CHAPTER 1

ABOUT THE CODES

A variety of codes regulate the design and construction of buildings and building interiors. In addition, there are a large number of standards and federal regulations that play a major role. The most nationally recognized codes, laws, and standard organizations are described in this chapter. Most of them are referenced and discussed throughout this book as they pertain to the interior of a building.

As you read about each of these codes, standards, and regulations, keep in mind that *not all of them will be enforced by every code jurisdiction.* (See Definitions in Introduction.) The jurisdiction chooses which publications to use and the edition of each publication. For example, a jurisdiction could decide to adopt the 2003 edition of the *NFPA 101, Life Safety Code* as a stand-alone document or to be used in conjunction with a building code. The jurisdiction could also make a variety of local amendments that add or delete clauses from the code. You must know which codes are being enforced in order to do your code research for a particular project. (See Chapter 10.)

Note

There are now two main sets of codes. The ICC codes have been available longer and are used in many jurisdictions. Many of the NFPA codes first became available in 2003.

In addition, each code publication references certain standards; therefore, the standards that need to be used depend on the required code publications. Other standards may not be referenced by a publication. Instead, they may be individually required or may be accepted as industrywide standards. For example, some finish standards are not *required,* but you will want to follow them for safety and liability reasons. The only regulations that are consistent in every jurisdiction are the federal regulations that are made mandatory by law.

A BRIEF HISTORY

The use of regulatory codes can be traced back as far as the eighteenth century BCE to the *Code of Hammurabi,* a collection of laws governing Babylonia. The *Code of Hammurabi* made the builder accountable for the houses he built. If one of his buildings fell down and killed someone, the builder would be put to death.

In the United States, the first codes addressed fire prevention. The first building law on record was in 1625 in what was then called New Amsterdam (now New York). It governed the types and locations of roof coverings to protect the buildings from chimney sparks. Then, in the 1800s, there were a number of large building fires, including the Chicago fire of 1871, which caused many fatalities. As a result, some of the larger U.S. cities developed their own municipal building *codes.* Some of these are still in existence today. In the mid-1800s, the National Board of Fire Underwriters was set up to provide insurance companies with information on which to base their fire damage claims. One of the results was the publication of the 1905 *National Building Code*—a code that helped spark the original three model building codes.

Meanwhile, the federal government was also creating *regulations.* Many of these laws pertained to government-built and -owned buildings. Some were national laws that superseded other required codes. In 1973, in an attempt to control government intervention, Congress passed the *Consumer Product Safety Act* and formed the Consumer Product Safety Commission (CPSC). The goal of the commission is to prevent the necessity of federal regulations by encouraging industry self-regulation and *standardization.* This resulted in the creation of a number of new standards-writing organizations and trade associations. Additional legislation since then has been used to promote this even further.

Note

For a comprehensive list of the code organizations, federal agencies, standards organizations, and trade associations, see Appendix D and Appendix E and the companion Web site: www.wiley.com/harmon.

Today, there are many separate codes in existence in the United States, a wide variety of federal regulations, and hundreds of standards organizations and regulatory and trade associations in almost every industry. Only the most widely recognized have been described below, to provide you with the groundwork as they are discussed throughout this book. (For more information refer to the resources in the Bibliography.)

CODE PUBLICATIONS

Codes are a collection of regulations, ordinances, and other statutory requirements put together by various organizations. Each jurisdiction decides which codes it will follow and enforce. (See more on jurisdictions in Chapter 10.) Once certain codes are adopted, they become law within that jurisdiction. Many changes have occurred in the code industry in the last five to ten years that have affected the codes available for adoption by a jurisdiction. For more than 50 years there had been three main model code organizations that created and published many of the codes used throughout the United States. They included the Building Officials Code Administrators International (BOCA), the Southern Building

CODE AND STANDARDS CHANGES

Each code and standards organization has its own procedures for changing and updating the requirements in its publications. Most of them use a *consensus* process to revise their publications. Each organization has a membership that consists of a wide range of individuals. These could include code officials, design professionals, building users, academics, manufacturers, building owners, consumers, contractors, and others. These members make up the committees that oversee the proposed changes. However, both members and nonmembers can typically propose and comment on changes either in writing or in person at open public hearings.

Many standards organizations as well as the National Fire Protection Association (NFPA) use a consensus process developed by the American National Standards Institute (ANSI). Once a code or standard is ready to be revised, a *call for proposals* is issued. For example, the NFPA will request proposals for changes to a code or standard. As the proposals are received, they are sent to a technical committee made up of NFPA members for review. The committee makes revisions if necessary and then reissues them for public comment. Typically both members and non-members can submit comments. These comments are used to modify the proposal so that it can be presented for recommendation and discussion at one of NFPA's membership meetings. Here, the various change proposals are voted on by the membership for the purpose of making a recommendation to the overseeing Standards Council. This council takes the votes into consideration but makes the final decision.

The International Code Council (ICC) uses what it calls a governmental consensus process—or open process. (This was also used by the legacy model code organizations.) Much of the process is the same as described above. The main difference is that the final decision is made by the "governmental" members of the ICC, rather than a small group or council. These governmental members consist of code officials and employees of the governmental agencies that administer and enforce the codes. Although this does not include all ICC members, it is a large part of their membership base.

Once a proposed code or standard change is voted on and approved, it is adopted by the organization. Usually once a year, or as needed, the organization will publish the most current changes in an addendum or supplement. When the next full edition of the code or standard is published, it incorporates all the changes into one text.

Code Congress International (SBCCI), and the International Conference of Building Officials (ICBO). However, in 1994 these three organizations agreed to form an umbrella organization called the International Code Council (ICC). In 2003, the legacy organizations (BOCA, ICBO, and SBCCI) formally consolidated into the ICC. As they began the integration process, the model code organizations put their effort into one set of codes and eventually stopped producing their own separate code publications. Now, rather than three different sets of codes

Note

The older model codes are now collectively known as the *legacy* codes.

there is one complete set of codes published by the ICC, known as the *International Codes*—or *I-Codes* for short. The first code produced by the ICC was the *International Plumbing Code* in 1995.

However, in the late 1990s the National Fire Protection Association (NFPA) decided to create its own set of codes. Prior to this, NFPA mainly created and published standards and a few codes such as the *Life Safety Code* and the *National Electrical Code*. Now it has a complete set of codes, some of which were created in collaboration with other industry organizations. This series of codes is called the *Comprehensive Consensus Codes*—or *C3-Codes* for short. Currently, the NFPA's collaboration partners include the International Association of Plumbing and Mechanical Officials (IAPMO), the Western Fire Chiefs Association (WFCA), and the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE). The various interior-related code publications from both the ICC and NFPA are summarized in Figure 1.1.

In the past, the model codes catered to certain regions of the country. The newer codes by the ICC and NFPA now take into account the many regional differences that can be found throughout the United States. For example, certain coastal states need more restrictive seismic building code provisions to allow for the many earthquakes in that area, and the northern states need codes to allow for long periods of below-freezing temperatures. All these various requirements are now in the current building codes. In some cases, a code jurisdiction will add amendments to the code they adopt to create requirements unique to their area.

In addition, some states and cities continue to maintain their own set of codes. Until the comprehensive set of I-Codes by the ICC became available, a number of state codes were based on or closely followed the model codes. These codes were usually created in response to unique situations or unique problems that had occurred. Often they set stricter building requirements. Boston, for example, established the *Boston Fire Code* as a result of fatal fires that occurred in the city. A devastating hurricane in the state of Florida prompted them to create their own set of statewide codes. Other states with their own codes include California, New York, and North Carolina.

However, even the differences between these customized codes are becoming less obvious as more states and cities are working closely with the code organizations. For example, many states are working with the ICC to revise the *International Building Code* as required for their state. The ICC then reprints the code specifically for that state as a customized code. Some of these locations have a complete set of unique codes, while others may have just one or two special code publications and use one of the available codes for everything else.

ICC I-Codes®		NFPA C3-Codes	
IBC®	International Building Code®	NFPA 5000®	Building Construction and Safety Code®
ICC PC	ICC Performance Code for Buildings and Facilities		(performance requirements included in each code)
IFC®	International Fire Code®	NFPA 1®	Uniform Fire Code® (UFC)
	(similar requirements found in IBC and IFC)	NFPA 101®	Life Safety Code® (LSC)
IPC®	International Plumbing Code®	IAPMOs	Uniform Plumbing Code® (UPC)
IMC®	International Mechanical Code®	IAPMOs	Uniform Mechanical Code® (UMC)
ICC EC™	ICC Electrical Code™ - Administrative Provisions (references NEC)	NFPA 70®	National Electrical Code® (NEC)
IECC®	International Energy Conservation Code®	NFPA 900®	Building Energy Code® (based on ASHRAE standards 90.1 and 90.2)
IRC®	International Residential Code® for One- and Two-Dwelling Units		(residential requirements included in other codes)
IEBC®	International Existing Building Code®		(existing building requirements included in each code)
IFGC®	International Fuel Gas Code®	NFPA 54®	National Fuel Gas Code® also refer to: NFPA 30®, Flammable and Combustible Liquid Code NFPA 30A®, Code for Motor Fuel Dispensing Facilities and Repair Garages NFPA 58®, Liquefied Petroleum Gas Code

NOTE: This chart includes interior related codes. Other codes dealing with overall building or site-related items are not included.

