴⁴ The current standards are called the Uniform Physical Condition Standards (UPCS). See HUD, “Uniform Physical Condition Standards and Physical Inspection,” 63 *Federal Register* 46565-46850, September 1, 1998. HUD is in the process of adopting new standards to replace UPCS, referred to as the National Standards for the Physical Inspection of Real Estate (NSPIRE) standards. For more information, see HUD, “The Building of a New Inspection Model: National Standards for the Physical Inspection of Real Estate (NSPIRE),” at https://www.hud.gov/program_offices/public_indian_housing/reac/nspire.

¹⁴⁵ Treas. Reg. §1.42-5(c) (1) (vi).

year compliance window. The state agency can choose to inspect the properties using local health, safety, and building codes or HUD's standards.¹⁴⁶

What Building Codes May Apply to Qualify for the National Flood Insurance Program?

Communities that participate in the National Flood Insurance Program (NFIP) must adopt minimum floodplain management standards, which are set forth in regulations,¹⁴⁷ to participate in the NFIP.¹⁴⁸ Though the standards appear in federal regulations, the standards have the force of law only because they are adopted and enforced by a state or local government. These standards are minimum requirements for NFIP participation; states and communities can elect to adopt higher standards as a means of mitigating flood risk. NFIP minimum standards include, among many other conditions, that communities (1) require permits for development in Special Flood Hazard Areas (SFHAs);¹⁴⁹ (2) require elevation of the lowest floor of all new residential buildings in the SFHA to be at or above Base Flood Elevation;¹⁵⁰ (3) restrict development in the regulatory floodway to prevent increasing the risk of flooding; and (4) require certain construction materials and methods that minimize future flood damage.¹⁵¹ These requirements apply to new construction in the SFHA. In addition, when improvements to existing buildings meet the definition of *substantial improvement*,¹⁵² or when damage meets the definition of *substantial damage*,¹⁵³ communities must enforce the requirements to bring those structures into compliance with the minimum standards for new construction. FEMA has produced guidance summarizing the flood-resistant provisions of the 2021 International Code Council codes and American Society of Civil Engineers flood resistant standards ASCE 24-14 that represent higher standards than NFIP requirements (see "Standards" section).¹⁵⁴

What Building Codes May Apply for FEMA's Hazard Mitigation Assistance?

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act, P.L. 100-707), federal regulations, and FEMA policy generally require recipients of federal assistance to

¹⁴⁶ Treas. Reg. §1.42-5(c) (2) (ii).

¹⁴⁷ See 44 C.F.R. Part 60, particularly 44 C.F.R. §60.3.

¹⁴⁸ 42 U.S.C. §4022(a)(1). See also CRS Report R47612, *Building Resilience: FEMA's Building Codes Policies and Considerations for Congress*, by Diane P. Horn and Erica A. Lee.

¹⁴⁹ FEMA defines the *Special Flood Hazard Area* as an area with a 1% or greater risk of flooding every year.

¹⁵⁰ FEMA defines *Base Flood Elevation* (BFE) as the water-surface elevation of the base flood, which is the 1%-annual-chance flood, commonly called the 100-year flood. The probability is 1% that rising water will reach BFE height in any given year.

¹⁵¹ 44 C.F.R. §60.3.

¹⁵² 44 C.F.R. §59.1 defines *substantial improvement* as any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the "start of construction" of the improvement. This term includes structures that have incurred "substantial damage," regardless of the actual repair work performed. Floodplain management requirements for new construction apply to substantial improvements.

¹⁵³ 44 C.F.R. §59.1 defines *substantial damage* as damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50% of the market value of the structure before the damage occurred.

¹⁵⁴ FEMA, *Building Code Requirements That Exceed or Are More Specific Than the National Flood Insurance Program*, May 2021, at https://www.fema.gov/sites/default/files/documents/fema_building-code-exceed-nfip-complete_2021.pdf.

comply with applicable building codes when conducting federally funded construction projects. In particular, FEMA programs that provide funding for hazard mitigation require resilient rebuilding.¹⁵⁵ However, each FEMA grant program includes different code compliance requirements, and FEMA’s 2022 *Building Codes Strategy* announced that the agency’s first goal was to align building code policies across FEMA programs.¹⁵⁶ In addition, several FEMA programs may provide financial and technical assistance to SLTTs seeking funding for the adoption of new building codes or the enforcement of existing codes. In August 2022, FEMA released a playbook for jurisdictions adopting and enforcing building codes that included an overview on relevant FEMA assistance.¹⁵⁷

Some of FEMA’s authorities are in flux pending implementation of provisions enacted in recent legislation, including the Disaster Recovery Reform Act of 2018 (DRRA; Division D of P.L. 115-54). Many of DRRA’s changes enhanced FEMA’s authorities to require compliance with consensus-based standards that may exceed locally adopted codes.¹⁵⁸ For example, DRRA amended Section 203 of the Stafford Act to permit FEMA pre-disaster mitigation funding for communities to adopt and enforce the “latest published editions of relevant consensus-based codes, specifications, and standards that incorporate the latest hazard-resistant designs.”¹⁵⁹

Federal Role: Enhancing Codes

What Role Does the Federal Government Play in Enhancing Building Performance?

Many federal agencies work to enhance model building codes that can then be adopted and enforced by SLTT building codes to enhance building performance (e.g., resiliency, efficiency, environmental impact reduction). In addition, federal agencies may incentivize building owners and communities to adopt enhanced model building codes (often beyond the SLTTs building codes) through financial and technical assistance for building construction, operation and maintenance, or repair (see “Federal Role: Code Requirements” section).

On June 1 2022, the Biden Administration announced a National Initiative to Advance Building Codes; this initiative outlines some federal agency activities to enhance codes.¹⁶⁰ In general, these activities can be categorized as research and development leading to enhanced model building codes, assisting SLTTs in adopting and enforcing enhanced codes, and expanding the federal

¹⁵⁵ CRS Report R47612, *Building Resilience: FEMA’s Building Codes Policies and Considerations for Congress*, by Diane P. Horn and Erica A. Lee. For additional information on FEMA hazard mitigation, see CRS Report R46989, *FEMA Hazard Mitigation: A First Step Toward Climate Adaptation*, by Diane P. Horn.

