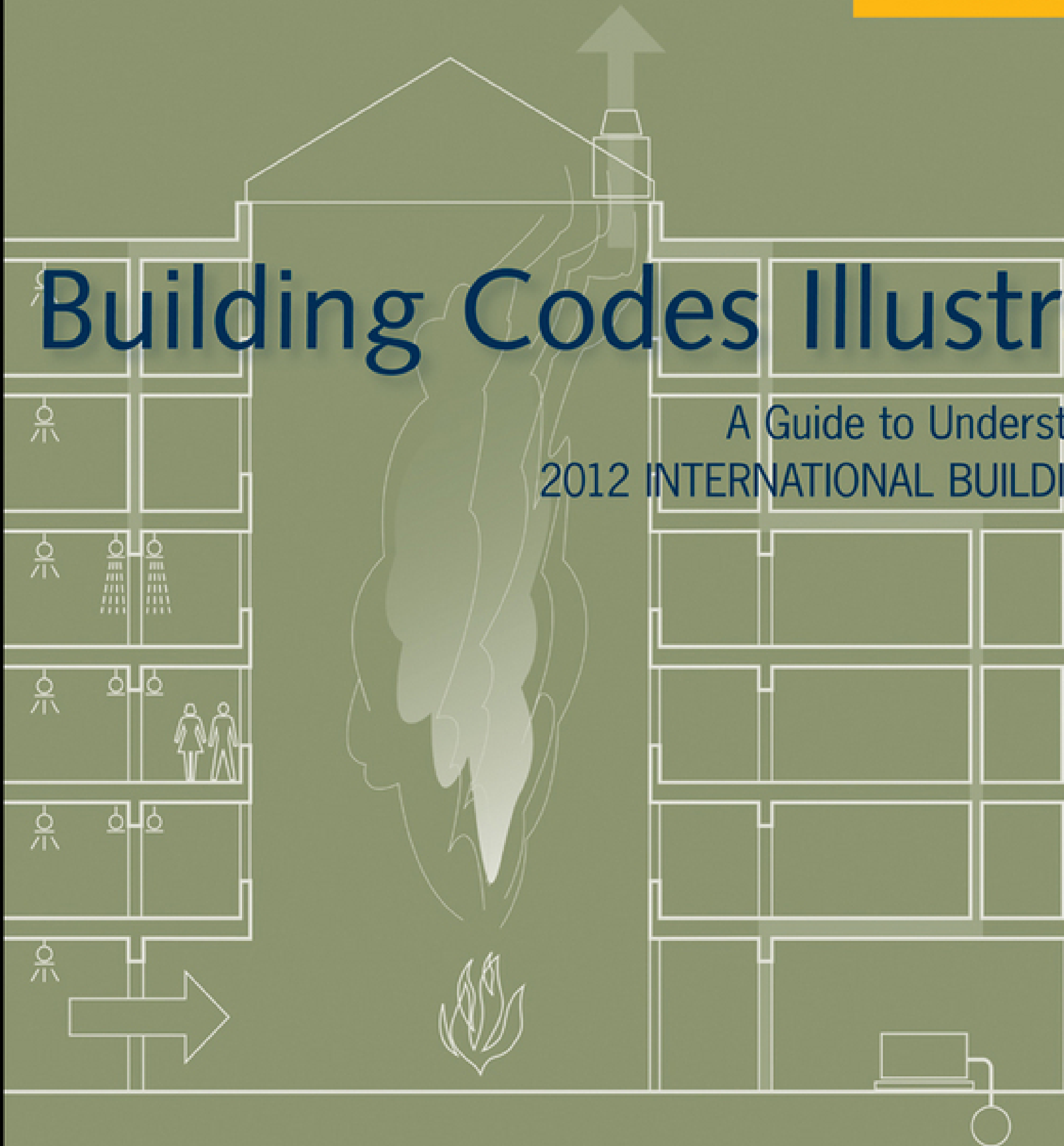
Fourth Edition

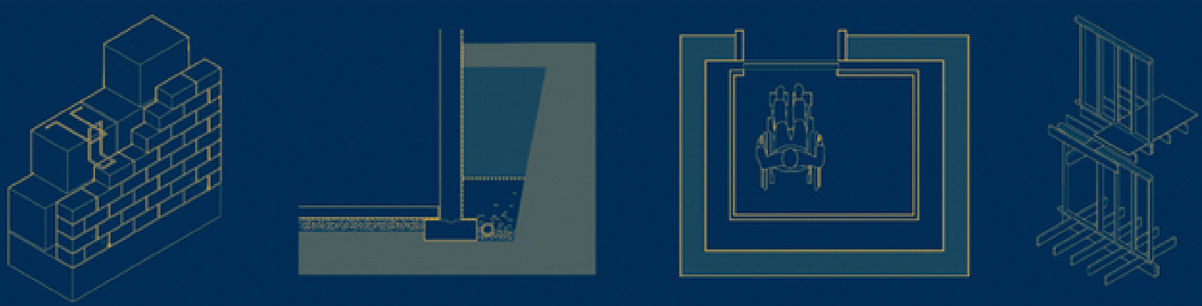
Building Codes Illustrated

A Guide to Understanding the 2012 INTERNATIONAL BUILDING CODE®



ICC
INTERNATIONAL CODE COUNCIL®

Francis D.K. Ching / Steven R. Winkel, FAIA, PE



Building Codes ILLUSTRATED

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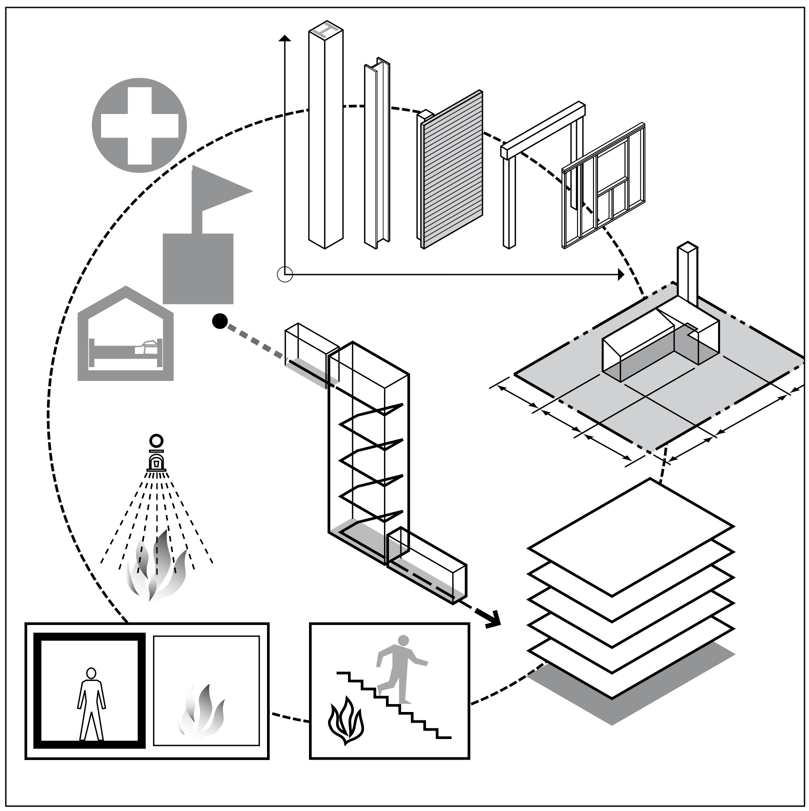
A Guide to Understanding the 2012 International Building Code®



FRANCIS D. K. CHING / STEVEN R. WINKEL, FAIA

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This book is printed on acid-free paper. ∞

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Disclaimer

The book contains the authors' analyses and illustrations of the intent and potential interpretations of the *2012 International Building Code*® (IBC). The illustrations and examples are general in nature and not intended to apply to any specific project without a detailed analysis of the unique nature of the project. As with any code document, the IBC is subject to interpretation by the Authorities Having Jurisdiction (AHJ) for their application to a specific project. Designers should consult the local Building Official early in project design if there are questions or concerns about the meaning or application of code sections in relation to specific design projects.

The interpretations and illustrations in the book are those of the authors. The authors do not represent that the illustrations, analyses, or interpretations in this book are definitive. They are not intended to take the place of detailed code analyses of a project, the exercise of professional judgment by the reader, or interpretive application of the code to any project by permitting authorities. While this publication is designed to provide accurate and authoritative information regarding the subject matter covered, it is sold with the understanding that neither the publisher nor the authors are engaged in rendering professional services. If professional advice or other expert assistance is required, the services of a competent professional person should be sought.

The authors and John Wiley & Sons would like to thank Doug Thornburg, AIA, Vice-President & Technical Director of Product Development, and Jay A. Woodward, Senior Staff Architect, of the International Code Council for their thorough review of the manuscript. Their review does not reflect in any way the official position of the International Code Council. Any errors in the interpretations or illustrations in the book are solely those of the authors and are in no way the responsibility of the International Code Council.

We would also like to thank David Collins, FAIA, of The Preview Group, Inc., for his insightful review. The book was made clearer and our interpretations were improved by his comments and suggestions.