Figure 1.1 Comparison of Code Publications (This chart is a summary of publications from the International Code Council® and the National Fire Protection Association that pertain to interior projects. Neither the ICC® nor the NFPA assume responsibility for the accuracy or the completion of this chart.)

Figure 1.2 is a map that indicates the number of states currently using one or more of the I-Codes. This could include an original I-Code or one that was revised by a city or state. Some of the NFPA codes, such as the *NFPA 5000*, are fairly new and have not been reviewed or adopted by many jurisdictions in their code adoption cycle. This may change in the future. In addition, both the ICC and NFPA work with federal and state agencies for possible adoption. For example, the U.S.

- 44 states plus Washington, D.C. and the Department of Defense use the *International Building Code*
- 44 states plus Washington, D.C. use the *International Residential Code*
- 36 states plus Washington, D.C. use the *International Fire Code*

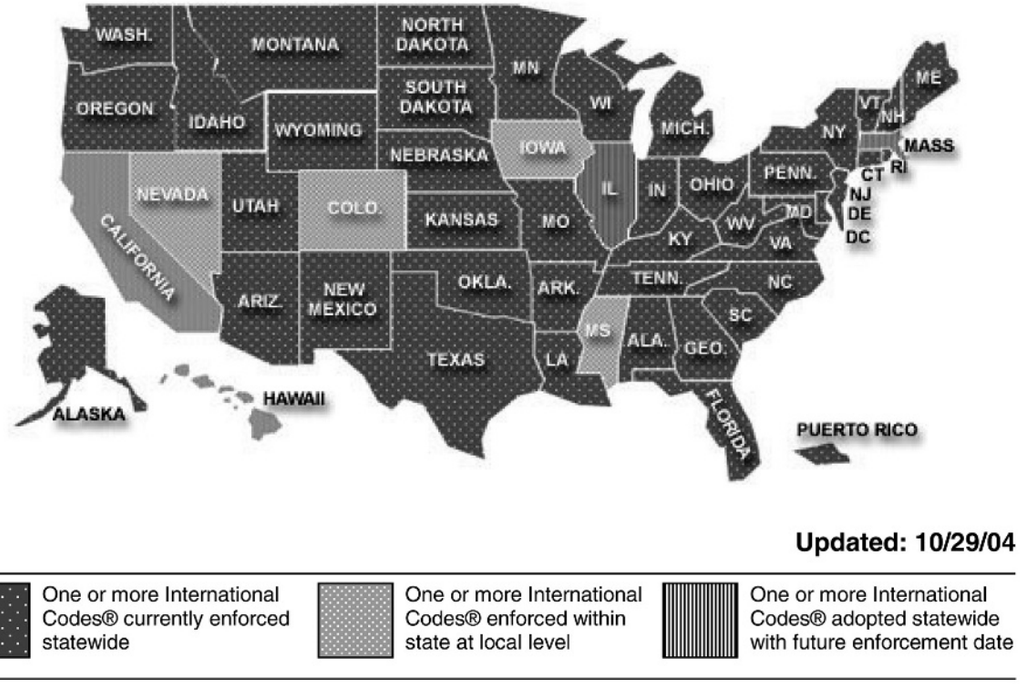

Figure 1.2 International Code Adoptions (Reproduced with permission from the International Code Council, www.iccsafe.org. See Web site for most current edition.)

Department of Defense and the National Park Services currently require the use of some I-Codes in their buildings. The Department of Veterans Affairs and the Centers for Medicare and Medicaid Services utilize the *Life Safety Code*. You can go to both the ICC and the NFPA Web sites to learn about the latest code adoptions. (See Resources in Appendix E.)

It is extremely important to know what codes and standards apply to your project before you start. Each of the codes produced by the ICC and NFPA, as they pertain to interior projects, are described in this section. The various standards are described in the next section. Be sure to contact the local jurisdiction to obtain a list of the approved code publications and any other special requirements or addendums.

Building Codes

Building codes stress the construction requirements of an entire building and place restrictions on hazardous materials or equipment used within a building. The principal purpose is to ensure the public health, safety, and welfare of the people using these buildings. This includes structural, mechanical, electrical, plumbing, life safety (egress), fire safety (detection and suppression), natural light and air, accessibility standards, and energy conservation. Although other codes and standards may be referenced, the building codes cover each of these topics.

In the past, the three model building codes were the most common building codes used throughout the country. They were the *BOCA National Building Code (NBC)* published by BOCA, the *Standard Building Code (SBC)* published by SBCCI, and the *Uniform Building Code (UBC)* published by ICBO. New editions of what are now called *legacy codes* are no longer being created. The older editions will stop being used as jurisdictions update the codes they enforce. Now the option is to adopt the *International Building Code (IBC)* published by ICC or the *Building Construction and Safety Code® (NFPA 5000®)* published by NFPA. The *IBC* was first published in 2000, with the most current edition being 2003 and the next edition due in 2006. *NFPA 5000* was first published in 2003, with the next edition due in 2006. As with the previous model codes, the ICC and the NFPA typically work on a three-year cycle, but this might vary as the NFPA coordinates the development of their publications. Usually, each state or jurisdiction adopts one of these two building codes or is covered by a state building code based on one of these codes (as described above). Since the *IBC* was published before the *NFPA 5000* and is based on the earlier legacy codes which were used extensively throughout the United States, many more states and local jurisdictions are currently using the *IBC* or a code based on the *IBC*. According to Figure 1.2, more than 40 states are using the *IBC*. You can see why it is so important to know which codes are being used in a particular jurisdiction to determine which requirements must be met.

Note

Since the model code organizations no longer publish their respective codes, they will not be discussed in this book.

The organization of the two main building codes is different. The *IBC* is organized by various aspects of a building and continues to use the CABO Common Code Format. This format was started by the model code organizations in 1994. Therefore, all the chapters in the *IBC* are arranged in the same order as the last editions of the model building codes. This allows designers working on projects in different jurisdictions with different codes to find information easily. Specific requirements for each occupancy or building type are referenced within each chapter.

Note

Some jurisdictions mention the "model" codes in their laws. As a result, the ICC has republished some of their codes with an older model code name on them until the laws can be changed.

The *NFPA 5000* uses a different format. Instead, it is organized using the new NFPA Manual of Style, where there are several key chapters in the beginning and end of the book and the rest of the chapters are divided by occupancy type. (This

IBC (2003) **International Building Code**		NFPA 5000 (2003) **Building Construction & Safety Code**		LSC (2003) **Life Safety Code***	
Chapter 2	Definitions	**Chapter 3**	Definitions	**Chapter 3**	Definitions
Separate	References separate code: *ICC Performance Code for Buildings and Facilities (ICCPC)*	**Chapter 5**	Performance-Based Option	**Chapter 5**	Performance-Based Option
Chapter 3	Use and Occupancy Classification	**Chapter 6** **Varies**	Classification of Occupancy, Classification of Hazard of Contents, and Special Operations Multiple chapters 16–30 each on a different occupancy classification	**Chapter 6** **Varies**	Classification of Occupancy and Hazard Contents Multiple (even) chapters 12–42 each on a different occupancy classification
Chapter 4	Special Detailed Requirements Based on Use and Occupancy	**Chapter 31** **Chapter 33** **Chapter 34**	Occupancies in Special Structures High-Rise Buildings High Hazard Contents	**Chapter 11**	Special Structures and High-Rise Buildings
Chapter 5	General Building Heights and Areas	**Chapter 7**	Construction Types and Height and Area Requirements		(none)
Chapter 6	Types of Construction	**Chapter 7**	Construction Types and Height and Area Requirements		(none)
Chapter 7	Fire-Resistance-Rated Construction	**Chapter 8**	Fire-Resistive Materials and Construction	**Chapter 8**	Features of Fire Protection
Chapter 8	Interior Finishes	**Chapter 10**	Interior Finish	**Chapter 10**	Interior Finish, Contents, and Furnishings
Chapter 9	Fire Protection Systems	**Chapter 55**	Fire Protection Systems and Equipment	**Chapter 9**	Building Service and Fire Protection Equipment
Chapter 10	Means of Egress	**Chapter 11**	Means of Egress	**Chapter 7**	Means of Egress
Chapter 11	Accessibility	**Chapter 12**	Accessibility		(none)
Chapter 12	Interior Environment	**Chapter 49**	Interior Environment		(none)
Chapter 13	Energy Efficiency	**Chapter 51**	Energy Efficiency		(none)
Chapter 24	Glass and Glazing	**Chapter 46**	Glass and Glazing		(none)
Chapter 26	Plastic	**Chapter 48**	Plastics		(none)
Chapter 27	Electrical	**Chapter 52**	Electrical Systems		(none)
Chapter 28	Mechanical Systems	**Chapter 50**	Mechanical Systems		(none)
Chapter 29	Plumbing Systems	**Chapter 53**	Plumbing Systems		(none)
Chapter 31	Special Construction	**Chapter 32**	Special Construction		(none)
Chapter 34	Existing Structures OR use separate code: *International Existing Building Code (IEBC)*	**Chapter 15**	Building Rehabilitation	**Varies**	Multiple (odd) chapters 13–39 each on a different occupancy classification
Chapter 35	Referenced Standards	**Chapter 2**	Referenced Standards	**Chapter 2**	Referenced Standards

*NOTE: This chart includes interior-related chapters only. The *Life Safety Code* is not a buildings code so it will not have all the same type of chapters but it is often used in conjunction with a building code.