¹⁵⁶ FEMA, *Building Codes Strategy*, March 2022, pp. 14-20.

¹⁵⁷ FEMA, *Building Codes Adoption, 2022*.

¹⁵⁸ For more information on changes in the Disaster Recovery Reform Act of 2018, see CRS Report R45819, *The Disaster Recovery Reform Act of 2018 (DRRA): A Summary of Selected Statutory Provisions*, coordinated by Elizabeth M. Webster and Bruce R. Lindsay; and CRS Report R46776, *The Disaster Recovery Reform Act of 2018 (DRRA): Implementation Updates for Select Provisions*, coordinated by Elizabeth M. Webster and Bruce R. Lindsay.

¹⁵⁹ 42 U.S.C. §5172(e)(1)(A); P.L. 115-254; CRS Report R46989, *FEMA Hazard Mitigation: A First Step Toward Climate Adaptation*, by Diane P. Horn; CRS Report R45819, *The Disaster Recovery Reform Act of 2018 (DRRA): A Summary of Selected Statutory Provisions*, coordinated by Elizabeth M. Webster and Bruce R. Lindsay.

¹⁶⁰ The White House, “Biden-Harris Administration Launches Initiative to Modernize Building Codes, Improve Climate Resilience, and Reduce Energy Costs,” fact sheet, June 1, 2022, at <https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/01/fact-sheet-biden-harris-administration-launches-initiative-to-modernize-building-codes-improve-climate-resilience-and-reduce-energy-costs/>.

government's adoption and enforcement of enhanced codes for federal buildings and military buildings.

NIST, FEMA, and DOE have research and development activities to improve building codes.¹⁶¹ All three agencies also have programs to assist SLTTs in adopting and enforcing improved codes. The CEQ, GSA, DOE, and EPA have activities to enhance codes for federal buildings and military buildings. In particular, the National Initiative to Advance Building Codes calls for federal building performance standards developed by these agencies and departments to include a net-zero emissions building portfolio by 2045.¹⁶²

Below are frequently asked questions about specific activities directed toward specific building performance goals, such as fire safety, energy efficiency, and resiliency.

What Role Does the Federal Government Play in Tracking Building Code Adoption and Enforcement?

The federal government tracks the types of building codes in use to understand the strengths, weaknesses, opportunities, and threats to building stock in the United States and its territories. For example, FEMA tracks building codes in use by SLTTs and notes that some of these codes include hazard resistant design elements, which may improve a building's ability to withstand a disaster.¹⁶³

Energy codes for energy efficiency and conservation for commercial and residential buildings may be adopted and enforced by various SLTTs. DOE tracks energy codes in use by states.¹⁶⁴

What Role Does the Federal Government Play in Copyright Protection for Standards Incorporated by Reference?

Federal and SLTT entities commonly adopt a model building code or a standard from a standards developing organization by incorporating such model codes or standards into law or regulation by reference.¹⁶⁵ Other incorporated by reference (IBR) standards may serve as a reference or as a guidance but do not formally impose legal obligations. Federal regulations require that IBR standards in regulations be made "reasonably available to interested parties."¹⁶⁶ SLTTs may have their own policies regarding access to IBR standards.¹⁶⁷

¹⁶¹ CRS Report R47215, *Hazard-Resilient Buildings: Sustaining Occupancy and Function After a Natural Disaster*, by Linda R. Rowan; and CRS Report R47612, *Building Resilience: FEMA's Building Codes Policies and Considerations for Congress*, by Diane P. Horn and Erica A. Lee.

¹⁶² The White House, "Biden-Harris Administration Launches Initiative to Modernize Building Codes, Improve Climate Resilience, and Reduce Energy Costs," fact sheet, June 1, 2022, at <https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/01/fact-sheet-biden-harris-administration-launches-initiative-to-modernize-building-codes-improve-climate-resilience-and-reduce-energy-costs/>.

¹⁶³ FEMA, "Nationwide Building Code Adoption Tracking," at <https://www.fema.gov/emergency-managers/risk-management/building-science/bcat>. See also FEMA, *Building Codes Adoption*, 2022.

¹⁶⁴ Office of Energy Efficiency and Renewable Energy, "Building Energy Codes Program," at <https://www.energycodes.gov/>.

¹⁶⁵ Hereinafter in this section, model building codes and standards will be referred to as *standards*.

¹⁶⁶ 1 C.F.R. 51.5(b)(2) (2019); 5 U.S.C. 552(a)(1). See also Administrative Conference of the United States "Incorporation by Reference in the CFR," at <https://www.acus.gov/recommendation/incorporation-reference>.

¹⁶⁷ CRS Report R47656, *Copyright in Standards Incorporated by Reference into Law and the Pro Codes Act*, by Kevin J. Hickey.

Standards are typically considered original works of authorship entitled to copyright protection.¹⁶⁸ SDOs often sell copies of their standards, in some cases to recoup the cost of developing the standards. Under copyright protection, third parties are prevented from making or distributing unauthorized copies of standards. Many SDOs also may make their standards available in some form online. For decades, federal courts have considered competing legal arguments about the copyright of IBR standards. Third-party organizations have argued that IBR standards lose copyright protection once they are incorporated into law or that they are permitted to publish IBR standards on third-party sites or materials, under the fair use doctrine. Courts have not reached a consensus about copyright protection for IBR standards. Bills introduced in the 118th Congress (the Pro Codes Act, H.R. 1631 and S. 835) would provide that otherwise copyrightable IBR standards retain their copyright protection even after a government incorporates them into law. The bills also would require SDOs to make the IBR standards publicly accessible online in a readable format for free.¹⁶⁹

What Role Does the Federal Government Play in Strengthening Fire Safety for Firefighters?

The U.S. Fire Administration, in FEMA, provides training on building and fire codes for fire officials; collects data through the National Fire Incident Reporting System, which helps inform standards development; advises fire departments on new fire risks (e.g., electric vehicle fires), and conducts public outreach and education on fire prevention and safety.¹⁷⁰ In addition, the federal government has prioritized fire standards for equipment and fire systems through federal grants. For example, the Assistance to Firefighter Grant Program (AFG), noting a 2021 study by the National Fire Protection Association that found nearly two-thirds of fire departments have firefighters wearing personal protective clothing that is at least 10 years old, prioritized funding for NFPA standards-based personal protective clothing and equipment.¹⁷¹ It also prioritizes funding for NFPA-certified training. Further, through the AFG Fire Prevention and Safety Grants, the federal government funds fire safety education, awareness, and prevention activities. Through the AFG program, Congress has made available over \$15 billion to fire departments to ensure the safety of firefighters, hire and train new firefighters, and support fire prevention activities.¹⁷²

What Role Does the Federal Government Play in Strengthening Energy Efficiency?