About the International Code Council®

The International Code Council (ICC®), a membership association dedicated to building safety, fire prevention and energy efficiency, develops the codes and standards used to construct residential and commercial buildings, including homes and schools. The mission of ICC is to provide the highest quality codes, standards, products and services for all concerned with the safety and performance of the built environment. Most United States cities, counties and states choose the International Codes, building safety codes developed by the International Code Council. The International Codes also serve as the basis for construction of federal properties around the world, and as a reference for many nations outside the United States. The Code Council is also dedicated to innovation and sustainability and Code Council subsidiary, ICC Evaluation Service, issues Evaluation Reports for innovative products and reports of Sustainable Attributes Verification and Evaluation (SAVE).

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Preface

The primary purpose of this book is to familiarize code users with the *2012 International Building Code®* (IBC). It is intended as an instructional text on how the Code was developed and how it is organized, as well as a primer on how to use the Code. It is intended to be a companion to the IBC, not a substitute for it. This book must be read in concert with the IBC.

Many designers feel intimidated by building codes. They can seem daunting and complex at first glance. It is important to know that they are a product of years of accretion and evolution. Sections start simply and are modified, and new material is added to address additional concerns or to address interpretation issues from previous code editions. The complexity of a building code often comes from this layering of new information upon old without regard to overall continuity. It is important to keep in mind that there is no single author of the building code. Each section has a different author. Building codes are living documents, constantly under review and modification. It is vital to an understanding of codes to keep in mind that they are a human institution, written by ordinary people with specific issues in mind or specific agendas they wish to advance.

This book is designed to give an understanding of how the International Building Code is developed, how it is likely to be interpreted, and how it applies to design and construction. The intent of this book is to give a fundamental understanding of the relationship of codes to practice for design professionals, especially those licensed or desiring to become licensed as architects, engineers, or other registered design professionals. Code knowledge is among the fundamental reasons for licensing design professionals, for the protection of public health, safety, and welfare. It is our goal to make the acquisition and use of code knowledge easier and clearer for code users.

BUILDING CODE

Webster's Third New International Dictionary defines a building code as: "A set of rules of procedure and standards of materials designed to secure uniformity and protect the public interest in such matters as building construction and public health, established usually by a public agency and commonly having the force of law in a particular jurisdiction."