Figure 1.3 Comparison of Building Codes and Life Safety Code (This chart is a summary of information contained in the *International Building Code® (IBC®),* the *NFPA 5000®*, and the *Life Safety Code® (LSC®)*. Neither the ICC nor the NFPA assume responsibility for the accuracy or the completion of this chart.)

format is being incorporated into all of the NFPA publications.) The occupancy chapters allow you to go directly to the chapter that pertains to your building type to start the code review. The particular occupancy chapter will reference the various other chapters as required. The most important building interior–related chapters in both the *IBC* and the *NFPA 5000* are summarized in the comparative list found in Figure 1.3.

Although there are more than 30 chapters and 10 appendixes in the *IBC* and even more chapters in the *NFPA 5000*, not all of them pertain to the interior of a building. The most common chapters (not including the *NFPA 5000* occupancy chapters) that you will need for working on building interiors are listed as follows and are discussed throughout this book. You should become the most familiar with these, although certain projects may require you to refer to other sections of the building code as well. For example, you may also need to look up information in the chapters on glass and glazing, plastic, or existing structures.

Note

The *IBC* contains appendixes with additional accessibility requirements. However, these are only required when specifically adopted by a jurisdiction.

Use or Occupancy Classification
Special Use or Occupancy Requirements
Types of Construction
Fire-Resistant Materials and Construction
Interior Finishes
Fire Protection Systems
Means of Egress
Accessibility
Interior Environment
Plumbing Systems

Note

A more comprehensive list of code adoptions can be found on the ICC and NFPA Web sites. (See resources in Appendix E.)

To cover as much as possible, the building codes frequently reference other codes and standards within their text. Each code organization publishes a number of other codes and standards that may be referenced. These include a plumbing code, a mechanical code, a fire prevention code, an energy conservation code, and an existing structures code, many of which are described later in this chapter. Many of these same topics are listed as chapters in the *IBC* and *NFPA 5000*. However, these chapters typically refer you to another code or standard. (Refer to Figure 1.1 for a full list of interior-related code publications.) Performance codes (described next) are also referenced within each building code. *NFPA 5000* includes a chapter within the text, while the *IBC* tells you to reference its own separate performance code publication. In addition, other nationally recognized standards organizations and publications are referenced by each of the codes. (See the section on Standards Organizations later in this chapter.)

Performance Codes

Note

The *SFPE Engineering Guide to Performance-Based Fire Analysis and Design of Buildings* is a good resource when working with performance-based codes.

Traditionally, codes have been more prescriptive in nature. A *prescriptive* code gives you a precise requirement so you know exactly what needs to be done to meet the code. A *performance* code, on the other hand, gives you an objective but not the specifics of how to achieve it. Yet, some requirements in the prescriptive codes have also included parameters for the use of alternate methods, materials, and systems that can be considered more performance-like. These alternate methods allowed some flexibility in the past; however, the traditional code does not describe how to show equivalency, which can make it hard to obtain approval from your code official. A performance-based code, instead, provides more structure by stating an objective and providing an administrative process to follow. It shows the designer how to meet these objectives, how to document the results, and how to work with the code official to obtain final approval.

A good example of the difference between a prescriptive code and a performance criterion can be found in the spacing of guardrail elements. In the *International Building Code* the prescriptive requirement specifies that rail elements must be spaced so "that a 4-inch-diameter (102 mm) sphere cannot pass through any opening up to a height of 34 inches (864 mm)." This requirement was developed specifically with children in mind. The *ICC Performance Code* does not mandate this narrow spacing. Instead, it specifies "that the openings shall be of an appropriate size and configuration to keep people from falling through based on upon the anticipated age of the occupants." If it can be shown that children are not expected to frequent the building, then different spacing of the guardrail elements may be allowed. An example might be a manufacturing facility.

Note

The use of performance codes actually started in other countries. Australia was one of the first to use them.

The development of performance-based codes separate from prescriptive codes is fairly recent in the United States. The International Code Council first published the *ICC Performance Code for Building and Facilities (ICCPC)* in 2001. Updated again in 2003, it is now on a three-year revision cycle. The *ICCPC* is meant to be used in conjunction with the *IBC*, as well as most of the other I-Codes. It addresses the overall scope of each of the I-Codes in performance-based language and describes how to use them together. However, the *ICCPC* cannot be used with the other I-Codes unless it is adopted by the code jurisdiction.

The NFPA, on the other hand, does not plan to have a separate text for performance criteria. Instead, the new *NFPA 5000* and the *Life Safety Code* starting with the 2000 edition (which will be discussed later) each include both performance requirements and prescriptive requirements. The information is organized in both publications in similar ways. Each has a Chapter 5 titled "Performance-Based Option." In addition, NFPA recommends that you reference Chapter 4 in

each text. This general chapter discusses some of the code's goals, assumptions, and objectives that give you additional insight to using prescriptive type codes. Since a jurisdiction that adopts one of the NFPA codes does have the option to exclude Chapter 5, you need to confirm that you are able to use the performance requirements if you are referring to these codes.

The purpose of performance codes is to allow for more creative design solutions in the use of materials and systems of construction and to allow innovative engineering to solve code requirements in ways that can be specific to each

USING PERFORMANCE CODES

With the introduction of performance requirements within the code publications, using performance codes on an interior project is an option. By using performance codes you may be able to specify innovative materials and develop unique design solutions for your projects. Performance codes can be especially helpful when trying to incorporate sustainable design into a project or when working on an existing building with unusual characteristics. However, it is the designer's responsibility to convince the client and the code official that the proposed situation meets the performance code criteria. You must take additional steps to prove that your design will provide equivalent safety to the same prescriptive requirements. Examples of additional steps that may be required include:

- ❑ ***Acquire data.*** **You can work with an engineer or other consultant to obtain specific data or develop new data through the use of available design guides, calculation methods, and computer models. These are currently used in supporting fire and structural-related scenarios but may have many new applications in the future.**
- ❑ ***Obtain reports.*** **You can do your own research on specific materials and assemblies by obtaining reports from product evaluation services (see separate inset in this chapter) and working with the manufacturer of a particular product. Existing products often have already gone through the necessary testing and have available evaluation reports. But, if you develop something new, you may be able to work with a manufacturer to obtain the necessary tests and reports.**
- ❑ ***Find comparables.*** **You can look to other buildings and projects with similar situations or a similar use of a product. Contact the designers and contractors involved in those projects for information that could be useful. (This usually cannot be your only supportive documentation.)**

In the future more alternatives will become available to help analyze and support your use of performance codes. The best method to support your solution depends on the extent of the performance criteria as well as the uniqueness of your design. No matter which steps you take to provide documentation, the ultimate goal is to show that the safety of the building occupants will be maintained. It is also suggested that you work with the code official early in the design process to establish what criteria will be required for approval.

Note

Other countries that use performance codes include Australia, Canada, Japan, New Zealand, and the United Kingdom.

project. In designing to meet the requirements of a performance code, there are a number of parameters or assumptions that must be determined in the beginning of a project. (See inset titled *Risk Factors and Hazards in Occupancies* on page 45.) These assumptions are used to create performance guidelines that are followed throughout the design process. (Similar assumptions were used by the code organizations in the development of the prescriptive codes.)

When using performance codes, it becomes even more important to start working with the code official in the early stages of a project. An overall team approach is actually encouraged by the code. For the solution to be acceptable, the code official must agree that your design and the supporting documentation meet the intent of the code. Performance codes are intended to allow for creativity in design and engineering while still providing for the necessary safety and welfare concerns of the code. You will need to prove this to the code official. (See Chapter 10 and the inset on page 19, *Using Performance Codes*, for additional information.) Performance codes may be applied to any design project if allowed by the code official. However, they may be most effective in unique situations, including the use of new technology, incorporating sustainable design, and the reuse of existing and historic buildings, which may not easily meet the strict requirement of the prescriptive codes. In most cases, performance codes will only apply to part of a project and will not totally replace the required prescriptive codes.

Fire Codes

Both the ICC and the NFPA now have a fire code as well. The first fire code produced by the ICC was in 2000 and is called the *International Fire Code (IFC)*. Like the other I-Codes it is on a three-year revision cycle with newer editions in 2003 and 2006. In 2003, NFPA came out with a new fire code, which was developed in partnership with the Western Fire Chiefs Association (WFCA). Titled the *Uniform Fire Code® (UFC)* or *NFPA 1®*, it integrates the older *NFPA 1, Fire Prevention Code* with the *Uniform Fire Code* originally developed by the ICBO and WFCA. This new version is organized similarly to the other C3-Codes and includes a chapter on performance-based design. It will be revised again in 2006. Much of the *UFC* is taken from various other codes and standards produced by NFPA, such as the *Life Safety Code*. When a specific requirement comes from another code, the *UFC* refers to the code so that you know where the requirement originated.

When adopted by a jurisdiction, the fire code is typically used in conjunction with the related building code. The fire code addresses building conditions that are hazardous and could cause possible fire and explosions. This could be due to a number of reasons such as the type of occupancy or use of the space, the type of materials stored, and/or the way certain materials are handled.

Although applicable to almost all building types, it becomes more prevalent when you are working with a building type that may not be fully covered by the building code. For example, the fire code gives you specifics for a paint booth in a car shop, a commercial kitchen in a restaurant, and a dry-cleaning facility.

