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## Building Codes

The existence of building regulations goes back almost 4,000 years. The Babylonian Code of Hammurabi decreed the death penalty for a builder if a house he constructed collapsed and killed the owner. If the collapse killed the owner's son, then the son of the builder would be put to death; if goods were damaged, then the contractor would have to repay the owner, and so on. This precedent is worth keeping in mind as you contemplate the potential legal ramifications of your actions in designing and constructing a building in accordance with the code. The protection of the health, safety, and welfare of the public is the basis for licensure of design professionals and the reason that building regulations exist.

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## HISTORY AND PRECEDENTS



*"If a builder build a house for some one, and does not construct it properly, and the house which he built fall in and kill its owner, then that builder shall be put to death.*

*If it kill the son of the owner, the son of that builder shall be put to death.*

*If it kill a slave of the owner, then he shall pay slave for slave to the owner of the house.*

*If it ruin goods, he shall make compensation for all that has been ruined, and inasmuch as he did not construct properly this house which he built and it fell, he shall re-erect the house from his own means.*

*If a builder build a house for some one, even though he has not yet completed it; if then the walls seem toppling, the builder must make the walls solid from his own means."*

Laws 229–233  
*Hammurabi's Code of Laws*  
(ca. 1780 BC)

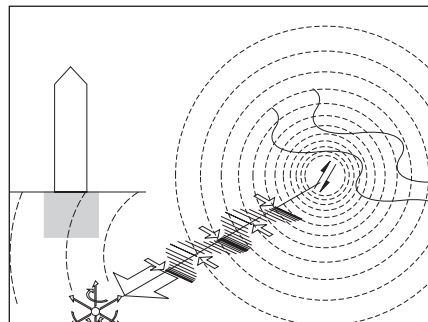
From a stone slab discovered in 1901 and preserved in the Louvre, Paris.

Various civilizations over the centuries have developed building codes. The origins of the codes we use today lie in the great fires that swept American cities regularly in the 1800s. Chicago developed a building code in 1875 to placate the National Board of Fire Underwriters, who threatened to cut off insurance for businesses after the fire of 1871. It is essential to keep the fire-based origins of the codes in mind when trying to understand the reasoning behind many code requirements.

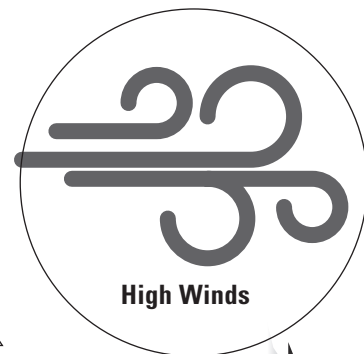
As the nation's population has increased, people have moved nearer to bodies of water, to regions subject to high winds, and into wooded areas on the edges of towns. Mitigating the impact of hazards such as floods, high winds, earthquakes, and wildland fires in populated areas, has increasingly been included in each new edition of the model codes. While fire safety is still a very large component in model codes, new model code documents now also include many provisions above and beyond the traditional fire-based requirements.



**Flooding**



**Earthquakes**



**High Winds**



**Fire**

These three model-code groups published the three different building codes previously in widespread use in the United States. These codes were developed by regional organizations of building officials, building materials experts, life safety experts, and design professionals to provide communities and governments with standard construction criteria for uniform application and enforcement. The ICBO *Uniform Building Code* was used primarily west of the Mississippi River and was the most widely applied of the model codes. The BOCA *National Building Code* was used primarily in the north-central and northeastern states. The SBCCI *Standard Building Code* was used primarily in the Southeast. The model-code groups merged in the late 1990s to form the International Code Council and BOCA, ICBO, and SBCCI ceased maintaining and publishing their "legacy" codes.

