CHAPTER

3

Codes and Standards

Building codes consist of a set of regulations related to the construction, alteration, maintenance and use of buildings and structures. People have an expectation that when they enter a building, they will be safe from inherent dangers caused by natural or manmade disasters. The public expects that if a storm passes through an area, the building will keep occupants dry and withstand the forces created by the storm, such as powerful winds and lightning. When a fire occurs in a building, the occupants need a safe, clear and unobstructive path out of the building. Building codes provide these protections by limiting the potential hazards in a building and requiring certain design criteria that provide the occupants with a safe environment in which to live, work and engage in countless activities.

The codes offer a common and familiar set of life-safety provisions for adoption by governmental agencies to regulate construction. There are 15 separate International Codes (I-Codes) with provisions for structural design for earthquake, hurricane and tornado forces; weather-resistant construction; fire- and life-safety measures, from egress and fire-resistant construction to fire suppression systems; moisture protection; energy efficiency; material selection; mechanical ventilation; water supply; sanitation; and electrical systems (Figure 3-1). These codes serve not only to protect the life safety of building occupants but also the public welfare of the greater community with respect to energy, carbon dioxide (CO_2) emissions, water, material resources and indoor environmental quality.

This chapter discusses the history of codes and how they have been developed over time. It also provides insight into the administrative enforcement and application of building codes.

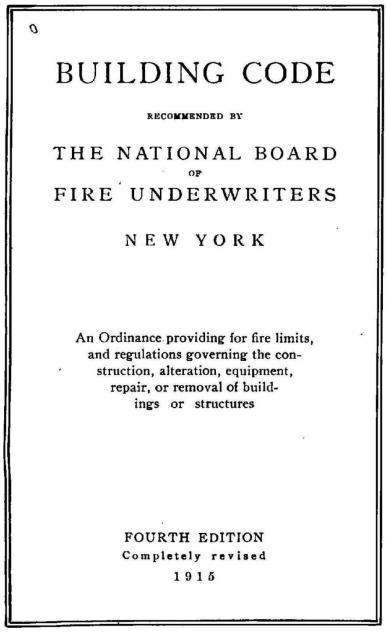
FIGURE 3-1 The International Codes (I-Codes).

HISTORY OF CODES

Building codes have been around for ages. The first known building code was found in the Code of Hammurabi, created around 1760 B.C. in ancient Babylon. This code, enacted by the sixth Babylonian King Hammurabi, set forth six rules for construction:

- If a builder has built a house for a man, and finished it, he shall pay him a fee of two shekels of silver for each sar (garden plot) built on.
- If a builder has built a house for a man, and has not made his work sound, and the house he built has fallen and caused the death of its owner, that builder shall be put to death.
- If it is the owner's son that is killed, the builder's son shall be put to death.
- If it is the slave of the owner that is killed, the builder shall give slave for slave to the owner of the house.
- If he has caused the loss of goods, he shall render back whatever he has destroyed. Moreover, because he did not make sound the house he built, and it fell, at his own cost he shall rebuild the house that fell.
- If a builder has built a house for a man, and has not keyed his work, and the wall has fallen, that builder shall make that wall firm at his own expense.

As one can see, codes have a totally different focus in today's modern construction industry. One of the first model building codes written was the *Building Code* developed by the National Board of Fire Underwriters (Figure 3-2). This code provided uniform language from a property insurance organization that could provide local governments with a model code that could be adopted without having to write one from scratch. In the 1920s, other organizations started developing model building codes. Eventually, there were three


BUILDING CODE

RECOMMENDED BY

THE NATIONAL BOARD
OF
FIRE UNDERWRITERS

NEW YORK

An Ordinance providing for fire limits, and regulations governing the construction, alteration, equipment, repair, or removal of buildings or structures

FOURTH EDITION
Completely revised
1915

FIGURE 3-2 Fire Underwriters Code.