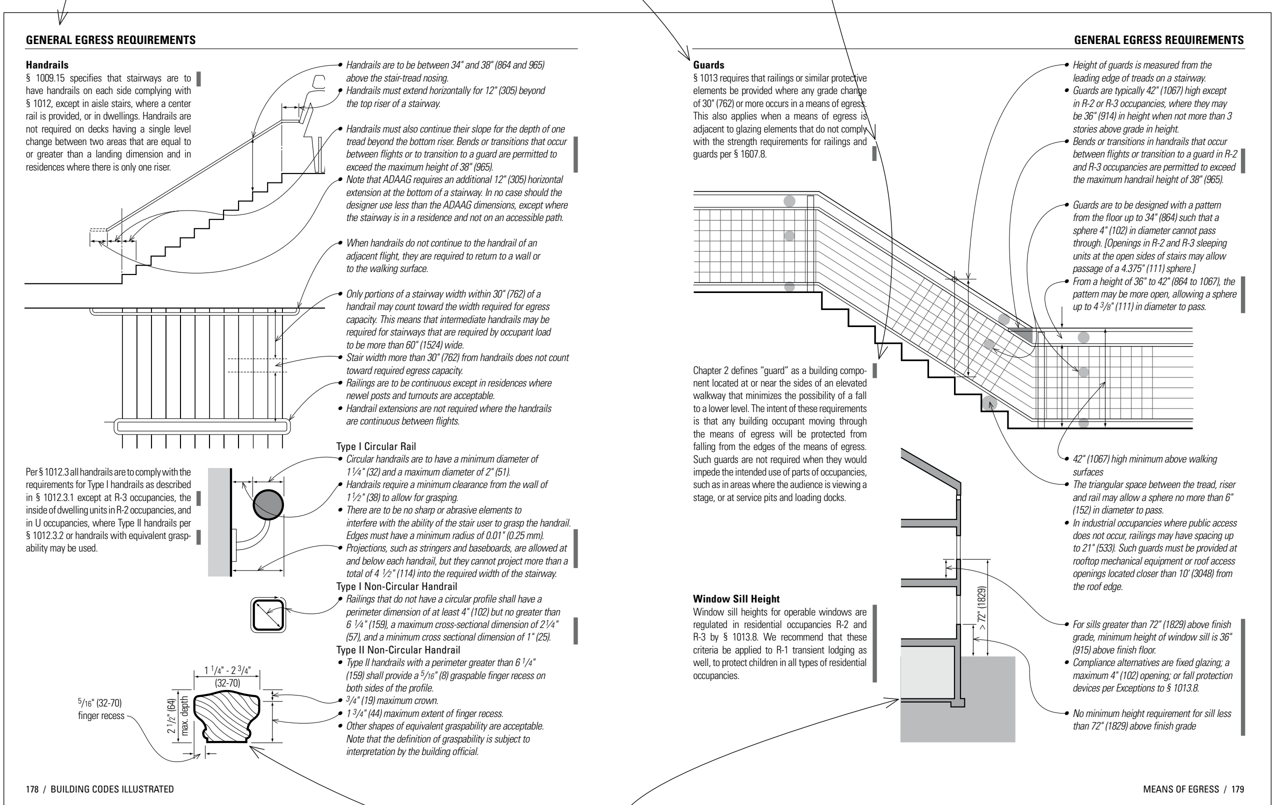
PREFACE

How This Book Is Organized

The first two chapters of this book give background and context regarding the development, organization and use of the IBC. Chapters 3 through 16 are organized and numbered the same as the corresponding subject-matter chapters in the IBC. The last two chapters, 17 and 18, are summaries of the remaining IBC chapters. There is no correspondence between the last two chapter numbers in the book and the IBC chapters.

- *Text that is new or revised for the Fourth Edition is denoted by a vertical gray bar ▌ in the margins. This is similar to markings used in the IBC to indicate changes in code provisions.*
- *The IBC uses solid black vertical bars ▌ to denote changes and arrows ➡ to denote deletions. We strongly recommend that users study the Code very carefully for changes and compare old copies of the Code to the new copies as you become familiar with the new Code.*
- *Note that relocated items are marked with an arrow indicating a deletion from that section, with no cross-reference about where the section was moved. This can be very confusing.*

- *Page headings refer to major sections within each chapter of the Code.*
- *Text is arranged in columns, typically on the left side of a single page or of two facing pages.*


GENERAL EGRESS REQUIREMENTS

Handrails
§ 1009.15 specifies that stairways are to have handrails on each side complying with § 1012, except in aisle stairs, where a center rail is provided, or in dwellings. Handrails are not required on decks having a single level change between two areas that are equal to or greater than a landing dimension and in residences where there is only one riser.

- Handrails are to be between 34" and 38" (864 and 965) above the stair-tread nosing.
- Handrails must extend horizontally for 12" (305) beyond the top riser of a stairway.
- Handrails must also continue their slope for the depth of one tread beyond the bottom riser. Bends or transitions that occur between flights or to transition to a guard are permitted to exceed the maximum height of 38" (965).
- Note that ADAAG requires an additional 12" (305) horizontal extension at the bottom of a stairway. In no case should the designer use less than the ADAAG dimensions, except where the stairway is in a residence and not on an accessible path.
- When handrails do not continue to the handrail of an adjacent flight, they are required to return to a wall or to the walking surface.
- Only portions of a stairway width within 30" (762) of a handrail may count toward the width required for egress capacity. This means that intermediate handrails may be required for stairways that are required by occupant load to be more than 60" (1524) wide.
- Stair width more than 30" (762) from handrails does not count toward required egress capacity.
- Railings are to be continuous except in residences where newel posts and turnouts are acceptable.
- Handrail extensions are not required where the handrails are continuous between flights.

Per § 1012.3 all handrails are to comply with the requirements for Type I handrails as described in § 1012.3.1 except at R-3 occupancies, the inside of dwelling units in R-2 occupancies, and in U occupancies, where Type II handrails per § 1012.3.2 or handrails with equivalent graspability may be used.

Type I Circular Rail
- Circular handrails are to have a minimum diameter of 1¼" (32) and a maximum diameter of 2" (51).
- Handrails require a minimum clearance from the wall of 1½" (38) to allow for grasping.
- There are to be no sharp or abrasive elements to interfere with the ability of the stair user to grasp the handrail. Edges must have a minimum radius of 0.01" (0.25 mm).
- Projections, such as stringers and baseboards, are allowed at and below each handrail, but they cannot project more than a total of 4 ½" (114) into the required width of the stairway.

Type I Non-Circular Handrail
- Railings that do not have a circular profile shall have a perimeter dimension of at least 4" (102) but no greater than 6 ¼" (159), a maximum cross-sectional dimension of 2¼" (57), and a minimum cross sectional dimension of 1" (25).

Type II Non-Circular Handrail
- Type II handrails with a perimeter greater than 6 1/4" (159) shall provide a 5/16" (8) graspable finger recess on both sides of the profile.
- 3/4" (19) maximum crown.
- 1 3/4" (44) maximum extent of finger recess.
- Other shapes of equivalent graspability are acceptable. Note that the definition of graspability is subject to interpretation by the building official.

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GENERAL EGRESS REQUIREMENTS

Guards
§ 1013 requires that railings or similar protective elements be provided where any grade change of 30" (762) or more occurs in a means of egress. This also applies when a means of egress is adjacent to glazing elements that do not comply with the strength requirements for railings and guards per § 1607.8.