Two enacted laws provided funding to programs within DOE to expand technical assistance to SLTTs: the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) and P.L. 117-169, commonly referred to as the Inflation Reduction Act of 2022 (IRA).

¹⁶⁸ 17 U.S.C. 106.

¹⁶⁹ CRS Report R47656, *Copyright in Standards Incorporated by Reference into Law and the Pro Codes Act*, by Kevin J. Hickey.

¹⁷⁰ For more information on the U.S. Fire Administration, see <https://www.usfa.fema.gov/>.

¹⁷¹ FEMA, “The Department of Homeland Security Notice of Funding Opportunity Fiscal Year 2022 Assistance to Firefighters Grant Program,” p. 4, at https://www.fema.gov/sites/default/files/documents/fema_fy-22-afg-nofo.pdf.

¹⁷² FEMA, “Assistance to Firefighters Grant Program,” 2023-01832 Federal Register, January 30, 2023; DHS, Notice of Funding Opportunity (NOFO), Fiscal Year 2022 Staffing for Adequate Fire and Emergency Response (SAFER) Grants Program, 2022, https://www.fema.gov/sites/default/files/documents/fema_afg-safer-2022-nofo.pdf, and DHS, Notice of Funding Opportunity (NOFO) Fiscal Year 2022 Fire Prevention and Safety (FP&S) Grant Program, 2022, at https://www.fema.gov/sites/default/files/documents/fema_fy22-afg-fps-nofo.pdf.

Section 40511 of the IIJA adds a Section 309 to the Energy Conservation and Production Act (P.L. 94-385). The section establishes within DOE a competitive grant program for state building code agencies (or other eligible entities) to enable sustained cost-effective implementation of updated building energy codes. The program is to consider factors such as prospective energy savings, long-term sustainability of those savings, prospective benefits (including resilience and peak load reduction, occupant safety and health, and environmental performance), demonstrated capacity of the agency/eligible entity, and the need for assistance. Eligible activities include creating/enabling partnerships for training builders, contractors, architects, designers, construction professionals, and building code officials; collecting and disseminating quantitative data; developing and implementing plans (including measuring compliance); addressing implementation needs for rural, suburban, and urban areas; and implementing updates in energy codes.

Section 50131 of the IRA provided funding to DOE for two types of technical assistance grants to SLTTs for building energy codes development and implementation. The law established two grant programs to assist state and local governments with building energy codes. One program is intended to assist with the adoption of the latest residential or commercial building energy codes and implementation of a plan to achieve full compliance with codes. For residential buildings, the latest building energy code equivalent would be the 2024 International Energy Conservation Code. For commercial buildings, the latest building energy standard would be the 2019 Standard 90.1. The second program is intended to assist with the adoption of residential or commercial building energy codes that meet or exceed the zero-energy provisions of the 2021 IECC or equivalent *stretch code* and implementation of a plan to achieve full compliance with codes.¹⁷³

What Role Does the Federal Government Play in Strengthening Hazard Resistance and Resilience?

FEMA and NIST conduct research on hazard resistant model building codes.¹⁷⁴ NIST's Buildings and Construction Program develops safety standards for construction and studies ways to better protect buildings from hazards such as earthquakes and windstorms.¹⁷⁵ FEMA's Building Science Branch studies how natural hazards affect structures and works with industry professionals to enhance structures' hazard resistance.¹⁷⁶ These and other federal agencies may submit model building code proposals to standards developing organizations, such as the International Code Council and the American Society of Civil Engineers, to enhance model codes to be more resistant to specific hazards.

In addition, Congress directed NIST and FEMA to take other actions that may contribute to the development of hazard-resistant buildings. The 2018 reauthorization of the National Earthquake Hazards Reduction Program defined *community resilience* as “the ability of a community to prepare and plan for, absorb, recover from, and more successfully adapt to adverse seismic

¹⁷³ A *stretch code* is a locally mandated code or alternative compliance path that is more aggressive than the base energy code, resulting in buildings that achieve higher energy savings. New Buildings Institute, “Stretch Codes,” at https://newbuildings.org/code_policy/utility-programs-stretch-codes/stretch-codes/.

¹⁷⁴ CRS Report R47215, *Hazard-Resilient Buildings: Sustaining Occupancy and Function After a Natural Disaster*, by Linda R. Rowan; and CRS Report R47612, *Building Resilience: FEMA's Building Codes Policies and Considerations for Congress*, by Diane P. Horn and Erica A. Lee.

¹⁷⁵ NIST, “Buildings and Construction,” at <https://www.nist.gov/buildings-construction>.