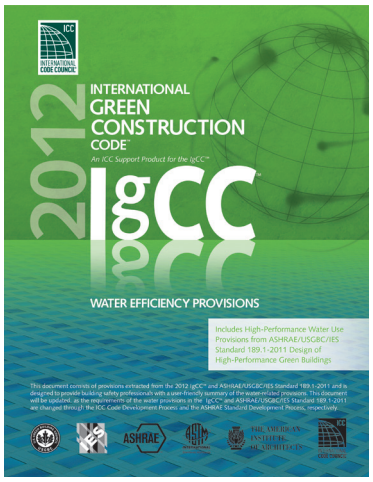


FIGURE 3-3 2012 IgCC cover.

model building code groups in the United States: Building Officials & Code Administrators International, Inc. (BOCA); International Conference of Building Officials, Inc. (ICBO); and Southern Building Code Congress International, Inc. (SBCCI). These organizations published the BOCA *National Building Code*, *Uniform Building Code* and *Standard Building Code*, respectively. In 1994, the codes were primarily regional in nature and their use was limited primarily to the United States. These three model code organizations, with support from the industry, agreed in principle to develop one model code and formed the International Code Council (ICC). The first *International Building Code* (IBC) developed by the ICC was published in 2000. The IBC is used in every state in the country and in some form in other countries.

The development of green codes and standards began as an effort to reduce the negative environmental impacts of building design and construction. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), with industry support, published ASHRAE 189.1—2009 in 2010. This standard was called the *Standard for the Design of High-Performance Green Buildings*. That same year ICC published its first public version of the *International Green Construction Code* (IgCC Public Version 1) and it was quickly adopted by several jurisdictions as an option for voluntary compliance with the jurisdiction's sustainable goals. The goal of the IgCC was to develop a green model code that would provide a baseline for regulating sustainable construction. It was later published with the complete family of 2012 I-Codes (Figure 3-3).

THE CASE FOR BUILDING AND GREEN CODES

Modern construction codes are continually developed and improved to help make our built environment safe, healthy and efficient. As previously mentioned, code history reaches back more than 3,500 years to King Hammurabi, whose code created the intent of building regulation based on fairness and sound construction—consumers should get what they pay for. Fire-resistant construction and sanitation infrastructure were implemented as Rome rebuilt after its 64 A.D. fire. This marked a shift in focus from protecting the building occupants to community scale risk reduction.

As a result of recurring European tragedies, building codes first appeared in the United States in 1625. These early codes were con-

cerned with fire safety and roof coverings. For example, in 1630, Boston prohibited chimneys made of wood. Thatch roofs were outlawed at about the same time. President George Washington suggested height and area limitations on wood-frame buildings in the District of Columbia. In 1788, the first formal building code in the United States was written in Old Salem, now Winston-Salem, North Carolina.

The cost of nonregulated construction is an issue of national importance. In the summer of 2011, the US Congress considered the Safe Building Code Incentive Act (H.R. 2069). Testimony during the hearings stated, "Adopting and enforcing newer codes can reduce losses [from natural disasters] by 40 percent or more." The cost of energy- and water-inefficient buildings is also a matter of national importance. The Departmen of Energy's (DOE) *Building Energy Codes Resource Guide*, published in June 2011, states, "Building energy codes are estimated to produce a financial benefit to owners of nearly 2 billion dollars annually by 2015, rising to over 15 billion dollars annually by 2030." The cost of water and wastewater treatment is steadily rising as the demand for water increases due to population growth and geographical shifts. The availability of fresh water is constantly changing due to weather-related issues such as droughts. The realized savings are risk reduction and lower utility costs on energy, water and wastewater for building owners and occupants.

In addition to reducing energy and resource consumption, green buildings contribute to the health and quality of life of building occupants. They have a lower carbon emissions profile and preserve natural resources. In many cases, the most important factor for building owners is the short-term economic bottom line. The design and construction of baseline green buildings are usually cost competitive even before one factors the savings from reduced operating costs.

Historically, codes and standards have been developed with a focus on the health and safety of the building occupants and the protection of property. For example, the structural integrity of a multiple-story building to withstand the lateral forces of wind during a severe storm or a fire suppression system that protects a structure in the event a fire within a building. Green building codes and standards broaden the scope to building performance and reducing the negative impacts that buildings may have on the health and safety of the natural environment. Collectively, the family of I-Codes and referenced standards provide health and safety protections for both the built and natural environment.