- Height of guards is measured from the leading edge of treads on a stairway.
- Guards are typically 42" (1067) high except in R-2 or R-3 occupancies, where they may be 36" (914) in height when not more than 3 stories above grade in height.
- Bends or transitions in handrails that occur between flights or transition to a guard in R-2 and R-3 occupancies are permitted to exceed the maximum handrail height of 38" (965).
- Guards are to be designed with a pattern from the floor up to 34" (864) such that a sphere 4" (102) in diameter cannot pass through. [Openings in R-2 and R-3 sleeping units at the open sides of stairs may allow passage of a 4.375" (111) sphere.]
- From a height of 36" to 42" (864 to 1067), the pattern may be more open, allowing a sphere up to 4 3/8" (111) in diameter to pass.

Chapter 2 defines "guard" as a building component located at or near the sides of an elevated walkway that minimizes the possibility of a fall to a lower level. The intent of these requirements is that any building occupant moving through the means of egress will be protected from falling from the edges of the means of egress. Such guards are not required when they would impede the intended use of parts of occupancies, such as in areas where the audience is viewing a stage, or at service pits and loading docks.

- 42" (1067) high minimum above walking surfaces
- The triangular space between the tread, riser and rail may allow a sphere no more than 6" (152) in diameter to pass.
- In industrial occupancies where public access does not occur, railings may have spacing up to 21" (533). Such guards must be provided at rooftop mechanical equipment or roof access openings located closer than 10' (3048) from the roof edge.

Window Sill Height
Window sill heights for operable windows are regulated in residential occupancies R-2 and R-3 by § 1013.8. We recommend that these criteria be applied to R-1 transient lodging as well, to protect children in all types of residential occupancies.

- For sills greater than 72" (1829) above finish grade, minimum height of window sill is 36" (915) above finish floor.
- Compliance alternatives are fixed glazing; a maximum 4" (102) opening; or fall protection devices per Exceptions to § 1013.8.
- No minimum height requirement for sill less than 72" (1829) above finish grade

MEANS OF EGRESS / 179

- *Drawings are typically to the right, accompanied by captions or explanatory notes. The illustrations are intended to help the reader visualize what is described in the text. They should therefore be considered to be diagrams that explain and clarify design relationships rather than represent specific design solutions.*

For the Student

The book is part of the introduction to building codes that are an integral part of professional studies in architecture, structural engineering and civil engineering. It will serve as explanatory text to accompany analysis of the organization, intent and use of codes in general and the International Building Code in particular. The introductory chapters will instill in undergraduate design students the reasons codes exist and how they form an integral part of the design process for every building project. Most design problems in school are at the schematic design level, so that detailed code analysis will not typically be undertaken in most undergraduate classes. In graduate classes the book can serve to organize and facilitate a deeper understanding of detailed requirements common to all building codes. The book also gives guidance on best practices for code analysis to lay a foundation for future practitioners to better meet the health, safety and welfare criteria that are the basis for professional licensure.

For Emerging Professionals

Whether you are engaged in design, production, management or construction administration, codes and standards are an integral and inescapable part of the practice of architecture and engineering. New practitioners need to refine their skills and knowledge of codes to make their projects safe and buildable with few costly changes. The more practitioners know about the code, the more it can become a tool for design rather than an impediment. The better the underlying criteria for code development and the reasons for code provisions are understood, the easier it is to create code-compliant designs. Early understanding and incorporation of code-compliant design provisions in a project reduces the necessity for costly and time-consuming rework or awkward rationalizations to justify dubious code decisions late in project documentation, or even during construction. Code use and understanding should be part of accepted knowledge for professionals, so that it becomes a part of the vocabulary of design.

For Experienced Practitioners

The greatest value of this book is that it is based on the widely adopted International Building Code. This is a code that is similar but by no means identical to the three model codes—the Uniform Building Code, the National Building Code and the Standard Building Code—that most experienced practitioners have used in the past. This book will guide experienced practitioners out of the old grooves of code use they may have fallen into with the old codes. The code-analysis methods and outcomes will vary from the old codes to the new IBC. While there are seemingly familiar aspects from each code interspersed throughout the new code, the actual allowable criteria and how they are determined are often quite different. It is likely that the illustrations and the underlying reasons for the development of each code section will look familiar to experienced practitioners. The experienced practitioner must not rely on memory or old habits of picking construction types or assemblies based on prior practice. Each building must be looked at anew until the similarities and sometimes-critical differences between the new code and old habits are understood and acknowledged. This admonition also applies to the need to determine local modifications to codes and not rely on new projects in new locations being identical to similar prior projects.

How to Use This Book

This book focuses on the use and interpretation of the nonstructural provisions of the International Building Code. There are references to basic structural requirements, but this book does not attempt to go into structural requirements in depth. That is the subject for another volume.