However, there are a few chapters or sections in each of the fire codes that you will reference more frequently. They include the following:

Means of Egress

Fire-Resistant Construction

Fire Protection Systems

Interior Finishes

Furnishings and Decorative Materials

These are similar to the chapters in the building codes. In addition, the fire codes each have a chapter on emergency planning, which addresses such things as evacuation plans and fire drills for each type of occupancy. Although this chapter is geared more toward building owners and fire departments, there are certain occupancy provisions that may also affect an interior project such as signage and keying requirements. Many of the various fire code requirements as they relate to interiors and the chapters listed above will be mentioned throughout this book.

Life Safety Code®

The *Life Safety Code (LSC)* was one of the first codes published by the NFPA. It is also referred to as *NFPA 101®*. Like the building codes, the *LSC* is typically revised every three years. More current editions would include 2003 and 2006, yet a jurisdiction may still be using an older version. The *LSC* is not a building code. It is a life safety code that concentrates on problems involving the removal or evacuation of all persons from a building. As stated in the *LSC*, the purpose of the code is to "establish minimum requirements that will provide a reasonable degree of safety from fire in buildings and structures." The difference between the *LSC* and the building codes can also be seen in Figure 1.3. You will notice that the *LSC* chapters correspond to those found in the *IBC* and the *NFPA 5000*, but since it is not a building code it does not address all the issues required for the construction of a building. For example, it does not include chapters on accessibility, glazing, or plumbing.

Note

The *Life Safety Code (LSC)* does have two corresponding documents: *NFPA 101A, Alternative Approaches to Life Safety* and *NFPA 101B, Means of Egress for Buildings and Structures*. (See Chapter 4.) A jurisdiction has the option of adopting these documents with the *LSC* or in place of the *LSC*.

The *LSC* uses the NFPA's Manual of Style format. The first part of the *LSC* concentrates on the broad topics of occupancies, means of egress, and fire protection. The remainder is divided into chapters by occupancy classification for both new and existing buildings. For example, there is a chapter on new apartment

buildings and existing apartment buildings. This distinction is made to provide older buildings with additional safety and protective devices so they are virtually as safe as newly constructed buildings. (This is different from the *NFPA 5000*, which has only one chapter per occupancy and puts all existing requirements into one separate chapter.) Once you know the occupancy classification of your project and whether it is considered new or existing, most of your research will be limited to one chapter of the *LSC*. This occupancy chapter will direct you to other chapters as required. (See Chapter 2 for more detail.)

Note

A proposal has already been approved by the ICC to revise the first six chapters in the 2003 edition of the *IEC*, making it easier to use.

Starting in 2000, the *LSC* also includes a chapter on alternative performance-based options, giving you the ability to select the requirements that best suit your project. (See Performance Codes and the inset titled *Using Performance Codes*, earlier in this chapter.) Like other codes, the *LSC* also references additional standard publications within its text. These are typically other NFPA standards, such as *NFPA 80, Standard for Fire Doors and Windows,* and *NFPA 220, Standard on Types of Building Construction.* (See the section on the NFPA standards later in this chapter.)

The *LSC* is used throughout the United States and in several other countries. It is currently used in at least one jurisdiction in every state and has been adopted statewide by at least 35 states in the United States. (A map of locations can be found on the NFPA Web site. See Appendix E.) When a jurisdiction requires you to use the *LSC* in conjunction with a building code, you must satisfy both sets of requirements in your design. Sometimes a requirement in the *LSC* might conflict with a requirement in the building code. When this occurs you need to use the more restrictive requirement or, if necessary, work with the local code official to determine the best way to meet both requirements.

Plumbing Codes

Note

The *IBC* also includes a chapter on plumbing fixtures. This chapter and other plumbing requirements will be explained in Chapter 7.

The *International Plumbing Code (IPC)* was actually the first I-Code published by the ICC in 1995. The most current version of the *IPC* is 2003, and it will continue to be revised every three years. Also available in 2003 as part of NFPA's set of C3-Codes was the *Uniform Plumbing Code (UPC)*. This code was produced in conjunction with one of their new partners: the International Association of Plumbing and Mechanical Officials (IAPMO). IAPMO originally published this code under the same name for the International Conference of Building Officials (ICBO) before ICBO consolidated with BOCA and SBCCI to form the ICC. In addition, the Plumbing-Heating-Cooling Contractors Association is continuing to publish its *National Standard Plumbing Code (NSPC)*. The newest edition is 2003. Currently, most code jurisdictions use the *IPC*; however, with the reintroduction of the *UPC*, this may change in the future.

Most of the chapters in the plumbing code are geared toward an engineer and the professional plumbing contractor. In a project requiring plumbing work, you will often use the services of a licensed engineer to design the system. You will notice in Figure 1.3 that both building codes have a chapter on plumbing systems as well. These chapters refer you to the respective plumbing code. However, in the *IBC* the plumbing chapter also includes the minimum plumbing facility section of the *IPC* with the related table. It is this plumbing fixture table and its related chapter that will be discussed in this book. (See Chapter 7 for more detail.) When designing interior projects, you will find this plumbing code chapter important in helping you determine the minimum number and type of fixtures required for a particular occupancy classification.

Mechanical Codes

Similar to the plumbing codes, a mechanical code was also published by each of the model code organizations. The first *International Mechanical Code (IMC)* was published by the ICC in 1996. The more current editions include 2003 and 2006. It is widely accepted. However, in 2003 the first edition of the new *Uniform Mechanical Code (UMC)* was published by IAPMO in partnership with NFPA. The *UMC* was originally published by the ICBO but has now been significantly modified to meet the requirements of NFPA's set of C3-Codes. Jurisdictions may now choose between the *IMC* and the *UMC*.

Again, as shown in Figure 1.3, each building code has a chapter on mechanical systems. However, this chapter refers you to the respective mechanical code. The mechanical codes are geared toward mechanical engineers and professional installers. Although you will very rarely have to refer to the mechanical codes, on interior projects you should be familiar with some of the general requirements and the terminology. These are discussed in more detail in Chapter 7.

Electrical Codes

The *National Electrical Code (NEC)*, published by the NFPA, is one of the oldest existing codes. Originally published in the late 1800s, it is now a part of the NFPA C3-Code set. The current edition is 2002 with the next one expected in 2005. Also known as *NFPA 70*, the *NEC* is the most used electrical code, and is the basis for electrical codes in almost all code jurisdictions. Even the ICC references this code. In 2000, the ICC published the first edition of the *ICC Electrical Code—Administrative Provisions (ICCEC)*. The most current edition is 2003. However, rather than creating a new electrical code, the *ICCEC* refers you to the *NEC* and outlines the provisions required for the enforcement of the *NEC* so that enforcement is similar to the other

I-Codes. At this time ICC does not plan to create an electrical code and will continue to refer to the *NEC*.

In addition, each building code has a chapter on electrical systems as shown in Figure 1.3. In the *IBC* this chapter refers you to the *ICCEC* and includes a section on emergency and standby power systems. In the *NFPA 5000*, the electrical chapter refers you to the *NEC*. You will rarely, if ever, refer directly to the electrical code, since it is the responsibility of an engineer to design electrical systems. On the other hand, for an interior project you will often locate electrical outlets and fixtures as well as specify light fixtures and other equipment. Therefore, it is important to have a basic understanding of this code. The most common requirements are explained in Chapter 8.

Energy Codes

Note

ASHRAE 90.1 is a standard geared toward energy efficiency in commercial buildings. Although the 1999 edition is required by the DOE, newer editions might be required by a code jurisdiction.

Both the ICC and the NFPA have an energy conservation code that establishes minimum regulations for energy efficient buildings. The ICC has the *International Energy Conservation Code (IECC)*, which was originally based on the *Model Energy Code* (1992 edition). First published in 1998, the most current edition of the *IECC* is 2003. It includes prescriptive and performance-related provisions. It also covers both residential buildings and commercial buildings. A majority of states in the United States currently require the use of the *IECC*.

In 2004 the NFPA came out with its first energy conservation code, titled *NFPA 900, Building Energy Code (BEC)*. Rather than creating a totally new code, the *NFPA 900* outlines the provisions required for administering and enforcing two ASHRAE standards. The standards are *ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings* (geared toward commercial buildings) and *ASHRAE 90.2, Energy-Efficient Design of New Low-Rise Residential Buildings* (geared toward residential homes). Both standards were most recently updated in 2004, although an older version might still be referenced by a jurisdiction. The *IECC* also references the *ASHRAE 90.1* for commercial buildings. In addition, the U.S. Department of Energy has established this standard as a requirement under the federal Energy Conservation and Production Act, which requires all states to have energy codes in place that are at least as strict as the 1999 edition of the standard.

Each building code has a chapter on energy efficiency; however, the chapter simply refers you to their respective energy code. Energy conservation codes address many aspects of a building, starting with the energy efficiency of the building envelope, which promotes adequate thermal resistance and low air leakage. For example, in an exterior wall the code will specify how much and what type of glass can be used and the rating of the wall insulation required. If you were

to change an interior element that connects to an exterior wall, you may need to confirm that you are not changing the energy efficiency of the original exterior wall.