Code Essentials

International Code Development Cycle: Governmental consensus process

1. Other than ICC staff, anyone can submit a code change proposal using cdpACCESS.
2. Proposals are published and distributed.
3. Open public hearings are held before the committee at the Committee Action Hearing.
4. Results are published and distributed.
5. Anyone can submit public comments on hearing results using cdpACCESS.
6. Public comments are published and distributed.
7. An open Public Comment Hearing is held.
8. Votes are cast by ICC Governmental Representatives and Honorary Members present at the Public Comment Hearing.
9. ICC Government Members and Honorary Members can vote in the Online Governmental Consensus Vote via cdpACCESS.
10. A new edition of the code is published. ●

CODE DEVELOPMENT

Construction technology, methods, materials, equipment and processes are constantly evolving. Accordingly, the I-Codes are systematically revised every three years to keep up with technical changes and to address the improved understanding of hazards and safeguard measures. The I-Codes are revised and updated through an open process that invites participation by all stakeholders and affected parties. This code development process can involve exhaustive research, review, discussion and debate of the potential changes.

A code change begins with the submittal of a proposal to add, revise or delete a code provision. Any interested individual or group (other than International Code Council staff) may submit a code change proposal and participate in the proceedings in which it and all other proposals are considered. Proposed code changes are submitted online through the ICC cdpACCESS® (code development process access) website. Following the publication and distribution of the proposals, an open public hearing—Committee Action Hearing (CAH)—is held before a committee, comprised of representatives from across the construction industry and government, including code officials, contractors, builders, architects, engineers, industry professionals and others with expertise related to the applicable code, or portion thereof, under consideration. This open debate and broad participation before the committee reflects a consensus of the construction community and those impacted by building and fire codes in the decision-making process. The committee may approve, modify or disapprove the code change proposal.

The next public hearing is the Public Comment Hearing in which the merits of code change proposals that received public comment are debated. Any interested party may offer testimony; however, only ICC Governmental Member Voting Representatives (designated public safety officials of a government jurisdiction responsible for administering and enforcing codes) and ICC Honorary Members are permitted to cast votes at the Public Comment Hearing. Public safety officials have no vested financial interest in the outcome, and they legitimately represent the public interest. Votes are cast electronically at the Public Comment Hearing, and the results are then made available online at cdpACCESS. In the online voting, ICC Governmental Honorary Members are permitted to vote. The voting at the Public Comment Hearing and the Online Governmental Consensus Vote will determine the revisions to the next edition of the code.

A new edition of the code is published every 3 years. Each I-Code, with the exception of the upcoming 2024 *International Energy Conservation Code*, is developed during a single 12-month cycle during the 3-year period. There are three separate code change cycles within each 3-year period, with individual codes assigned to one of the three cycles. This important process ensures that the I-Codes reflect the latest technical advances and address the concerns of those throughout the industry in a fair and equitable manner (Figure 3-4).