The organization of this book presumes that the reader has a copy of the latest version of the IBC itself as a companion document to this book. The book is intended to expand on, interpret and illustrate various provisions of the Code. The IBC has been adopted in many jurisdictions. As it is now being extensively applied, there is an evolving body of precedent in application and interpretation. It is our hope that the analysis and illustrations in the book will aid the designer and the Authorities Having Jurisdiction (AHJ) in clarifying their own interpretations of the application of code sections to projects.

The book is not intended to take the place of the *2012 International Building Code®* (IBC) in any way. The many detailed tables and criteria contained in the IBC are partially restated in the book for illustrative purposes only. For example, we show how various tables are meant to be used and how we presume certain parts will be interpreted. When performing a code analysis for a specific project, we anticipate the reader will use our book to understand the intent of the applicable code section and then use the Code itself to find the detailed criteria to apply. One can, however, start with either the IBC or this book in researching a specific topic.

Beginning with the *2012 International Building Code®*:
- Search Contents or Index.
- Read relevant section(s).
- For further explanation and/or clarification, refer to this book.

Beginning with *Building Codes ILLUSTRATED*:
- Search Code Index for section number or Subject Index for topic.
- Refer back to specific text of *2012 International Building Code®*.

The text is based on the language of the Code and interprets it to enhance the understanding of the user. The interpretations are those of the authors and may not correspond to those rendered by the AHJ or by the International Code Council (ICC). This book, while based on a publication of the ICC, does not in any way represent official policies, interpretations, or positions of the ICC. We would encourage the users of the book to confer with the AHJ, using the illustrations from this book to validate interpretations. Reconciling text with construction drawings often benefits from additional illustrations. We trust that this will be the case with the explanations and graphics in this book.

Note that the text of the 2012 IBC contains terms in *italic type*. These italicized terms appear in the definitions in Chapter 2 of the IBC. Where defined terms are used in ways intended by their definitions they are italicized in the body of the IBC. Italicized type is <u>not</u> used in this book in the same way. The IBC publisher's intent for this notification method is to highlight for the code user that the definitions should be read carefully to facilitate a better understanding of how they are used in the context where they appear in italics. It is critical that the code user go back to the IBC's definitions when attempting to understand the literal and figurative meaning of code requirements. The detailed text for all code definitions are now listed in Chapter 2 of the IBC, but the chapter-specific terms are listed in each chapter.

By their nature, architects are very creative, often at the forefront in the application of new design methods and innovative techniques. Architects not only deal with common everyday buildings but must also confront complex and unique buildings with features or elements that would be impossible to predict and address within the pages of a modern building code. The Building Code has often been considered rigid and static, and is viewed by many as an obstacle to creativity and innovation. While no one denies the need for a building regulatory system to address the safety and welfare of the public, everyone wants it to be effective, flexible, and encourage innovation.

Surprising though this may be to some, the Building Code has provided for such flexibility and innovation for several decades, offering a window of opportunity for those architects who want to put the code to work for them. A look at the 1927 edition of the legacy Uniform Building Code, for example, reveals this window of opportunity in § 302, Alternate Materials and Types of Construction. This provision has been carried forward and is now found in § 104.11 of the 2012 International Building Code (IBC), which reads:

"**104.11 Alternative materials, design and methods of construction and equipment.**
The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material and method of work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety."

With advances in technology and the globalization of our economy, the need to address innovation and flexibility has never been more critical. However, this also must be done in a manner that supports the public welfare and in no way compromises public safety—the primary purpose of any reputable building code. As a means of approval of new and innovative materials, designs and methods of construction, the code official requires research reports and/or tests from approved sources providing verification of code compliance. The independent source utilized by code officials to verify that a new and innovative product meets the Building Code requirements in terms of quality, strength, effectiveness, fire resistance, durability, and safety is the ICC Evaluation Service, Inc.® (ICC-ES®). Functioning as a subsidiary of the International Code Council, ICC-ES works hand in glove with manufacturers, code officials, and the design community in an effort to facilitate the acceptance of new building technologies in the marketplace without compromising the safety of the public.