The energy codes also cover the design, selection, and installation of energy-efficient mechanical systems, water-heating systems, electrical distribution, and illumination systems. Since most of the requirements are geared to either the building shell or mechanical and electrical systems, you will not have to refer to the code often. However, you should be aware of the basic requirements, especially as they relate to illumination and the selection of light fixtures. These requirements will be further explained in Chapter 7 and Chapter 8. Other energy requirements related to the interior of a building will be mentioned throughout the book. (Using energy codes also greatly affects the sustainability of a building or space. See inset titled *Sustainability and LEED* in Chapter 9 on page 374.)

Residential Code

The *International Residential Code (IRC)*, published by the ICC, first became available in 1998 and is based on the former *One- and Two-Family Dwelling Code (OTFDC)*. The more current editions include 2003 and 2006. It is the main code used for the construction of single-family and duplex residences and townhouses. It covers the typical residential home that is not more than three stories in height and has a separate means of egress. All other types of residential uses would be regulated by a building code. For example, if you were working on a house that is over three stories or a small apartment building where the units do not exit directly to the outside, you would need to use the building code instead of the *IRC*. The *IRC* is a stand-alone code meaning that it covers all construction aspects of the building without having to refer to other code documents. In addition to the typical building code chapters, it includes complete chapters on mechanical, electrical, plumbing, and energy requirements.

Note

Refer to Appendix B for more information on codes for single-family homes.

The NFPA currently does not have a separate residential code. Instead, it covers the building aspects of single-family homes in both the *NFPA 5000* and the *Life Safety Code*. Each has an occupancy chapter titled "One- and Two-Family Dwellings." This chapter provides specific requirements and directs you to other chapters in the text that provide exceptions for single-family homes. This chapter also directs you to other NFPA codes as well as multiple NFPA standards that are geared toward one- and two-family dwellings. For example, the *NFPA 5000* refers you to the *UMC*, *NEC*, *UPC*, and *ASHRAE 90.2* for residential requirements dealing with mechanical, electrical, plumbing, and energy provisions, respectively. If a jurisdiction requires the *IRC* in addition to an NFPA code, you would need to make sure the most restrictive requirements are followed. (Although this

book concentrates more on commercial type projects, codes and standards specifically for residential homes are briefly discussed in Appendix B.)

Existing Building Code

Note

Design and construction projects in existing buildings typically require the use of the building codes. However, a jurisdiction may also have the option of using the *IEBC*. See Appendix C.

In the past, there were two model codes available for use with existing buildings. These included the SBCCI's *Standard Existing Building Code* and the ICBO's *Uniform Code for Building Conservation*. Some code jurisdictions may still be referring to them. The ICC and NFPA building codes both dedicate an entire chapter to existing buildings—Chapter 34 on "Existing Structures" in the *IBC* and Chapter 15 on "Building Rehabilitation" in the *NFPA 5000*. (The *Life Safety Code* includes existing occupancy chapters throughout its text.) However, in 2003 the ICC published the first *International Existing Building Code (IEBC)*. The next one is expected in 2006. It is dedicated entirely to existing buildings, providing requirements for reasonable upgrades and improvements depending on the type and the extent of the work.

PRODUCT EVALUATION SERVICES

In 2003 the International Code Council (ICC) merged the National Evaluation Service (NES) with the evaluation services of the three model code organizations. The new organization, called the ICC Evaluation Service (ICC ES), is a subsidiary of the ICC. Like its predecessors, the ICC ES evaluates new materials, methods of construction, and testing as they become available to make sure they comply with the I-Codes, as well as other codes in the United States. The ICC ES works closely with various accredited testing laboratories and approved inspection agencies in order to accomplish this. These laboratories and agencies are reviewed and approved by the International Accreditation Services (IAS), another independent subsidiary of the ICC.

The request to evaluate a product or system often comes from the manufacturer, but others, such as builders, code officials, engineers, architects, and designers, can do so as well. The ICC ES will evaluate the characteristics of the product, the installation of the product, and the conditions of its use to verify that it meets or exceeds the requirements of the codes and standards. Once a product or system is approved, a report is issued and made available to the industry. (The reports are posted on its Web site, www.icc-es.org.) These reports can then be used to support the use of a building material by code officials and designers. It is especially helpful as part of a performance-based design. The evaluation report also allows manufacturers to gain national recognition of a new product. Other evaluation services are available as well. For example, some states, such as California and Florida, have developed their own uniform requirements to meet their statewide codes. (Reports created by the older model code organizations are still available and are known as ICC-ES "Legacy Reports." As each report is updated, it becomes part of the I-Codes.)

If you are working in an existing building, you will need to confirm that the *IEBC* has been adopted by that jurisdiction. If not, you need to determine if the jurisdiction requires the use of one of the older codes mentioned above or the appropriate chapter in the building code. When using the *IEBC*, the extent of work (i.e., repair, alteration, or addition) will determine the level of code compliance. In some cases the requirements will be more lenient than those in the building code. The *IEBC* also includes both prescriptive and performance-related provisions. All of this is explained in more detail in Appendix C. (Although this book concentrates on codes for new construction, many of the same requirements apply to new work being done in existing buildings. For more detailed information on codes for historic and existing buildings, see Appendix C.)

FEDERAL REGULATIONS

A number of federal agencies and departments work with trade associations, private companies, and the general public to develop federal laws for building construction. These regulations are published in the *Federal Register (FR)* and the *Code of Federal Regulations (CFR)*. The *FR* is published daily and includes the newest updates for each federal agency. However, not all rules published in the *FR* are enforceable laws. Typically, a federal agency must review the regulations published in the *FR* and make a formal ruling. Once the regulations are passed into law, they are published in the *CFR*. The *CFR* is revised annually to include all permanent agency rules.

Note

When using federal regulations, both the *FR* and the *CFR* should be reviewed to determine the most current requirements.

The federal government plays a part in the building process in a number of ways. First, it regulates the building of its own facilities. These include federal buildings, Veterans Administration (VA) hospitals, and military establishments. The construction of a federal building is usually not subject to state and local building codes and regulations. Instead, each federal agency has criteria and regulations that must be met when constructing a new building or renovating an existing one. For example, the Department of Defense or the Department of Transportation might have certain building requirements and regulations that are not required by the Department of Justice.

Note

The Occupational Safety and Health Act (OSHA) is another federal regulation affecting building interiors. It stresses the safe installation of materials and equipment to ensure a safe work environment for construction workers and building occupants. It must be strictly observed by contractors.

More recently, however, the federal government has begun to adopt more of the codes and standards from the private sector rather than create its own. This became more prevalent with the passing of the National Technology Transfer and Advancement Act (NTTAA) of 1995, which establishes the responsibility for federal agencies to use national voluntary consensus standards instead of developing

Note

The NTTAA gives the National Institute of Standards and Technology (NIST) the authority to assist with coordination between federal agencies and the private sector. You can find out more on the NIST Web site. (See resources in Appendix E.)

their own, wherever practical. Many federal agencies have been working with the ICC and the NFPA as well as standards organizations such as the American National Standards Institute (ANSI) to adopt existing codes and standards. (See Standards Organizations later in this chapter.) For example, multiple federal agencies require the use of the *Life Safety Code*, and the Department of Defense requires the use of the *International Building Code*. In some cases, the federal agencies collaborate with the organizations to develop new documents. Some of these are discussed in this chapter. If you are working on a federally owned or funded building, you will need to determine from the federal agency which codes and standards apply. Keep in mind that there could be more than one federal agency involved.

Another way the federal government plays a part in the building process is that it can pass federal legislation creating a law that supersedes all other state and local codes and standards. Each piece of legislation is created by a specific federal agency. When passed into law, it becomes mandatory nationwide. This is typically done to create a uniform level of standards throughout the country. The Americans with Disabilities Act (ADA) is one example. Although there is a wide variety of legislation covering everything from energy to transportation, only a few laws that pertain to the design of interiors are discussed in this section. (Also see Energy Codes on page 24.)

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) is a four-part federal legislation that became law on July 26, 1990, and became enforceable beginning in 1992. Prior to this, only federal buildings and federally funded projects had to comply with similar legislation under the Architectural Barriers Act (ABA) and its related *Uniform Federal Accessibility Standards (UFAS)*. With the passing of the ADA, many other types of projects are required to meet accessibility guidelines as outlined through the various titles of the law.

The ADA is a comprehensive civil rights law that protects individuals with disabilities in the area of employment (Title I), state and local government services and public transportation (Title II), public accommodations and commercial facilities (Title III), and telecommunication services (Title IV). The ADA was developed by the Department of Justice (DOJ) and the Department of Transportation (DOT).

The regulations that will apply most often to interior projects are found in Title III and Title IV. Title IV requires telephone companies to provide telecommunication relay services for the hearing and speech impaired. When you specify a public phone you must be familiar with the requirements. (See inset titled *Public Telephones* on page 329 in Chapter 8.)

Title III covers all public accommodations (any facility that offers food, merchandise, or services to the public) and commercial facilities (nonresidential buildings that do business but are not open to the general public). The intent of Title III is to regulate the design and construction of buildings so that persons with disabilities can use them. These regulations were incorporated into the *Americans with Disabilities Act Accessibility Guidelines (ADAAG)* as developed by the Architectural and Transportation Barriers Compliance Board (ATBCB or Access Board) and first published in 1991. The *ADAAG* deals with architectural concerns, such as accessible routes and restrooms, and communication concerns, such as visible alarm systems and signage.