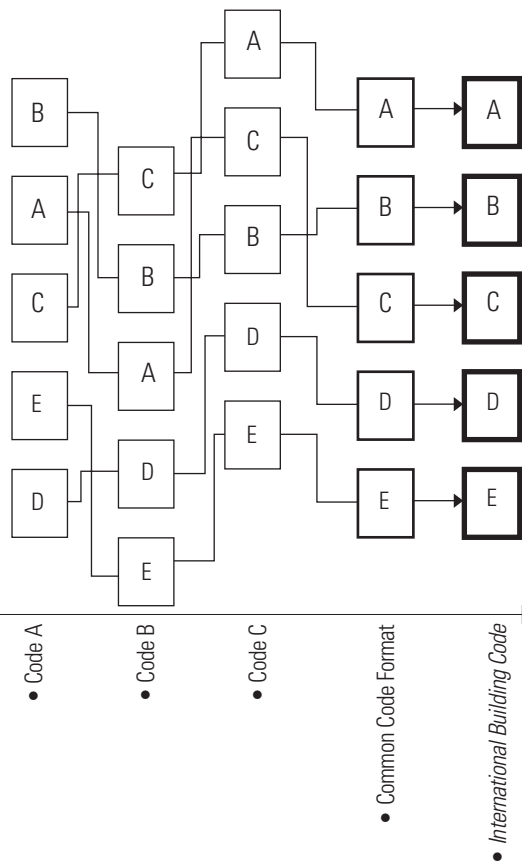
**The International Building Code**

The new ICC process was a real revolution in the development of model codes. There was recognition in the early 1990s that the nation would be best served by a comprehensive, coordinated national model building code developed through a general consensus of code writers. There was also recognition that it would take time to reconcile the differences between the existing codes. To begin the reconciliation process, the three model codes were reformatted into a common format. The International Code Council, made up of representatives from the three model-code groups, was formed in 1994 to develop a single model code using the information contained in the three current model codes. While detailed requirements still varied from code to code, the organization of each code became essentially the same during the mid-1990s. This allowed direct comparison of requirements in each code for similar design situations. Numerous drafts of the new *International Building Code* were reviewed by the model-code agencies along with code users. From that multiyear review grew the original edition of the *International Building Code* (IBC), first published in 2000. There is now a single national model code maintained by a group composed of representatives of the three prior model-code agencies, the International Code Council, headquartered in Washington, D.C. The three organizations accomplished many years ago a full merger of the three model-code groups into a single agency to update and maintain the IBC.

Note that most local jurisdictions make other modifications to the codes in use in their communities. For example, many jurisdictions make amendments to require fire sprinkler systems where they may be optional in the model codes. In such cases, mandatory sprinkler requirements may change the design trade-offs offered in the model code for inclusion of sprinklers where "not otherwise required" by the code. It is imperative that the designer determines what local adoptions and amendments have been made to be certain which codes apply to a specific project.

Many jurisdictions have not adopted the latest versions of the model codes. It is critical that designers familiarize themselves with the applicable edition of the model codes. All too often, practitioners assume that codes they have been using in one jurisdiction are the same as those in a new locale for their practice. That is often not the case and can lead to a lack of code compliance for some projects.

A major revision took place in the 2015 IBC. The provisions for existing buildings, contained in Chapter 34 of the previous code, were removed. Therefore the IBC applies only to new buildings. The provisions for existing buildings are now contained exclusively in the *International Existing Building Code* and refer back to the IBC or adopt similar requirements, but the two codes are now intended to be used separately. For the purposes of this book, assume that the requirements discussed are to apply to new buildings or to additions to new buildings unless noted otherwise. See Chapter 23 for a more detailed discussion on how to use the IBC and the IEBC together.



## FEDERAL AND NATIONAL CODES

There are also specific federal requirements that must be considered in design and construction in addition to the locally adopted version of the model codes. Among these are the Americans with Disabilities Act of 1990 and the Federal Fair Housing Act of 1988.

### Americans with Disabilities Act

The Americans with Disabilities Act (ADA) of 1990 is federal civil-rights legislation requiring that buildings be made accessible to persons with physical disabilities and certain defined mental disabilities. The original *ADA Accessibility Guidelines* (ADAAG) were administered by the Architectural and Transportation Barriers Compliance Board (ATBCB), and the regulations are administered by the US Department of Justice. Enforcement of the law is through legal actions brought by individuals or groups asserting violations of their rights of access, as civil rights. A new version of the ADA accessibility guidelines known as the *2010 ADA Standards for Accessible Design* (ADAS) went into effect on March 15, 2012. Designers can obtain copies of the new guidelines from the Access Board at [www.access-board.gov/ada](http://www.access-board.gov/ada).