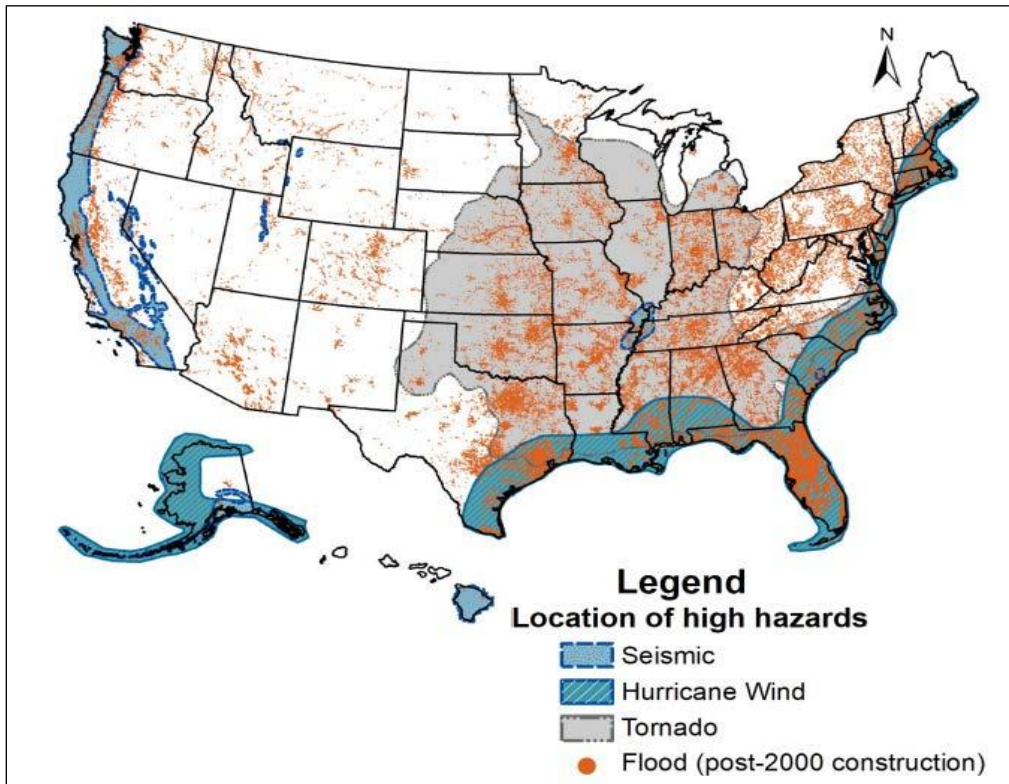
¹⁷⁶ FEMA, “Building Science,” at <https://www.fema.gov/emergency-managers/risk-management/building-science>.

events” (42 U.S.C. §7703) and directed NIST to conduct research to “improve community resilience through building codes and standards” (42 U.S.C. §7704(b)(5)).¹⁷⁷

What Role Does the Federal Government Play in Identifying and Assessing Natural Hazard Risks?

FEMA, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Geological Survey (USGS), among other federal agencies, observe, monitor, model, and in some cases forecast natural hazards. These agencies often provide hazard assessments to help to define where hazard risks are high for people and property in the United States. **Figure 2**, **Figure 3**, and **Figure 4** show hazard maps from these agencies for past hazards and their frequency and potential future hazards.

Figure 2. FEMA Map of Selected Dominant Hazards in the United States

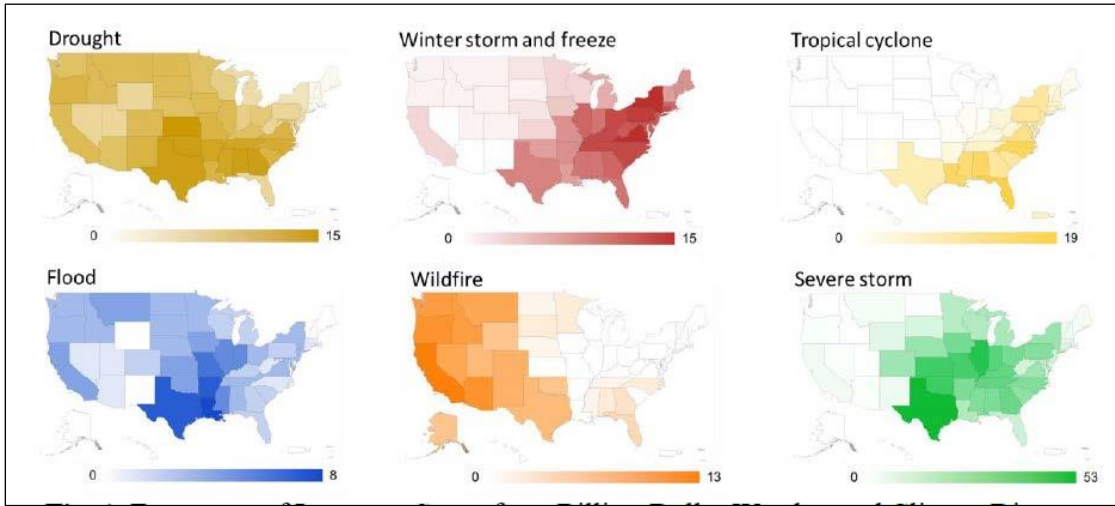


Source: Federal Emergency Management Agency (FEMA), *Protecting Communities and Saving Money: The Case for Adopting Building Codes*, November 2020, at https://www.fema.gov/sites/default/files/2020-11/fema_building-codes-save_brochure.pdf.

Notes: FEMA estimates that seismic activity, hurricane winds, tornadoes, and floods represent dominant hazards in the United States relative to other natural hazards, based on the number of occurrences of these hazards and the amount of losses due to damage to buildings from these hazards in the past.

¹⁷⁷ CRS Report R43141, *The National Earthquake Hazards Reduction Program (NEHRP): Overview and Issues for Congress*, by Linda R. Rowan.

Figure 3. NOAA Billion-Dollar Weather and Climate Disasters Frequency, by State
(from 1980 to 2017, by hazard type)

