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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 must 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 professional licensure and the reasons that building regulations exist.

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.

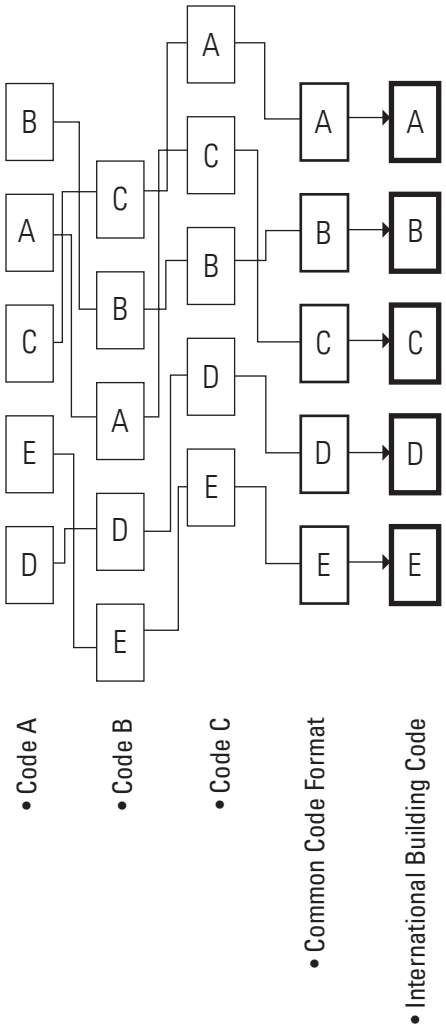
The various city codes and often conflicting codes were refined over the years and began to be brought together by regional nongovernmental organizations to develop so-called model codes. The first model codes were written from the point of view of insurance companies to reduce fire risks. Model codes are developed by private code groups for subsequent adoption by local and state government agencies as legally enforceable regulations. The first major model-code group was the Building Officials and Code Administrators (BOCA), founded in 1915. They published the BOCA National Building Code. Next was the International Conference of Building Officials (ICBO), formed in 1922. The first edition of their Uniform Building Code was published in 1927. The Southern Building Code Congress, founded in 1940, published the Southern Building Code

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, design professionals, and life safety experts 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 have merged together to form the International Code Council and BOCA, ICBO and SBCCI have ceased maintaining and publishing their legacy codes.

The International Building Code

Over the past few years a real revolution has taken place 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 comprised of representatives of the prior three model-code agencies, the International Code Council, headquartered in Falls Church, Virginia. The three organizations have now accomplished 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 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 options 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.



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. Foremost among these for designers is the Americans with Disabilities Act of 1990.

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 and certain defined mental disabilities. The ADA Accessibility Guidelines (ADAAG) are administered by the Architectural and Transportation Barriers Compliance Board (ATBCB), and the regulations are administered by the U.S. 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.

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 effectively 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 the architect.

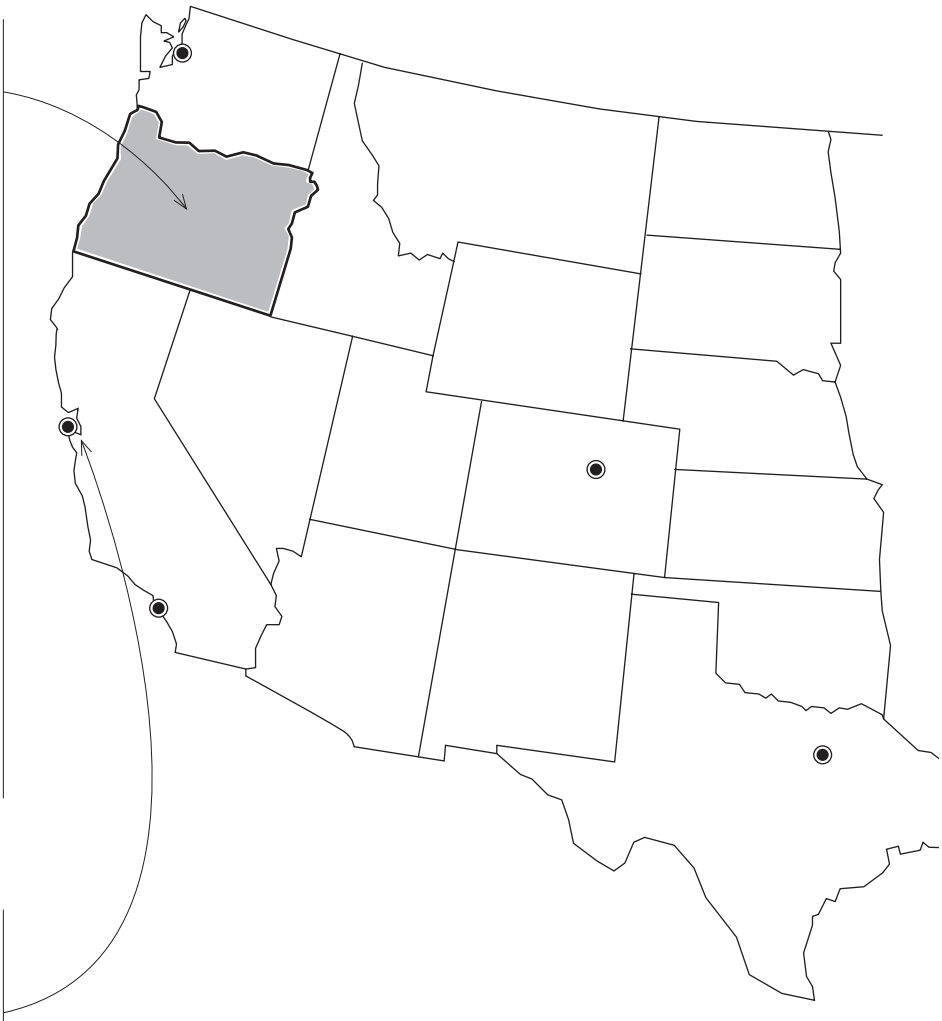
The ADA is one of the few building regulations—in this case a law, not a code—that requires retrofitting of projects apart from upgrading facilities during remodeling or renovation. Most codes apply to existing buildings only when renovation is undertaken. Under the ADA those access improvements that 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.