It is critical for designers to understand that unless adopted as the access regulations for a jurisdiction or state, the ADA is not subject to interpretation by local building officials; it is enforced by legal action, through the courts. Access is to be provided for all disabilities, not just for people with mobility impairments. These include hearing, vision, speech, and cognitive impairments, as well as persons of short stature and with limited mobility not necessarily requiring the use of a wheelchair. The ADA applies to all new construction. The ADA also requires that barriers to access be removed from existing buildings where such work is readily achievable. The definition of readily achievable is an economic one and should be addressed by the building owner, not by the building architect.

The ADA is one of the few building regulations—in this case a law, not a code—that requires retrofitting of projects apart from upgrading facilities during remodeling or renovation. Most codes apply to existing buildings only when renovation is undertaken. Under the ADA, those access improvements that are readily achievable should be undertaken by the owner, whether or not any other remodeling work is to be done. The **owner**, not the architect, must make this determination.

As the ADA is not enforced by local building officials, we will concentrate here only on those accessibility codes that are enforced locally and subject to review and interpretation as part of the permit process. Designers must first concentrate on complying with codes and standards adopted locally but must also keep national statutory requirements such as the ADA in mind. It is prudent to review design work against the 2010 ADAS at the same time as the model-code review. It is often a judgment call as to which is the most stringent requirement where requirements between codes and legislation differ. In these situations, it is essential and prudent to make the client aware of these discrepancies and have them actively participate in any decisions as to which part of which requirements will govern the design of project components.

Space requirements for accessibility are related to ergonomics. Bigger is not automatically better. The 16"–18" (406–457) required range between the centerline of a water closet to a side wall or partition with grab bars, is based on reach ranges and leverage for movement using one's arms. A longer reach reduces leverage and thus may be worse than too little space.

### Federal Fair Housing Act

The Federal Fair Housing Act (FFHA) of 1988 includes Department of Housing and Urban Development (HUD) regulations requiring all residential complexes of four or more dwelling units constructed after March 13, 1991, to be adaptable for use by persons with disabilities. For example, residential complexes must provide access to all units on the ground floor, and all units must be accessible from grade by a ramp or elevator. Many state housing codes also incorporate these requirements. A very good reference for the FFHA is the *Fair Housing Act Design Manual*, which can be obtained free of charge at <https://www.huduser.gov/portal/publications/PDF/FAIRHOUSING/fairfull.pdf>.



### State Building Codes

Each state has a separate and distinct code adoption process. In the past, many states adopted one of the three previous model codes, and some states even had their own building codes. The geographic areas for state model-code adoptions corresponded roughly to the areas of influence of the three previous model codes. The BOCA *National Building Code* predominated in the northeastern United States. The *Southern Building Code* was adopted throughout the southeastern United States. The *Uniform Building Code* was adopted in most states west of the Mississippi River. Many states allowed local adoption of codes so that in some states, such as Texas, adjacent jurisdictions in the same state had different building codes based on different model codes. Now, the advent of the International Codes has altered this landscape drastically. The "I Codes" are now the basic model codes in essentially every state. However, be aware that most state processes still allow amendments to the IBC, which means that there will likely be state-adopted amendments to the IBC. Make certain you know what code you are working with at the permitting level. Also, as noted, in states or localities that adopt a model code, be sure to verify which edition of the model code has been adopted.

### Local Building Codes

Many localities adopt the model-code documents with little modification except for the administrative chapters that relate to local operations of the building department. Larger cities, such as Los Angeles, New York City, Chicago, and San Francisco, typically adopt much more sweeping revisions to the model codes. The codes for such cities often bear little resemblance to the underlying model codes and in some cases have no basis in them at all. Interpretations, even of the unaltered model code made by big-city building departments, often tend to be very idiosyncratic and nonuniform when compared to smaller jurisdictions that use less modified versions of the model codes. The adoption of the IBC at the state level has generated a review of big-city building codes so that these city codes are moving toward greater conformity with the model codes. For example, San Francisco and Los Angeles previously used a UBC-based state code, which has now been converted to an IBC-based, locally modified



state code. This will require a careful analysis of the city-code amendments to ensure conformance with the new model code. This redevelopment of codes has also been occurring in other large cities, such as Dallas and New York, as their states adopt the IBC. Be aware of local modifications and be prepared for varying interpretations of the same code sections among various jurisdictions. Do not proceed too far in the design process based on review of similar designs in another jurisdiction without verifying the code interpretation in the jurisdiction where the project is located. Similarly, although this book offers opinions of what code sections mean, all such opinions are subject to interpretation by local authorities as codes are applied to specific projects.