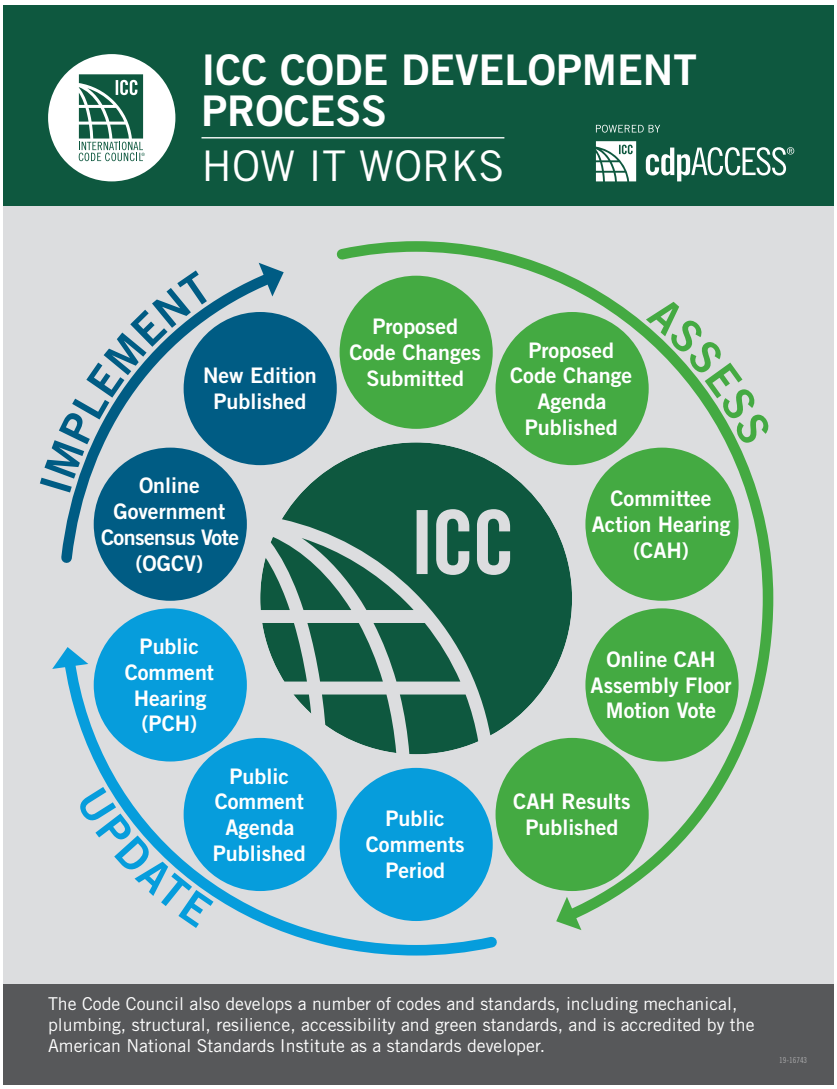


FIGURE 3-4 ICC Code Development Process.

IgCC Development

The IgCC is a model code that is coordinated with other I-Codes, such as the *International Energy Conservation Code* (IECC), and industry standards, such as ANSI/ASHRAE/IES 90.1. The IgCC provides a whole building systems approach to the design, construction and

You Should Know

cdpACCESS

- cdpACCESS is the International Code Council's cloud-based system for the code development process (cdp).
- It was developed to increase participation in the code development process.
- cdpACCESS allows users to create, collaborate, review, submit and vote (if eligible) on code change proposals and public comments.
- After the Committee Action Hearings, International Code Council members can view and vote on motions for those code changes that received an assembly motion.
- After the Public Comment Hearings, the International Code Council will post the Online Governmental Consensus Vote. The proposals and hearing testimony are available to be viewed by everyone; ICC Governmental Member Voting Representatives and Honorary Members will be able to vote. ●

operation of commercial buildings. The IgCC regulates building components that result in reduced environmental impacts associated with energy, material resources, CO_2 emissions, water and indoor environmental quality that affect health and safety.

American Institute of Architects (AIA), American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), International Code Council (ICC), Illuminating Engineering Society (IES) and the US Green Building Council (USGBC) partnered in the development of the 2021 IgCC as the premier building code for green design and construction in North America. ICC is the most trusted code development body; ASHRAE is the most technically sound heating, ventilation, air-conditioning and refrigeration standards development organization; USGBC is the most influential green building rating system; and AIA is the nation's institute society of professional architects.

This collaboration marks a change from previous versions of the IgCC and ASHRAE 189.1 in the United States. The goal was to provide a single document that offers an adoptable, usable and enforceable standard for green building design and construction, leveraging the strengths of ICC and ASHRAE while coordinating with the aspirational objectives of the USGBC Leadership in Energy and Environmental Design (LEED®) rating system.

The maintenance responsibilities for updating the IgCC are shared between the International Code Council and ASHRAE. The IgCC is updated every three years through a combination of the ICC Governmental Consensus process (described above) for the administrative provisions and through the ASHRAE/ANSI process for the technical content of the IgCC, which is based on ASHRAE 189.1. The 189.1 Standing Standard Project Committee considers and administers changes to the standard as a continuous maintenance standard and provides interpretations as requested. Proposed changes to the standard may originate within or outside of the committee. The committee welcomes proposals for improving the standard using the ANSI-approved ASHRAE continuous maintenance procedure. The committee takes formal action on every proposal received, which may lead to changes to the published standard. ASHRAE posts approved addenda in publication notices on its website. The approved changes to the technical provisions are then combined with the approved changes to the administrative provisions, which results in an updated IgCC publication in alignment with the ICC three-year code development cycle.