The ADA is not enforced by local building officials unless the ADAAG guidelines are adopted as the local access provisions. We will concentrate here only on those accessibility codes that are enforced locally and are 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 ADAAG 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. For example, specifying an 18" (457) dimension between a toilet and adjacent 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.

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 as noted on page 3. 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.



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 non-uniform 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 are currently using a UBC based state code, which will soon be converted to an IBC based state code. This will require a careful analysis of the city code amendments for conformance with the new model code. This re-development 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 verification of 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 they are applied to specific projects.

Occupancy Specific Codes for Educational Facilities

Many educational facilities, especially public K-12 schools are under state regulations which overlay model code requirements. These are often tied to the level of education. There are often varying state requirements for K-8 schools versus 9-12 grade levels. Note that the IBC subdivides educational occupancies between Group E occupancy for use by students in 12th grade and under and Group B occupancy for use by students above the 12th grade. In many states the approval process for public schools is distinct from the normal process of obtaining a building permit from the Authority Having Jurisdiction (AHJ). There are also often state regulations for higher education facilities, which are administered under a separate approval process as well. It is essential that the designer determine which agency, or agencies in some cases, will be the AHJ to determine which set of rules will be applicable to your project. It is also essential to determine at an early stage in the design into which category the facility will be placed by the AHJ.

OTHER CODES

Educational occupancies may also be examined by the AHJ under the provisions of the Life Safety Code (NFPA-101) published by the National Fire Protection Association. This code serves as a basis for the egress portions of the other model codes. The NFPA also publishes various other documents that are adopted to accompany the other model codes. Primary examples are NFPA-13, which governs the installation of fire sprinklers, and NFPA-70, which is the National Electric Code.

Whereas fire codes in the past were seen as maintenance documents, the International Fire Code is a companion document to the IBC. It serves as a document regulating building design as well as building occupations. 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 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. Fire codes can have an impact on building design. They have requirements for 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 of these courses of action the local adopting authority has chosen. The determination of the required number of plumbing fixtures is an important design consideration. Which set of plumbing fixture criteria is to be used is often not obvious and must be confirmed with the Authorities Having Jurisdiction early in the design process.

Code Interactions

The Authorities Having Jurisdiction (AHJ)—a catch-all phrase for all planning, zoning, fire and building officials having something to say about building—may not inform the designer of overlapping jurisdictions or duplicity of regulations. Fire departments often do not thoroughly check plan drawings at the time building permit documents are reviewed by the building department. Fire-department deficiencies are often discovered at the time of field inspections by fire officials, usually at a time when additional cost and time is required to fix these deficiencies. The costs of tearing out noncomplying work and replacing it may be considered a designer's error. Whenever starting a project, it is therefore incumbent upon the designer to determine exactly which codes and standards are to be enforced for the project and by which agency. It is also imperative to obtain copies of any revisions or modifications made to model codes by local or state agencies. This must be assured for all AHJs.

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. There are cost thresholds where permits are required, usually relatively low, often as little as $100. 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 (IEBC). As the importance of preservation of historic structures and the sustainable design implications of reusing exiting buildings become more important the IEBC will take on greater impact. 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 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. A notable exception to this is the Americans with Disabilities Act (ADA), which requires that renovation be undertaken retroactively and provide access for persons with disabilities if it can. However, this is a civil-rights law and not a code. It is typically not enforced by building officials, but note that some jurisdictions have adopted the ADA and the accompanying ADA Accessibility Guidelines as their access code. This does not relieve the building owner from obligations under the ADA. 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 upon the requirements for remedial work to be undertaken in the project area.