## OTHER CODES AND STANDARDS

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Codes and standards are related, but serve different purposes. A building code (e.g., the *International Building Code*) establishes a jurisdictional “floor” relative to occupants’ health, safety, and welfare. A building standard (e.g., NFPA 13, which addresses fire sprinkler requirements) is a “standard practice” often referred to within the codes. In short, a *code* is what you must do (sprinklers, yes or no, per which standard); a *standard* is a guide on how you do it (sprinkler head flow rates, spacing, etc.). There are thus a number of other codes and standards that the designer must be familiar with. They are mentioned here in brief to remind users of the *International Building Code* that other documents must also be consulted during project design.

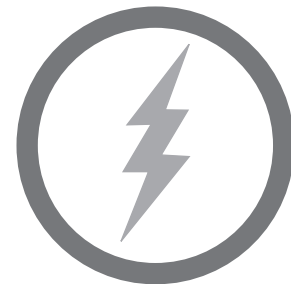
While building code and accessibility regulations are usually the focus of interest for architectural and structural work, you need to be aware of the existence of other separate codes and standards for such work as electrical, plumbing, mechanical, fire sprinklers, and fire alarms. Each of these may impact the work of design consultants and in turn the work of the architect. Detailed consideration of the requirements in these other codes is beyond the scope of this book.

Fire codes are typically considered maintenance codes. They are intended to provide for public health and safety in the day-to-day operation of a structure. They are also meant to assure that building life-safety systems remain operational in case of emergency. The various model-code agencies have developed model fire codes for these purposes. They are developed with primary input from the fire services and less input from design professionals. Note, however, that fire codes can have an impact on building design. They contain requirements for such elements as fire-truck access, locations and spacing of fire extinguishers, as well as requirements for sprinklers and wet or dry standpipes. The fire code also may contain requirements for added fire protection related to the ease or difficulty of fire equipment access to structures.

Plumbing codes often dictate the number of plumbing fixtures required in various occupancies. Some codes place this information in the building code, some in the plumbing code, and some in appendices that allow local determination of where these requirements may occur in the codes. The designer must determine which course of legal adoption the local authority has chosen. The determination of the required number of plumbing fixtures is an important design consideration. It is essential to use the adopted tables and not automatically assume those in the model building code apply. A discussion of the use of the fixture counts found in Chapter 29 of the 2021 IBC are found in Chapter 20 of this book.

The model codes have no force of law unto themselves. Only after adoption by a governmental agency are they enforceable under the police powers of the state. Enforcement powers are delegated by statute to officials in various levels of government. Designers must verify local amendments to model codes to be certain which code provisions apply to specific projects.

There are many different codes that may apply to various aspects of construction projects. Typically, the first question to be asked is whether the project requires a permit. Certain projects, such as interior work for movable furniture or finishes, are usually exempt. Carpeting may be replaced and walls painted without a permit, but moving walls, relocating doors, or doing plumbing and electrical work will require a permit in most jurisdictions.



Traditionally, codes have been written with new construction in mind. In recent years more and more provisions have been made applicable to alteration, repair, and renovation of existing facilities. One of the emerging trends in code development is the creation of an *International Existing Building Code*. The reuse of existing buildings is also of concern for accessibility issues. One of the most crucial aspects of remodeling work is to determine to what extent and in what specific parts of your project do the building codes and access regulations apply. Most codes are not retroactive. They do not require remedial work apart from remodeling or renovation of a building. Providing access to spaces like toilets serving altered areas may require work outside of the area of alteration.

A notable exception to this is the ADA, which requires that renovation be undertaken to provide access for persons with disabilities if access can be readily provided. However, this is a civil-rights law and not a code. As such, it is not enforced by building officials. In existing buildings it is critical for the designer to determine with the AHJ what the boundaries of the project are to be and to make certain that the AHJ, the designer, and the client understand and agree on the requirements for remedial work to be undertaken in the project area.