Note

The Access Board researches accessibility needs and is responsible for updating and adding to the ADA guidelines when necessary. They also offer a toll-free number, a Web site (see Appendix E), and a variety of publications for guidance.

The Access Board continually works with other organizations to conduct research and create new documents. Some of the research is used to create proposed additions to the ADA guidelines, while other research is used to create guidance materials, such as checklists and technical bulletins, which can be used to gain additional insight. Although the Access Board has proposed changes to the *ADAAG*, very few changes have actually been incorporated into the guidelines since it was first published. This is because the Department of Justice (DOJ) must rule on and approve a proposal before it becomes an official part of the ADA guidelines. However, you need to be aware that some of the newer copies of the guidelines might include sections that are still waiting on a DOJ ruling. Until they are approved by the DOJ and become enforceable as part of the ADA law, you are not required to meet these requirements. (See the section on New ADA Guidelines in Appendix A for more detail.) To keep abreast of these latest changes and rulings you should regularly check the Access Board Web site. (See Resources in Appendix E.)

Note

To review other guidance material available from the Access Board, go to their Web site. (See resources in Appendix E.)

Most recently, the Access Board has been working with multiple agencies and organizations to combine the *ADAAG* with the *Uniform Federal Accessibility Standard (UFAS)*, which is used for federal buildings. (See inset titled *Accessibility Requirements—ANSI, ADAAG, UFAS, and FHAG* on page 32.) The new document, released in July 2004, is titled the *ADA and ABA Accessibility Guidelines*, but it will not be required by law until it goes through the proper government approvals. (See Appendix A.) The most comprehensive revision to date, these guidelines are organized to more closely correspond to the accessibility chapters in the building codes and other industry standards. The International Code Council worked closely with the Access Board to assist with its organization as well as reduce the differences in the accessibility provisions in its own 2003 edition of the *IBC*. The newer editions of the ICC/ANSI standard have also been harmonized with the new document. The organization of the new *ADA and ABA Accessibility Guidelines* as compared to the 1998 and 2003 ICC/ANSI standards is shown in Figure 1.4.

Although ADA regulations are mandatory, they may not be the only guidelines for accessibility issues that you follow. Each of the building codes contains an

ANSI (1998 and 2003) **ICC/ANSI 117.1 Accessibility Standard**		ADA Guidelines (2004) **ADA and ABA Accessibility Guidelines**	
		PART I	**ADA APPLICATION AND SCOPING**
Chapter 1	Application and Administration	**Chapter 1**	Application and Administration
Chapter 2	Scoping	**Chapter 2**	Scoping Requirements
		PART II	**ABA APPLICATION AND SCOPING**
		PART III	**TECHNICAL REQUIREMENTS**
Chapter 3	Building Blocks	**Chapter 3**	Building Blocks (basic technical requirements)
Chapter 4	Accessible Routes	**Chapter 1**	Accessible Routes
Chapter 5	General Site and Building Elements	**Chapter 5**	General Site and Building Elements
Chapter 6	Plumbing Elements and Facilities	**Chapter 6**	Plumbing Elements and Facilities
Chapter 7	Communication Elements and Features	**Chapter 7**	Communication Elements and Features
Chapter 8	Special Rooms and Spaces	**Chapter 8**	Special Rooms, Spaces, and Elements
Chapter 9	Built-in Furnishings and Equipment	**Chapter 9**	Built-in Elements
Chapter 10	Dwelling Units*		(distributed throughout other chapters)
	(not included)	**Chapter 10**	Recreation Facilities

*titled Dwelling Units and Sleeping Units in 2003 edition.

Figure 1.4 Comparison of Accessibility Publications (This chart is a summary of information contained in the *ICC/ANSI 117.1* standard and the *ADAAG*. The ICC, ANSI, and the Access Board do not assume responsibility for the accuracy or the completion of this chart.

accessibility chapter that includes specific requirements and references the ICC/ANSI standard *ICC/ANSI A117.1.* (See section on American National Standards Institute on page 34.) The requirements in these documents may differ. For example, the building codes may include accessibility requirements not found in the ADA guidelines. However, these requirements must still be followed. In addition, some states, such as California and North Carolina, have adopted their own acces-

sibility requirements. You must research, compare, and follow the most stringent requirements for that jurisdiction while maintaining the minimum federal requirements. Various accessibility requirements are addressed throughout this book. (Typically, the most restrictive requirements are used.) You will often have to incorporate both a code requirement and a related accessibility requirement together into your design. (Other aspects of ADA, such as the varying levels of compliance and responsibility for compliance, are discussed further in Appendix A.)

Note

The Appendix of the original *ADAAG* provides additional guidelines that enhance and clarify the main text. The new ADA-ABA Accessibility Guidelines inserts these as notes throughout the text. Although they are helpful, they are not binding. The *ADAAG* text is law. The Appendix or additional notes are not.

Fair Housing Act

The Fair Housing Act (FHA) is federal legislation enforced by the Department of Housing and Urban Development (HUD). Originally established in 1968, the FHA regulates fair housing and protects the consumer from discrimination in housing when buying or renting. In 1988, the FHA was expanded to include persons with disabilities. The FHA prohibits discrimination because of race, color, national origin, religion, sex, family status, or disability. Although the FHA is not specifically accessibility legislation, it does incorporate a number of provisions for people with disabilities and families with children.

The FHA regulations may apply to private housing, private housing that receives federal financial assistance, and state and local governmental housing. The FHA typically pertains to residential housing that has four or more dwelling units, such as apartments and condominiums. The ADA generally covers the places of public accommodation in these facilities, such as the related sales and rental offices; the FHA covers additional accessibility requirements. In 1991, HUD developed the final *Fair Housing Accessibility Guidelines (FHAG)* to help clarify these requirements. Many of the interior aspects of a dwelling are regulated, such as the location of thermostats, electrical outlets, light switches, and maneuvering areas in hallways, bathrooms, and kitchens. In addition, at least the ground floor units must be accessible and meet specific construction requirements.

Another document that became available in 2001 is the *Code Requirements for Housing Accessibility (CRHA)*. This code was developed by the International Code Council in conjunction with the National Association of Home Builders (NAHB) and HUD. HUD endorses this document as being equivalent to the most current version of the *FHAG*. Now, a jurisdiction can adopt the *CRHA* as an enforceable code. When you use this code you know that you are meeting, if not exceeding, the requirements of the *FHAG*. Other compliant documents considered equivalent to the *FHAG* include the 2000 *IBC* if used in conjunction with the 2001 *Supplement to the International Codes* and the 1986, 1992, or 1998 editions of the *ICC/ANSI A117.1*.

Some consider the FHA to be the residential version of the ADA. (See Appendix A.) Both were originally based on the same edition of the ANSI standards. However, the FHA does not require total compliance to the ICC/ANSI standards; it uses them only as a reference.

ACCESSIBILITY REQUIREMENTS—ANSI, ADAAG, UFAS, and FHAG

There are four main accessibility documents that are used most frequently for interior projects. In addition, each building code has a chapter dedicated to accessibility requirements. Although in many ways they are similar, none of them match exactly. It is important to know which document applies to your project.

ANSI A117.1 was originally developed by the American National Standards Institute (ANSI). It was one of the first accessibility guidelines used throughout the United States. It has served as the basis for other accessibility documents as well. The 1998 edition, known *as ICC/ANSI A117.1,* was developed in conjunction with the International Code Council (ICC) using the ANSI consensus process. The more current 2003 edition was developed by the ICC with the Access Board to be more consistent with the new *ADA and ABA Accessibility Guidelines*.

The *Americans with Disabilities Act Accessibility Guidelines (ADAAG)* was developed by the Architectural and Transportation Barriers Compliance Board (ATBCB or Access Board) as guidelines for the ADA legislation. It was originally based on the 1986 *ANSI A117.1*. A few minor updates have been made to it since its inception. More recently, the Access Board updated and totally reorganized the *ADAAG* and combined it with the *UFAS* to create the new *ADA and ABA Accessibility Guidelines*.

The *Uniform Federal Accessibility Standards (UFAS)* was developed as guidelines for the Architectural Barriers Act (ABA) legislation and applies to federal government buildings and recipients of federal funding (i.e., schools, hospitals, etc.). Although federal buildings are not currently required to conform to ADA regulations, a project that uses federal funding may be required to meet both the ADA guidelines and the *UFAS*. First issued in 1989, the *UFAS* is based on the 1980 ANSI standard. However, with the combination of the *UFAS* and the *ADAAG*, the requirements between both are becoming more consistent. The new *ADA and ABA Accessibility Guidelines* share the technical requirements. However, there are still separate scoping requirements for each legislation.

The *Fair Housing Accessibility Guidelines (FHAG)* was developed in 1991 as part of the Fair Housing Act (FHA). It provides accessibility requirements specifically for multi-unit housing that consists of four or more dwelling units and can include apartments as well as other building types such as dormitories and assisted living facilities.

Because the various agencies and organizations continue to work together, these separate accessibility documents are becoming more similar in scope and organization. However, each document still has some unique requirements and different characteristics. Although the ICC/ANSI standard is referenced in the building codes, the various federal laws are not. Therefore, all applicable documents must be reviewed for the most stringent accessibility requirements. In some cases more than one federal document will apply to one project. There may also be additional and/or conflicting state or local accessibility codes that need to be considered.