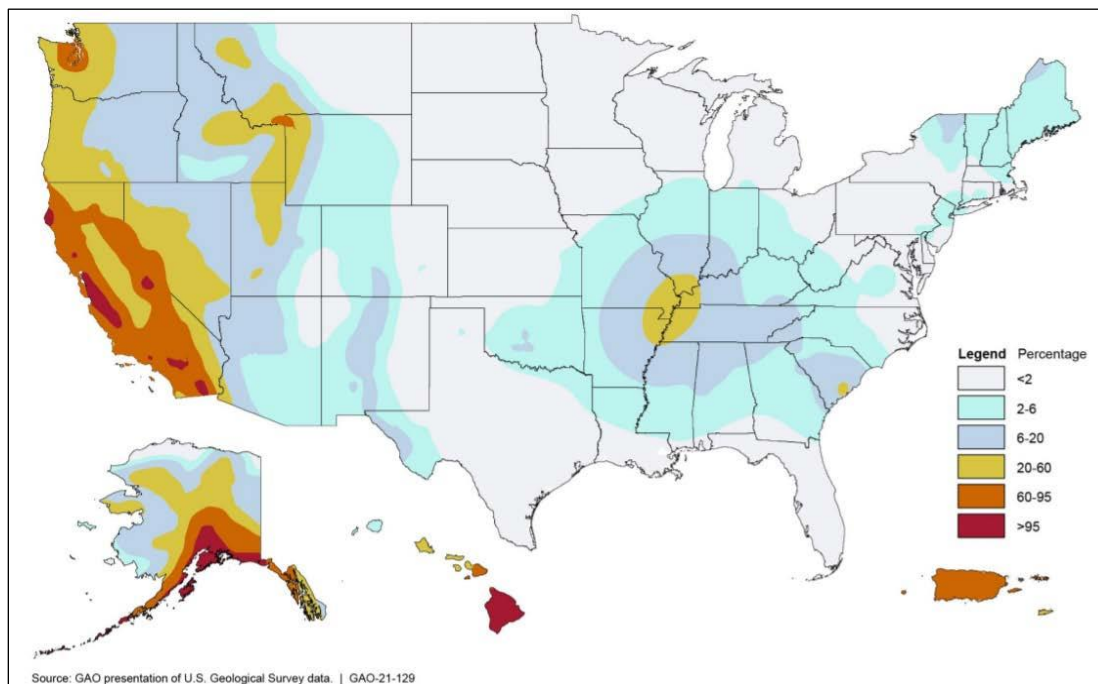


Sources: Siamak Sattar et al., *Research Needs to Support Immediate Occupancy Building Performance Objective Following Natural Hazard Events*, National Institute of Standards and Technology (NIST), NIST Special Publication 1224, August 2018, at <https://doi.org/10.6028/NIST.SP.1224>, using data from National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information, “Billion-Dollar Weather and Climate Disasters: Overview,” 2018, at <http://www.ncdc.noaa.gov/billions/>.

Notes: Frequency with which each state was impacted by a disaster exceeding \$1 billion in damage between 1980 and 2017. For example, 15 drought disasters impacted Texas, totaling more than \$1 billion for each occurrence, between 1980 and 2017 (upper left panel). NOAA estimates the total cost for each disaster as the cost in terms of dollars that would not have been incurred had the event not taken place. The dollar amounts are adjusted for inflation. The costs include physical damage to residential, commercial, and municipal buildings; loss of material assets (content) within buildings; time element losses, such as business interruption or loss of living quarters; damage to vehicles and boats; damage to public assets including roads, bridges, levees; electrical infrastructure and offshore energy platforms; damage to agricultural assets including crops, livestock, and commercial timber; and wildfire suppression costs, among others. NOAA estimates that growth in material wealth, population centers, and infrastructure in vulnerable areas such as coasts and river floodplains as well as climate change impacts contribute to the costs of weather and climate disasters. NOAA also notes that building codes are often insufficient in reducing damage from these extreme events. See NOAA, “Billion-Dollar Disasters: Calculating the Costs,” at <https://www.ncei.noaa.gov/access/monitoring/dyk/billions-calculations>.

Figure 4. USGS Seismic Hazard Map

(probability of a Modified Mercalli Intensity VI earthquake in 100 years, expressed as a percentage)



Source: U.S. Government Accountability Office (GAO), *Earthquakes: Progress Made to Implement Early Warning System, But Actions Needed to Improve Program Management*, GAO-21-129, March 2019.

Notes: The Modified Mercalli Intensity Scale from Roman numeral I to X represents the shaking intensity from an earthquake felt by people or damaging property. Intensity VI is strong shaking that is felt by everyone and causes slight damage to property. See U.S. Geological Survey (USGS), “The Modified Mercalli Intensity Scale,” at <https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale>. See also CRS Report R43141, *The National Earthquake Hazards Reduction Program (NEHRP): Overview and Issues for Congress*, by Linda R. Rowan.

FEMA developed a National Risk Index (NRI),¹⁷⁸ an online mapping application that identifies communities most at risk from 18 natural hazards at the county and census tract levels and maps a community’s social vulnerability, community resilience, and other environmental factors (**Figure 5**). The NRI provides a baseline relative risk measurement for each county and census tract in the United States. The NRI shows a score for each individual hazard as well as a composite score for all 18 natural hazards.

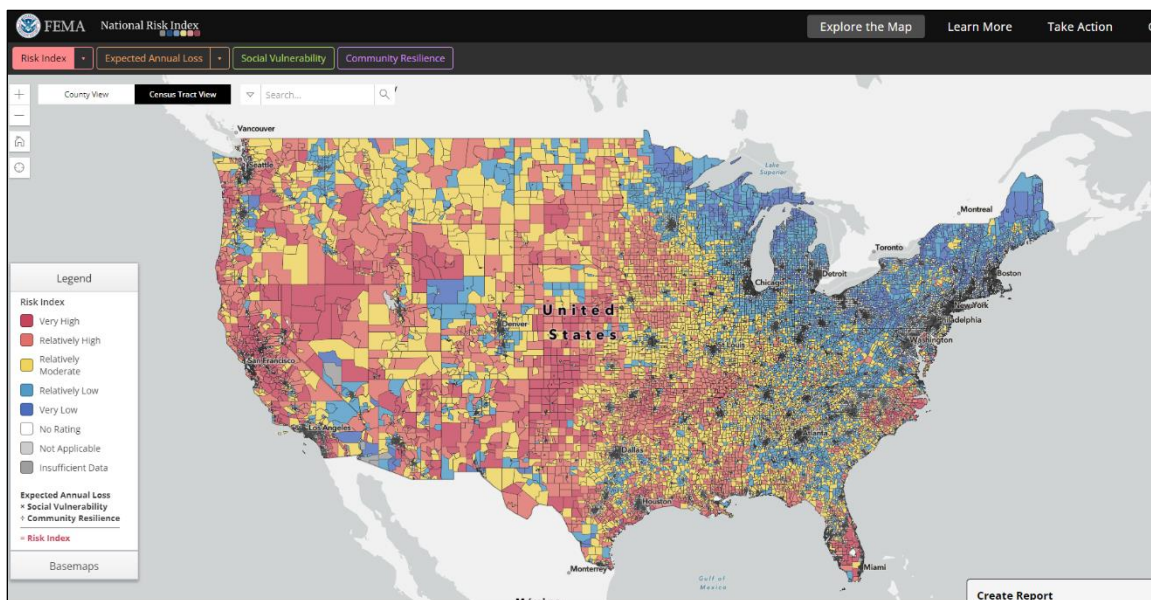
In addition, the Community Disaster Resilience Zones Act of 2022 (P.L. 117-141) amends the Stafford Act to require the President maintain and update a natural hazard assessment program that develops and maintains publicly available products to show the risk of natural hazards across the United States. FEMA intends to use the NRI to satisfy this requirement. The act also requires the President to identify and designate Community Disaster Resilience Zones (CDRZs) that identify disadvantaged communities most at risk of natural hazards.¹⁷⁹ The President is authorized

¹⁷⁸ FEMA, “National Risk Index for Natural Hazards,” at <https://www.fema.gov/flood-maps/products-tools/national-risk-index>.