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. 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 concept defining the level 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.

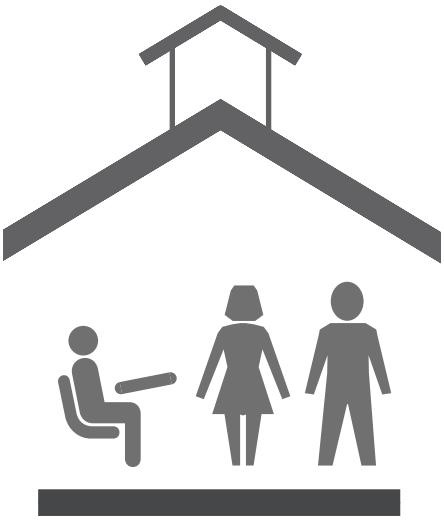
Life Safety vs. Property Protection

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 building life safety provisions or from structural collapse. There is also a strong component of property protection contained in code requirements. Sprinklers 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 a 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. 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.

Code Development

As described above the three previously existing model-code agencies merged into one organization. The three agencies modified their code development processes into a unified national format. This new format has been modified slightly over the past few years as it had been developed and now seems well settled.

As in the past, any person may propose a code revision. Any designer, material supplier, code official or interested member of the public that 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, general and so forth. Anyone may testify at these committee hearings regarding the merits or demerits of the code changes. The committee then votes to make its recommendation to the annual business meeting. At the final hearing testimony will be heard from interested parties, both from non-voting industry representatives and building officials who are given voting privileges. Only governmental members of the organization, typically public employees serving as building, mechanical, electrical, plumbing and fire officials, are those allowed to vote on the proposed changes. This is described as a "governmental consensus process" by the ICC.



The International Building Code is a living document. It is subject to regular, ongoing 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 constant during the design-and-construction process. The code development cycle allows the code to respond to new information, growing by accretion and adaptation.

Performance vs. Prescriptive Codes

There is now an ICC International Performance Code. It presents regulations based on outcomes rather than prescriptions. It encourages new design methods by allowing a broader parameter for meeting the intent of the International Codes. Where adopted locally it may be used in place of the regular IBC provisions. We will discuss briefly the distinctions between prescriptive and performance codes.

The International Building Code, as the codes that preceded it, is predominately prescriptive in nature, but it does have some performance based criteria as well. It is developed to mitigate concerns by creating mostly specific and prescribed responses to problems that have been identified. Designers identify the problem to be addressed, such as the width of corridors, and then they look up the prescribed response in the applicable code section. For example, guardrail heights in most commercial applications are prescribed to be 42" (1067) high and are required when adjacent changes in grade exceed 30" (762). The designer follows the prescribed requirements to avoid the problem the code has identified—that is, preventing falls over an edge higher than 30" (762). The code provides a defined solution to an identified problem.

Performance codes, such as the ICC International Performance Code, define the problem and allow the designer to devise the solution. The word performance in this context refers to the problem definition and to the setting of parameters for deciding if the proposed solution solves the problem adequately. These standards define the problem, but do not define, describe or predetermine the solution.

The use of performance codes has been increasing in the past few years, due in large part to the development of new modeling techniques for predicting how a building will react under certain fire, earthquake or other stimuli. Performance codes are used in many countries around the world. Their requirements may be as broad as "the building shall allow all of its prospective occupants to safely leave the building in the event of a fire." Most performance codes have tightly defined requirements, but the exiting requirement stated above is a good example of the essence of what performance-code requirements can be.

The basic form of modem performance-code language can be described as objective-based. Each code requirement is broken into three sections. We will use fall prevention as our example. Note that provision of guardrails is only one example of many solutions to the performance objective, not the only solution:

Objective: What is to be accomplished? In this case the prevention of falls from heights of more than 30" (762).

Functional Statement: Why do we want to accomplish this? We wish to safeguard building occupants by preventing them from accidentally falling from a height great enough to result in an injury.

Performance Requirement: How is this to be accomplished? Performance codes could become prescriptive at this juncture, mandating a guardrail. More likely such a performance standard would require that the barrier be high enough, strong enough and continuous enough to prevent falls under the objective circumstances. Note that a guardrail meeting current code standards would be deemed to satisfy those requirements, but alternate means and methods could also achieve the same ends. For example, landscaping could prevent access to the grade change, or innovative railing substitutes could be designed to function like automobile air bags to catch falling persons without having a visible rail present in most conditions. Let your imagination provide other alternatives.

Performance codes give designers more freedom to comply with the stated goals. They also require the designer to take on more responsibility for knowing the consequences of their design actions. We anticipate that performance codes will be used in limited ways for innovative projects, but that many typical, repetitive designs will continue to use prescriptive code for speed, clarity and assurance of compliance during design review. Also, given the legal climate designers are often reluctant to take on the responsibility for long term-code compliance for innovative systems.