STANDARDS ORGANIZATIONS

A standard is a definition, a recommended practice, a test method, a classification, or a required specification that must be met. Standards are developed by trade associations, government agencies, and standards-writing organizations where members are often allowed to vote on specific issues. The size of these groups can range from a worldwide organization to a small trade association that develops one or two industry-related standards.

By themselves, standards have no legal standing. Instead, they are typically referenced by the codes. The standards become law when the code is adopted by a jurisdiction. In some cases, a jurisdiction will adopt an individual standard. In this way, standards supplement the code. Rather than giving all the details, the code will establish the minimum quality and performance criteria for a particular material or method. The code will then reference a standard, which sets the conditions or requirements for the material or method to meet. This allows the codes to provide specific instructions without going into great detail. For example, instead of setting specific fire extinguisher requirements, the *International Building Code (IBC)* references the *NFPA 10, Portable Fire Extinguishers. NFPA 10* then becomes a part of the enforced building code.

Note

Each of the code publications has a chapter or appendix listing the standards mentioned throughout its text. This list will indicate which edition of the standard is required.

When a standard is referenced, the acronym of the standard organization and a standard number is called out. For example, "*ASTM E152*" is an American Society for Testing and Materials standard known as *E152*. It is a standard method of fire testing for door assemblies. The reference also typically includes the year of the latest revision of the standard. When listed in a code publication, be sure to note the year to make sure you are using and/or referencing the correct edition. Although the year might not be used when mentioned within the text, each code publication includes a separate list of all the standards referenced within the text. This list will include the year or edition of the standard to be used.

Note

Some smaller standards organizations are specific to an industry. For example, the Business and Institutional Furniture Manufacturers Association (BIFMA) and the Upholstered Furniture Action Council (UFAC) are specific to the finish and furnishings industry. These and other organizations are listed in Appendix D.

The most common standards organizations that pertain to interior projects are described in this section. Each develops a wide variety of standards. Some may need to be examined in detail prior to designing an interior project. Others may only need mentioning in the specifications of the project. The most common standards that pertain to interior projects are discussed throughout this book.

National Fire Protection Association

The National Fire Protection Association (NFPA) was originally founded in 1896 to develop standards for the early use of sprinklers. Today it is one of the largest standards organizations. It develops and publishes more than 300 different

TESTING AGENCIES

Many standards affect the way building materials and other products are made. Manufacturers must know these standards and incorporate them into the manufacturing process. Many finished building products must pass one or more specific tests before they can be sold and used.

These tests are developed by the standards organizations. Some of the organizations provide testing services, but many of them do not have the facilities. Instead, a number of independent testing laboratories and testing agencies in the United States and throughout the world are set up to perform these tests. (Many are listed in a database available on the Internet at www.findtesting.com.) A manufacturer will typically send them a finished product, which is then tested and evaluated. (See inset titled *UL Labels* on page 37.)

Tested products are given a permanent label or certificate to prove they pass a required standard. Depending on the test and the specific standard, the manufacturer will either attach a label to the product or keep a certificate on file. For example, a fire-rated door will typically have a label on the edge of the door. Other materials such as carpets or wallcoverings might not be easily labeled. Instead, these labels may be located on samples or be available from the manufacturer upon request. As the designer, you should be specifying tested products when required as well as keeping records of the products you specify. (This is discussed further in Chapter 10 in the section on Documentation and Liability.) The only way to know if they are required is to know the codes and standards and consult with the local code officials.

standards, many of which are used internationally. Each document is available from NFPA in book or booklet form.

As mentioned earlier in this chapter, NFPA also publishes a full set of codes known as the C3-Codes. All of the NFPA codes and many other codes, including those produced by the International Code Council, reference the NFPA standards in their text. Many of the NFPA standards are geared toward fire protection. Generally, they are designed to reduce the extent of injury, loss of life, and destruction of property during a fire. Their testing requirements cover everything from textiles to fire fighting equipment and means of egress design. The standards are developed by committees made up of NFPA members. (See inset titled *Code and Standards Changes* on page 11.) They are reviewed and updated as needed. Similar to the C3-Codes, the newer standards and the most current editions of the existing standards have been formatted to meet NFPA's new Manual of Style format.

Note

When a code requirement varies from that of a standard referenced by the code, the code requirement takes precedence over the standard.

American National Standards Institute

The American National Standards Institute publishes the *American National Standard.* Both are generally referred to as ANSI. ANSI is a private corporation that was originally founded in 1918 as the American Engineering Standards Commit-

tee. ANSI is a coordinator of voluntary standards development. Instead of concentrating on developing standards, ANSI generally approves the standards developed by other organizations. It also helps to establish priorities and avoid duplications between different standards.

ANSI undertakes the development of a standard only when commissioned by an industry group or government agency. Representing virtually every facet of trade, commerce, organized labor, and the consumer, ANSI's approval procedures ensure a consensus of interests. They are widely accepted on an international level, and local jurisdictions often require compliance with ANSI's standards. ANSI's standards are published annually, though the actual text is updated only on an as-needed basis.

Note

An *active* standard is the current official standard as required by a jurisdiction, which supersedes any older versions of the same standard.

The most common ANSI designated standard used by designers for interior projects is *ANSI A117.1.* Its full title is *ICC/ANSI A117.1, Standard on Accessible and Usable Building and Facilities* (referred to as the "ICC/ANSI standard" throughout this book). It concentrates on the accessibility features in the design of buildings and their interiors, allowing people with disabilities to achieve independence. It was the first standard written for accessibility and is the most widely known. Various editions of the ANSI standard were used as the basis for the *ADAAG*, the *UFAS*, and the *FHAG.* (See inset titled *Accessibility Requirements—ANSI, ADAAG, UFAS, and FHAG* earlier in this chapter.) The 1998 edition of the ICC/ANSI standard was developed by the International Code Council (ICC) to create consistency with the accessibility chapter in the 2003 *International Building Code*. The *NFPA 5000* references it as well. In addition to the many requirements included in the standard, the ICC/ANSI standard also refers to other industry standards for certain items such as power-operated doors, elevator/escalators, and signaling systems.

Note

Many of the *UBC* standards and tests are similar to those of other standards organizations such as NFPA, ASTM, and UL. The last editions of these standards were published in 1997 and are still used by some jurisdictions.

A 2003 edition of the ICC/ANSI standard, which became available May 2004, was developed in conjunction with the ICC and the Access Board to create consistency between the next edition of the *IBC* and the new *ADA and ABA Accessibility Guidelines*. A comparison of the various sections in the 1998 and 2003 editions of the ICC/ANSI standard and the new ADA guidelines is shown in Figure 1.4. Although the 1998 ICC/ANSI standard is the edition required by the 2003 building codes, the 2003 standard may be adopted separately by a jurisdiction. (Other jurisdictions may have their own accessibility standards.)

Note

The building codes each have a chapter dedicated to accessibility requirements, which references the *ANSI/ICC 117.1* accessibility standard.

American Society for Testing and Materials

The American Society for Testing and Materials (ASTM) is a standards-writing organization formed in 1898 as a nonprofit corporation. In 2002, it changed its name to ASTM International to reflect its global reach and participation. ASTM International does not perform testing or certify products. Instead, it manages

Note

ASTM and UL now offer publications that combine the standards referenced by the *IBC* into one document so that you do not need to purchase their entire catalog to review the standards you need.

the development of standards and the promotion of related technical knowledge received from over 30,000 members around the world.

There are more than 11,000 ASTM standards used to specify materials, assure quality, integrate production processes, promote trade, and enhance safety. They are updated and/or published each year in more than 70 volumes of the *ASTM Annual Book of Standards.* These standards are divided into 15 different categories, two of which include construction and textiles. Many of the ASTM standards are referenced in the codes and other reference materials. Copies of these standards can be obtained from ASTM International. In addition, they publish a special grouping of standards for the building construction industry. In 2003, ASTM International also developed, in conjunction with the International Code Council, a comprehensive volume that contains all the standards that are referenced in the 2003 *International Building Code*. Titled the *2003 International Building Code-ASTM Referenced Standards*, it contains more than 260 ASTM standards representing close to half of all the standards referenced in the *IBC*. The NFPA codes reference some of these standards as well.

ASTM International is currently working on creating some of the first standards for sustainable design. The first two available standards include *E2114, Terminology for Sustainability Relative to the Performance of Buildings* and *E2129, Practice for Data Collection for Sustainability Assessment of Building Products*. Other sustainability standards are in committees being developed.

American Society of Heating, Refrigeration, and Air-Conditioning Engineers

The American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) came into existence in 1959 with the merger of two engineering groups. ASHRAE is a worldwide standards organization. It sponsors research projects and develops standards for performance levels of HVAC (heating, ventilating, and air conditioning) and refrigeration systems. ASHRAE standards include uniform testing methods, design requirements, and recommended standard practices. ASHRAE also distributes technological information to the public.

As a designer you will generally not refer to ASHRAE standards. They are typically used by mechanical engineers and refrigerant specialists and installers. Two of the more widely used standards include *ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings* and *ASHRAE 90.2, Energy-Efficient Design of New Low-Rise Residential Buildings*. They are referenced by the ICC and the NFPA in their energy codes and are the basis for most of the energy code provisions required in the United States. (See section on Energy Codes earlier in this chapter.)

Underwriters Laboratories

Underwriters Laboratories (UL) is primarily a testing agency that approves products. It has a number of testing laboratories around the world. It tests various devices, systems, and materials to see if they meet specific requirements and to determine their relation to life, fire, casualty hazards, and crime prevention.