### Rating Systems

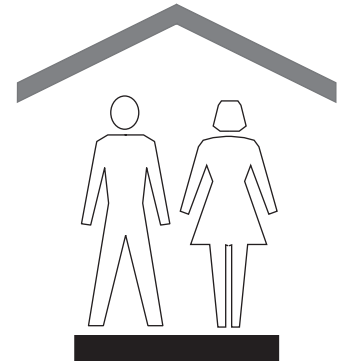
There are also rating systems, the most well known and widespread of which is the *Leadership in Energy and Environmental Design*, or LEED program, developed by the US Green Building Council (USGBC). LEED is not intended to be a code, although some jurisdictions have adopted LEED criteria as code language. Typically, a rating system is a voluntary program based on options selected by the owner and the design team rather than being a set of requirements. Rating systems serve as an ever-being-raised “ceiling” for practice.



### Standard of Care

The designer should always remember that codes are legally and ethically considered to be minimum criteria that must be met by the design and construction community. The protection of health, safety, and welfare is the goal of these minimum standards. It is important to also understand that registered design professionals will be held by legal and ethical precedents to a much higher standard than the code minimum.

The so-called “standard of care” is a legal term defining the level of quality of service that a practitioner is expected to meet. This is higher than the minimum standard defined by the code. The code is the level that a practitioner must never go below. Because professional work involves judgment, perfection is not expected of a design professional. The standard of care is defined for an individual designer as being those actions that any other well-informed practitioner would have taken given the same level of knowledge in the same situation. It is a relative measure, not an absolute one.



### Life Safety vs. Property Protection

The basis for building-code development is to safeguard the health, safety, and welfare of the public. The first and foremost goal of building codes is the protection of human life from the failure of life safety provisions in a building, or from structural collapse. But there is also a strong component of property protection contained in code requirements. Sprinkler provisions can serve both purposes. When buildings are occupied, sprinklers can contain or extinguish a fire, allowing the building occupants to escape. The same sprinkler system can protect an unoccupied structure from loss if a fire occurs when the structure is not occupied.



While many systems may perform both life safety and property protection functions, it is essential that code developers keep the issue of life safety versus property protection in mind. For example, security measures to prevent intrusion into a structure may become hazards to life safety. A prime example of this is burglar bars on the exterior of ground-floor windows that can trap inhabitants of the building in an emergency if there is not an interior release to allow occupants to escape while still maintaining the desired security. In no case should property-protection considerations have primacy over life safety.

## THE FUTURE FOR CODE DEVELOPMENT

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The *International Building Code* is a living document. It is subject to regular review and comment cycles. A new code is published at regular intervals, usually every three years. This publication cycle gives some measure of certainty for building designers that the code will remain unchanged during the design-and-construction process. The code responds to new information, growing by accretion and adaptation. Since the three model-code agencies merged into one organization, detailed changes in the code-development process have evolved and have been refined. We will give only a general description of the code-development process. For a detailed description of the current code development process, see the ICC website.

Any person may propose a code revision. Any designer, material supplier, code official, or interested member of the public who feels they have a better way to describe code requirements or to accommodate new life-safety developments or new technology may prepare revised code language for consideration. Proposed code changes are published for review by all interested parties. They are then categorized based on what section of the code is being revised and assigned to a

committee of people experienced in those matters for review and consideration. Committees are typically organized around specific issues, such as means of egress, fire safety, structural requirements, and so forth. Anyone may testify at these committee hearings regarding the merits or demerits of the code change. The committee then votes to make its recommendation to the Public Comment Hearings, which are held in conjunction with the annual business meeting. At the Final Action Hearing, testimony will be heard from all interested parties, both from non-voting industry representatives and building officials who will be able to vote on the proposed changes. After testimony is heard, only the government members of the organization, typically public employees serving as building and fire officials, are allowed to vote on the proposed changes. This is described as the “governmental consensus process” by the ICC. The ICC Code Development Process is conducted using cloud-based cdpACCESS. For details of code development process go to <https://www.iccsafe.org/wp-content/uploads/ICC-CDP-How-It-Works.pdf>. For information on cdpACCESS go to <https://www.iccsafe.org/cdpaccess/>.