¹⁷⁹ Community Disaster Resilience Zones are defined in P.L. 117-255 as the 50 census tracts assigned the highest individual hazard risk ratings. The individual risk ratings reflect (1) an intersection of (a) loss to population equivalence, (b) building value, and (c) agricultural value; (2) high social vulnerability ratings and low community resilience ratings; and (3) any other elements determined by the President. See 42 U.S.C. §5136(d).

to increase the federal cost share for pre-disaster mitigation funding to CDRZs to not more than 90% of the total cost of the mitigation project.¹⁸⁰ According to FEMA, CDRZs will be identified later in 2023 and will hold the designation of CDRZs for five years.¹⁸¹

Figure 5. FEMA National Risk Index
(census tract view)



Source: Federal Emergency Management Agency (FEMA), “National Risk Index,” at <https://hazards.fema.gov/nri/map>.

Notes: The National Risk Index is expected (annual loss x social vulnerability) ÷ community resilience. The figure is a screenshot of the homepage for this interactive tool. Users can choose to show the risk for 18 different hazards, to show risk by expected annual loss, social vulnerability or community resilience. In addition, users can view the data in a county view or a census tract view and zoom in on specific areas. Not shown in this figure are Alaska and Hawaii. Users can adjust the region shown to see the risks for different hazards for these states on the interactive map.

What Role Does the Federal Government Play in Assessing Climate Change Risks to Buildings? Are There Any Nonfederal Initiatives?

Most building codes adopted and enforced by most SLTTs do not consider climate change risks.¹⁸² Some building codes, model building codes, guidelines, and certifications may consider some aspects of climate change. Considering climate change risks in building codes, standards, guidelines, or certifications may be challenging, because climate change risks may be based on different models that lead to different estimations of potential risks. Further, the models may not have the spatial or temporal resolution to estimate climate change risks for a particular area. In addition, estimations of climate change risks may be uncertain.

¹⁸⁰ 42 U.S.C. §5136(g).

¹⁸¹ FEMA, “Community Disaster Resilience Zones,” at <https://www.fema.gov/flood-maps/products-tools/national-risk-index/community-disaster-resilience-zones>.

¹⁸² Government Accountability Office (GAO), *Climate Change: Improved Federal Coordination Could Facilitate Use of Forward-Looking Climate Information in Design Standards, Building Codes, and Certifications*, GAO-17-3, November 30, 2016, at <https://www.gao.gov/products/gao-17-3>.

In addition, use of consensus-based model codes and standards may not necessarily incorporate the latest editions of hazard-resistant design.¹⁸³ For example, starting with the 2015 edition, the International Code Council codes (see “Model Building Codes” section) have required at least 1 foot of freeboard be incorporated into elevation requirements.¹⁸⁴ However, the 1 foot freeboard is designed with reference to the elevation of the 1% annual-chance flood, which does not allow for changes in water level associated with the potential effects from climate change and extreme events. Requirements also may exist for adding additional freeboard for critical facilities, depending on the type of facility and flood zone. Communities that use ICC codes have the option to establish a design flood elevation that exceeds the ICC code standards (e.g., to adopt a higher freeboard).¹⁸⁵

The Government Accountability Office (GAO) noted that standards developing organizations vary in whether they update the climate change risk information in design standards, model building codes, and voluntary certifications on a regular basis.¹⁸⁶ GAO recommended that federal agencies that deal with climate change coordinate with federal agencies that work with SDOs on codes and standards to help SDOs address the challenges of climate change risks in future standards. GAO called for NIST, the U.S. Global Change Research Program, and FEMA’s Mitigation Framework Leadership Group to coordinate on addressing climate change issues in codes, standards, and certifications.¹⁸⁷ NOAA has joined with the American Society of Civil Engineers and university partners in a multiyear effort to identify and collect climate data to inform future ASCE standards.¹⁸⁸ A focus of the effort is on American Society of Civil Engineers flood resistant standards, ASCE 24 and all hazard resistant standards, ASCE 7 updates (see “Standards” section).

The White House, NOAA, and the Department of the Interior launched the Climate Mapping for Resilience and Adaptation (CMRA) portal in September 2022 (**Figure 6**).¹⁸⁹ The web-based tool integrates information from across the federal government, including climate maps and data, building code standards, economic justice and social vulnerability information, and federal grant funding opportunities. The CMRA tool is intended to help SLTTs understand the real-time climate-related hazards in their area, analyze projected long-term exposure to those hazards, and

¹⁸³ For example, FEMA defines a *hazard-resistant building code* as a “building code with provisions that provide a minimum level of building protection against natural hazards” and considers a jurisdiction to be hazard resistant if it adopts either the 2015 or the 2018 edition of ICC codes without weakening provisions related to flood, hurricane wind, and seismic hazards. FEMA, *Building Codes Save*, 2020, p. xi and p. 3-4, at https://www.fema.gov/sites/default/files/2020-11/fema_building-codes-save_study.pdf.

¹⁸⁴ FEMA defines *freeboard* as an additional amount of height above the BFE used as a factor of safety in determining the level at which a structure’s lowest floor must be elevated or floodproofed to be in accordance with the state or community floodplain management standards. See FEMA, Glossary, “Freeboard,” at <https://www.fema.gov/glossary/freeboard>. See also FEMA, *Building Codes Save*, 2020, p. 1-6.

¹⁸⁵ Freeboard can be established as a requirement in building codes and local floodplain management regulations. See FEMA, *Building Codes Save*, 2020, pp. 4-4 and 4-5.

¹⁸⁶ GAO, *Climate Change: Improved Federal Coordination Could Facilitate Use of Forward-Looking Climate Information in Design Standards, Building Codes, and Certifications*, GAO-17-3, November 30, 2016, at <https://www.gao.gov/products/gao-17-3>.