UL LABELS

Underwriters Laboratories (UL) tests a wide variety of products all over the world. The UL label is the most widely recognized mark of compliance with safety requirements. These safety requirements are based on UL standards as well as standards from other organizations. Most federal, state, and municipal authorities, as well as architects, designers, contractors, and building owners and users, accept and recognize the UL mark.

UL can test whole products, components, materials, and systems depending on the standard required. The products tested include building materials, finishes, upholstered furniture, electrical products, HVAC equipment, safety devices, and more. Once the initial product passes a test, it is retested at random to make sure it continues to function properly.

There are four common types of labels or UL marks a product can receive. (Other marks are more specific to other industries.) The UL Web site describes them as follows:

1. *Listing Mark:* The most popular, it indicates that samples of the product have been tested and evaluated and comply with UL requirements. It is found on appliances and equipment including alarm systems and light fixtures. The mark generally includes the UL registered name or symbol, the product name, a control number, and the word *listed.*
2. *Classification Mark:* This label may list a product's properties, limited hazards, and/or suitability for certain uses. It is found on building materials such as fire doors as well as industrial equipment. The label includes the UL name or symbol and a statement indicating the extent of the UL evaluation and a control number.
3. *Recognized Component Mark:* This covers the evaluation of a component only. The component is later factory-installed in a complete product or system. The label includes a manufacturer's identification and product model number.
4. *Certificate:* This is used when it is difficult to apply one label to a whole system. The certificate indicates the type of system and the extent of the evaluation. It accompanies the product and is issued to the end user upon installation.

There are other marks specific to other countries, as well. For example, the GS Mark (which stands for German Safety Mark) is used in Europe, the AR-UL Mark is used in Argentina, and the BR-UL Mark is used in Brazil. If there is a capital "C" on the mark it means it is accepted in Canada.

UL develops and performs tests in conjunction with other standards organizations. When testing new products, if a standard exists UL will use it. If no standard exists, UL will use its own existing standard or create a new one. All of the more than 800 different UL safety standards are published in the UL *Catalog of Standards.* In 2000, Underwriters Laboratories also created the first *International Codes UL Referenced Standards—Building Provisions* in conjunction with the International Code Council. It is a single volume that contains the more than 25 UL standards referenced in the *International Building Code* and the building portions (Chapters 1 to 10) of the *International Residential Code*. This allows I-Code users to obtain one volume with all the relevant standards. UL standards are referenced in the NFPA codes as well.

Note

The largest International standards-setting organization is the International Organization for Standardization (ISO) with national standards bodies in more than 140 countries.

UL's findings are recognized worldwide. When a product is approved, it receives a permanent label or classification marking that identifies Underwriter Laboratories, the word *classified*, a class rating, and a UL control number. (See example in Chapter 5, Figure 5.14, page 204 and the inset titled *UL Labels* in this chapter.) UL also lists all approved products and assemblies in a number of product directories. The directories most likely to pertain to interior projects include *Building Materials*, *Fire Protection Equipment*, and *Fire Resistance.* These directories, which are used to find information about UL certified products, components, and materials, are published yearly. In 2001, the directories were reorganized to make them easier to use with the code publications. An electronic version of the directory, known as the *Online Certification Directory*, is also available on the Internet, where it is updated regularly as new information becomes available. (See resources in Appendix E.)

Note

UL labeled products may also include country-specific identifiers such as US and C (Canada) to show that they comply with that country's product safety standards.

Note

In addition to the standards organizations discussed in this chapter, there are two *national* organizations that can provide valuable information. Although they do not create codes or standards, they play a major role in supporting them. These organizations are the National Conference of States on Building Codes and Standards (NCSBCS) and the National Institute of Building Sciences (NIBS). Both supply a wide variety of helpful publications. (See Appendix E.)

LOCAL CODES

In addition to the codes, standards, and regulations already mentioned, there are more specific codes within each jurisdiction. They can include, but are not limited to, local municipal ordinances, health codes, zoning regulations, historic preservation laws, and neighborhood conservation restrictions. For example, health codes must typically be followed when working on projects that involve food preparation, such as restaurants. In addition, other occupancies (e.g., hospitals) have regulations that must be incorporated into the design in order for the facility to obtain a license to operate. These regulations can control the size, location, and use of a building, and are usually set and controlled at a local level.

This book does not cover these local codes, since they are specific to each jurisdiction. However, it is important to consult the jurisdiction of a project for

Interior Codes and Standards Checklist

Date:_____

Project Name:_____

PUBLICATIONS REQUIRED	YEAR OF EDITION	YEAR OF AMENDMENT (if required)	RESEARCH DATE
Codes and Regulations			
BUILDING CODE - Circle One: IBC NFPA 5000 OTHER _____ Structural Engineer Required? _____ YES _____ NO	_____	_____	___/___/___
PERFORMANCE CODE - Circle One: ICCPC NFPA[1] OTHER _____	_____	_____	___/___/___
FIRE CODE - Circle One: IFC UFC OTHER _____	_____	_____	___/___/___
LIFE SAFETY CODE (NFPA 101)	_____	_____	___/___/___
PLUMBING CODE - Circle One: IPC UPC OTHER _____ Plumbing Engineer Required? _____ YES _____ NO	_____	_____	___/___/___
MECHANICAL CODE - Circle One: IMC UMC OTHER _____ Mechanical Engineer Required? _____ YES _____ NO	_____	_____	___/___/___
ELECTRIC CODE - Circle One: ICCEC NEC OTHER _____ Electrical Engineer Required? _____ YES _____ NO	_____	_____	___/___/___
ENERGY CODE - Circle One: IECC NFPA 900 OTHER _____ Engineer Required? _____ Structural _____ Electrical _____ Mechanical	_____	_____	___/___/___
RESIDENTIAL CODE - Circle One: IRC OTHER _____	_____	_____	___/___/___
EXISTING BUILDING CODE - Circle One: IEBC OTHER _____	_____	_____	___/___/___
ACCESSIBILITY REGULATIONS/STANDARDS			
ADA Guidelines[2]	_____	_____	___/___/___
ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities	_____	_____	___/___/___
Other: _____	_____	_____	___/___/___
OTHER: [3] _____	_____	_____	___/___/___
_____	_____	_____	___/___/___
_____	_____	_____	___/___/___
Standards [4]			
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):			
NFPA _____ _____	_____	_____	___/___/___
NFPA _____ _____	_____	_____	___/___/___
NFPA _____ _____	_____	_____	___/___/___
AMERICAN SOCIETY OF TESTING & MATERIALS (ASTM)			
ASTM _____ _____	_____	_____	___/___/___
ASTM _____ _____	_____	_____	___/___/___
UNDERWRITERS LABORATORIES (UL)			
UL _____ _____	_____	_____	___/___/___
UL _____ _____	_____	_____	___/___/___
OTHER: _____	_____	_____	___/___/___
_____	_____	_____	___/___/___
_____	_____	_____	___/___/___

NOTES:

1. Circle NFPA if you are using another NFPA document and plan to use a performance-based requirement listed in that document.
2. All projects should be reviewed for ADA compatibility with few exceptions (i.e., federal buildings, religious facilities, one/two family homes).
3. Be sure to check for other state and local codes. Local codes can include special ordinances, health codes, zoning regulations, and historic preservation laws. List the specific ones.
4. Refer to the codes as well as local requirements to determine which standards are required. List the specific publications.

Figure 1.5 Interior Codes and Standards Checklist

these specific regulations so they can be appropriately researched and referenced. (See Code Enforcement in Chapter 10.)

INTERIOR CODES CHECKLIST

When working on a new project it can be difficult to remember all the applicable code sources that must be referenced. Depending on the type of interior project and the jurisdiction in which it is located, you could be using any number of the codes, regulations, and standards described in this chapter. Figure 1.5 is a checklist that provides a comprehensive list of these codes and standards. Use this list, or develop your own, to be sure you reference the necessary codes and regulations.

Note

If an interior project is somehow affecting the structure of a building, the services of a structural engineer may be required.

Before starting an interior project, refer to this checklist to determine which code, standard, and federal publications must be referenced. Remember that not all of them will apply every time. If you are uncertain, consult the code officials in the jurisdiction of the project. Check off the publications you will need in the "Publications Required" column and enter the edition or year of the required publication in the next column. Remember that not every jurisdiction uses the most current edition of a code, and that a jurisdiction may have made amendments to an existing publication. If there are amendments, make a note of this in the third column.

Note

To further document your research, make copies of any sections of the codes that specifically pertain to your project and attach it to the code checklist. (Refer to Chapter 10.)

Do this for each code, regulation, and standard listed. A reminder for engineering involvement is given under each of the code headings. Blank spaces have been provided for specific state or local codes that must be consulted. Blank spaces have also been provided for you to fill in the specific standards and/or federal regulations to be used. For example, depending on the type of project, you could be required to follow the ADA guidelines, the *UFAS*, or the *FHAG*.

As you work on the project, continue to refer to the checklist to make sure each of the checked codes, standards, and federal regulations is being used. As the research is completed for each publication, enter the date in the "Research Date" column. You will find that as you research the codes, additional standards may be required. Add these to the checklist in the spaces provided or on a separate piece of paper. When the project is complete, keep this form with the project's files for future reference and proof that each of the code sources was reviewed.