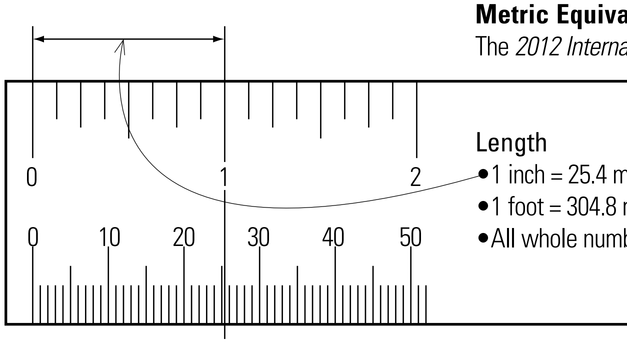
Manufacturers of new and innovative products can look to ICC-ES for third-party validation that their products do in fact meet the minimum performance requirements of the IBC. Working closely with the building construction industry, ICC-ES develops acceptance criteria, which establish a baseline against which an innovative product can be objectively measured by both designers and code officials. Acceptance criteria provide technical guidance and a level playing field for manufacturers. Upon completion of a thorough evaluation and verification of a manufacturer's data, ICC-ES posts its reported findings on its Web site as a tool for designers interested in incorporating the latest advances in building technology into their designs. These Evaluation Reports can be accessed and downloaded free of charge at www.icc-es.org/evaluation_reports and are readily searchable based on attributes such as product type, manufacturer, or report number. ICC-ES also has a specialized program for the Sustainable Attributes Verification and Evaluation™ (SAVE™) to provide reliable information about claims made by manufacturers of sustainable products.

Building codes should not be seen as an inhibitor to progress. With ICC's Evaluation Service as a resource, a more flexible and dynamic system is in place to help regulators become facilitators when it comes to the introduction and acceptance of innovative building technologies in the marketplace. It also encourages the creative impulse in the best designers and architects to lean into the wind, to go beyond the conventional while still embracing safe construction.

Mark A. Johnson
Executive Vice President and Director of Business Development
International Code Council, Inc.

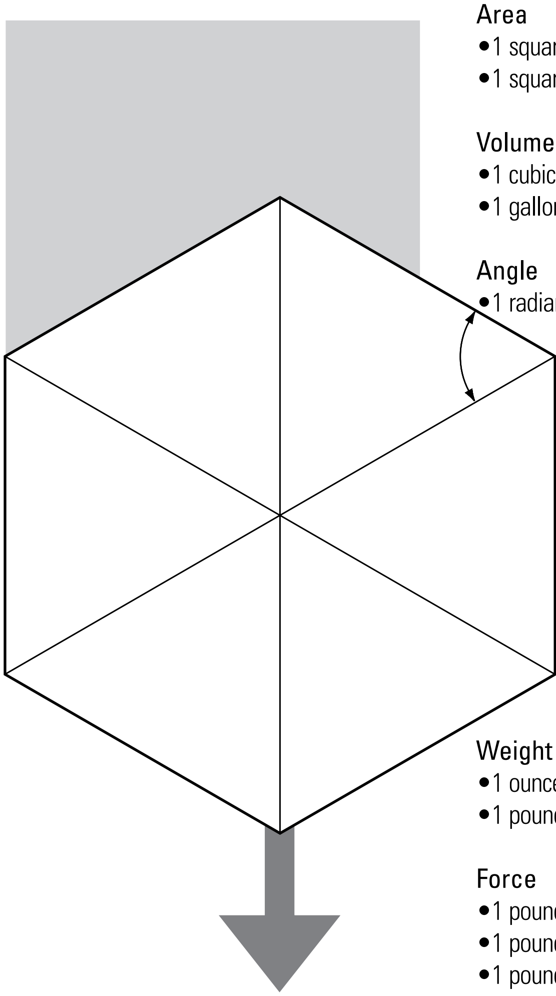
Metric Equivalencies

The *2012 International Building Code*® uses the following SI units.



Length

- 1 inch = 25.4 mm
- 1 foot = 304.8 mm
- All whole numbers in parentheses are millimeters unless otherwise noted.



Area

- 1 square inch = 645.2 mm^2
- 1 square foot (sf) = 0.0929 m^2

Volume

- 1 cubic foot (cf) = 0.028 m^3
- 1 gallon (gal) = 3.785 L

Angle

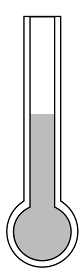
- 1 radian = $360/2\pi \approx 57.3°$; 1 degree = 0.01745 radian (rad)

Weight

- 1 ounce = 28.35 g
- 1 pound = 0.454 kg = 0.004448 kN

Force

- 1 pound per square inch (psi) = 6.9 kPa
- 1 pound per linear foot (plf) = 1.4882 kg/m = 0.01459 kN/m
- 1 pound per square foot (psf) = 4.882 kg/m^2 = 0.0479 kN/m^2 = 0.0479 kPa
- 1 pound per cubic foot (pcf) = 16.02 kg/m^3



Light

- 1 foot-candle = 10.76 lux

Speed

- 1 mile per hour (mph) = 0.44 m/s = 1.609 km/h

Heat

- 1 British thermal unit (Btu) = 0.293 watts (w)
- °C = [(°F) – 32]/1.8

1

Building Codes

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

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

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

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

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

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

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

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

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

The various city codes and often conflicting codes were refined over the years and began to be brought together by regional nongovernmental organizations to develop so-called model codes. The first model codes were written from the point of view of insurance companies to reduce fire risks. Model codes are developed by private code groups for subsequent adoption by local and state government agencies as legally enforceable regulations. The first major model-code group was the Building Officials and Code Administrators (BOCA), founded in 1915 and located in Country Club Hills, Illinois. Next was the International Conference of Building Officials (ICBO), formed in 1922, located in Whittier, California. The first edition of their Uniform Building Code was published in 1927. The Southern Building Code Congress, founded in 1940 and headquartered in Birmingham, Alabama, first published the Southern Building Code in 1946. The first BOCA National Building Code was published in 1950.