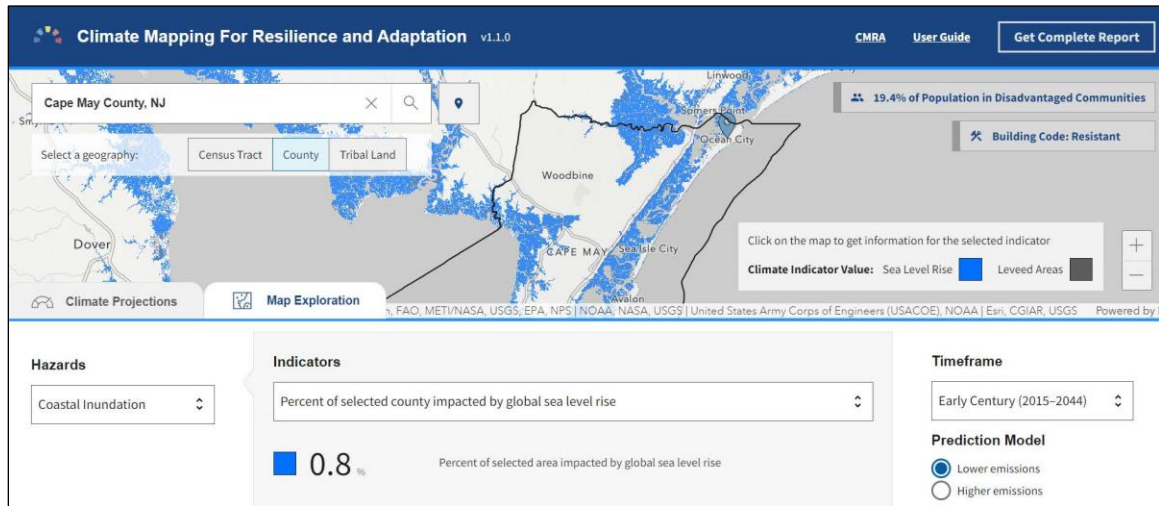
¹⁸⁷ U.S. Global Change Research Program, “GlobalChange.gov,” at <https://www.globalchange.gov/> and FEMA, “Mitigation Framework Leadership Group (MitFLG),” at <https://www.fema.gov/emergency-managers/national-preparedness/frameworks/mitigation/mitflg>.

¹⁸⁸ ASCE, “ASCE NOAA Taskforce,” at <https://www.asce.org/initiatives/asce-noaa-taskforce>.

¹⁸⁹ The White House, “Fact Sheet: Biden-Harris Administration Launches New Climate Portal to Help Communities Navigate Climate Change Impacts,” press release, September 8, 2022, at <https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/08/fact-sheet-biden-harris-administration-launches-new-climate-portal-to-help-communities-navigate-climate-change-impacts/>.

identify federal funds to support climate resilience projects. The CMRA tool covers five hazards: extreme heat, drought, wildfire, inland flooding, and coastal flooding. The portal’s assessment tool provides hazard reports on heat, drought, and flooding down to the census tract level, including projections of future impacts in both low- and high-emissions scenarios, based on climate models used in the U.S. National Climate Assessment.¹⁹⁰ The assessment tool also integrates information from federal initiatives, including updated sea level rise data,¹⁹¹ the Climate and Economic Justice Screening Tool,¹⁹² and the Building Code Adoption Tracking Portal.¹⁹³

Figure 6. Example from Climate Mapping for Resilience and Adaptation Portal
(coastal inundation shown for part of Cape May County, NJ)



Source: National Oceanic and Atmospheric Administration, Office for Coastal Management Digital Coast, Screenshot of Climate Mapping for Resilience and Adaptation Tool accessed on November 2, 2023, at <https://livingatlas.arcgis.com/assessment-tool/explore/map>.

Several nonfederal initiatives consider how to include climate change risks in building code design, standards, guidelines, or certifications. Many of these initiatives are led by SDOs and other organizations involved in guidelines or certifications. For example, the ICC considers climate change risks as part of the ICC resilience effort.¹⁹⁴ The ICC is part of a Global Resiliency Dialogue (GRD) with the Australian Building Codes Board; the National Research Council of Canada; and the New Zealand Ministry of Business, Innovation, and Employment to consider how to include climate change related hazards in building code design, standards, and adoption. The GRD published Global Building Resilience Guidelines (announced at the 27th United Nations Conference of the Parties [COP27] in Egypt).¹⁹⁵

¹⁹⁰ Climate Mapping for Resilience and Adaptation, *Getting Started with the Climate Mapping for Resilience and Adaptation Assessment Tool*, at <https://resilience.climate.gov/pages/user-guide>.

¹⁹¹ NOAA, National Ocean Service, “Data and Tools: 2022 Sea Level Rise Technical Report Data Files,” at <https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-data.html>.

¹⁹² CEQ, “Climate and Economic Justice Screening Tool,” at <https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5>.

¹⁹³ FEMA, “Nationwide Building Code Adoption Tracking,” at <https://www.fema.gov/emergency-managers/risk-management/building-science/bcat#>.

¹⁹⁴ ICC, “Resilience Toolkit,” at <https://www.iccsafe.org/advocacy/resilience-toolkit/>.

¹⁹⁵ ICC, “Global Resiliency Dialogue,” at <https://www.iccsafe.org/advocacy/global-resiliency/>; and Judy Zakreski, (continued...)

In another example, Codes for Climate, a nonprofit think-tank partnership between the Rocky Mountain Institute and the New Buildings Institute, is focused primarily on energy codes to mitigate climate change, but such codes also might mitigate climate change risks.¹⁹⁶

What Is the Federal Flood Risk Management Standard?

The Federal Flood Risk Management Standard (FFRMS) is a flood resilience standard that is required for federally funded projects,¹⁹⁷ which are defined as actions where federal funds are used for new construction, substantial improvement, or to address substantial damage to structures and facilities.¹⁹⁸ For FFRMS compliance, the floodplain for federally funded projects is determined using one of three currently available approaches: (1) the freeboard value approach;¹⁹⁹ (2) the 500-year floodplain;²⁰⁰ or (3) the climate-informed science approach.²⁰¹ Individual federal agencies must develop or update procedures and regulations tailored to their programs to account for the reinstated FFRMS. For example, HUD is reinitiating its rulemaking process; the proposed rule would affect projects receiving HUD assistance, financing, or insurance. The proposed rule would establish that, when possible, the climate-informed science approach should be used to determine the FFRMS floodplain and would require that newly constructed and substantially improved structures be elevated or floodproofed to the FFRMS floodplain elevation. The proposed rule also would revise HUD's Minimum Property Standards for one- to four-family buildings under the FHA mortgage insurance program and low-rent public housing programs to

"Adapting Building Standards to Changing Weather Risks," ICC, *Building Safety Journal*, at <https://www.iccsafe.org/building-safety-journal/bsj-dives/adapting-building-standards-to-changing-weather-risks/>.

¹⁹⁶ Rocky Mountain Institute, "Codes for Climate Offers States and Cities a Path to Building Decarbonization," at <https://rmi.org/press-release/codes-for-climate-offers-states-and-cities-a-path-to-building-decarbonization/>.

¹⁹⁷ The Federal Flood Risk Management Standard (FFRMS) was introduced in 2015 by President Obama's Executive Order (E.O.) 13690. In August 2017, President Trump signed E.O. 13807 to streamline federal infrastructure approval. Among other actions, E.O. 13807 revoked E.O. 13690. In January 2021, President Biden revoked E.O. 13807 as part of E.O. 13990, which effectively reinstated E.O. 13690, including the FFRMS. In May 2021, President Biden's E.O. 14030 confirmed that guidelines for implementing E.O. 13690 were never revoked and thus remain in effect. E.O. 13690, "Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input," 80(23) *Federal Register* 6425-6428, January 30, 2015; E.O. 13807, "Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects," 82(163) *Federal Register* 40436-40469, August 24, 2017; E.O. 13990, "Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis," 86(14) *Federal Register* 7037-7042, January 25, 2021; E.O. 14030, "Climate-Related Financial Risk," 86(99) *Federal Register* 27967-27971, May 25, 2021.

¹⁹⁸ FEMA, *Guidelines for Implementing Executive Order 11988, Floodplain Management, and Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, October 8, 2018, p. 16, at https://www.fema.gov/sites/default/files/documents/fema_implementing-guidelines-EO11988-13690_10082015.pdf (hereinafter, FEMA, *Guidelines for Establishing a FFRMS*). The FEMA guidelines do not require the use of the National Flood Insurance Program definitions of *substantial improvement* and *substantial damage* (footnotes 146 and 147, respectively).

¹⁹⁹ The floodplain obtained through the freeboard value approach in the FFRMS is defined as the elevation and flood hazard area that result from adding an additional 2 feet to BFE for noncritical actions and adding an additional 3 feet to BFE for critical actions, which are defined as any activity for which even a slight chance of flooding would be too great. FEMA, *Guidelines for Establishing a FFRMS*, provides additional guidance to assist agencies in determining whether an action is critical.

²⁰⁰ The *500-year floodplain* is defined as the area subject to flooding by the 0.2%-annual-chance flood.

²⁰¹ Defined as the elevation and flood hazard area that result from using a climate-informed science approach that uses the best available actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science.

require that the lowest floor in newly constructed and substantially improved structures under these programs be built at least 2 feet above the 100-year floodplain.²⁰²

²⁰² HUD, “Federal Flood Risk Management Standard,” March 23, 2023, at https://www.hud.gov/program_offices/comm_planning/environment_energy/ffrms.

Appendix. Abbreviation Table

Table A-1 contains a list of the abbreviations used in this report.

Table A-1. Abbreviations Used in This Product

Abbreviation	Full Name
AARST	American Association of Radon Scientists and Technologists
ADA	Americans with Disabilities Act (P.L. 101-336)
ACI	American Concrete Institute
AFG	Assistance to Firefighter Grant Program
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BFE	Base Flood Elevation
BREEAM	Building Research Establishment Environmental Assessment Method
CDBG	Community Development Block Grant
CDBG-DR	Community Development Block Grant – Disaster Recovery
CDBG-MIT	Community Development Block Grant – Mitigation
CDRZ	Community Disaster Resilience Zone
CEQ	Council on Environmental Quality
CMRA	Climate Mapping for Resilience and Adaptation
DOD	Department of Defense
DOE	Department of Energy
DOJ	Department of Justice
DRRA	Disaster Recovery Reform Act of 2018 (Division D of P.L. 115-254)
ECPA	Energy Conservation and Production Act (P.L. 94-385)
EISA	Energy Independence and Security Act of 2007 (P.L. 110-140)
EPA	Environmental Protection Agency
EPAAct 92	Energy Policy Act of 1992 (P.L. 102-486)
FAQ	Frequently asked question
FEMA	Federal Emergency Management Agency
FEMP	Federal Energy Management Program
FFRMS	Federal Flood Risk Management Standard

Abbreviation	Full Name
FHA	Federal Housing Administration
GAO	Government Accountability Office
GRD	Global Resiliency Dialogue
GSA	General Services Administration
HUD	Department of Housing and Urban Development
IBC	International Building Code
IBHS	Insurance Institute for Business and Home Safety
IBR	Incorporated by reference
ICC	International Code Council
IEBC	International Existing Building Code
IECC	International Energy Conservation Code
IEEE	Institute of Electrical and Electronics Engineers
IES	Industrial Electronics Society
IJA	Infrastructure Investment and Jobs Act (P.L. 117-58)
IRA	Inflation Reduction Act of 2022 (P.L. 117-169)
IRC	International Residential Code
ISO	International Organization for Standardization
LEED	Leadership in Energy and Environmental Design
LIHTC	Low Income Housing Tax Credit
MHCSS	Manufactured Home Construction and Safety Standards
MPS	Minimum Property Standards
NEHRP	National Earthquake Hazards Reduction Program
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NRI	National Risk Index
NTTAA	National Technology Transfer and Advancement Act of 1995 (P.L. 104-113)
OMB	Office of Management and Budget
SDO	Standards developing organization
SEI	Structural Engineering Institute
SFHA	Special Flood Hazard Area
SLTT	State, local, tribal, and territorial
UFC	Uniform Facilities Criteria
UPCS	Uniform Physical Condition Standards
USDA	U.S. Department of Agriculture

Abbreviation	Full Name
USGS	U.S. Geological Survey
USSS	United States Standards Strategy
TMS	The Masonry Society

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