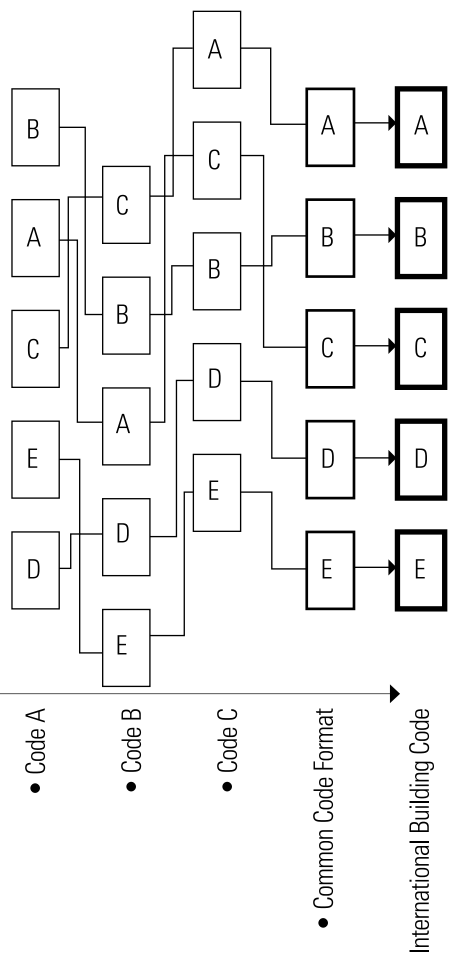
These three model-code groups published the three different building codes previously in widespread use in the United States. These codes were developed by regional organizations of building officials, building materials experts, design professionals and life safety experts to provide communities and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

The International Building Code

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

Note that in addition to the International Building Code (IBC), code users must be familiar with the International Residential Code (IRC). This code is meant to regulate construction of detached one- and two-family dwellings and townhouses that are not more than three stories in height. This code supplants residential requirements in the IBC in jurisdictions where it is adopted.

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



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

Americans with Disabilities Act

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

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

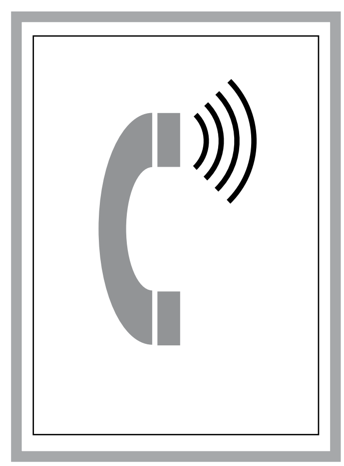
The ADA is one of the few building regulations—in this case a law, not a code—that requires retrofitting of projects apart from upgrading facilities during remodeling or renovation. Most codes apply to existing buildings only when renovation is undertaken. Under the ADA those access improvements that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

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

Space requirements for accessibility are related to ergonomics. Bigger is not automatically better. The 18" (457) dimension between a toilet and adjacent grab bars is based on reach ranges and leverage for movement using one's arms. A longer reach reduces leverage and thus may be worse than too little space.

Federal Fair Housing Act

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



State Building Codes

Each state has a separate and distinct code adoption process. In the past many states adopted one of the three previous model codes, and some states even had their own building codes. The geographic areas for state model-code adoptions corresponded roughly to the areas of influence of the three previous model codes as noted on page 3. The BOCA National Building Code predominated in the northeastern United States. The Southern Building Code was adopted throughout the southeastern United States. The Uniform Building Code was adopted in most states west of the Mississippi River. Many states allowed local adoption of codes so that in some states, such as Texas, adjacent jurisdictions in the same state had different building codes based on different model codes. Now, the advent of the International Codes has altered this landscape drastically. The "I Codes" are now the basic model codes in essentially every state. However, be aware that most state processes still allow amendments to the IBC, which means that there will likely be state-adopted amendments to the IBC. Make certain you know what code you are working with at the permitting level.

Local Building Codes

Many localities adopt the model-code documents with little modification except for the administrative chapters that relate to local operations of the building department. Larger cities, such as Los Angeles, New York City, Chicago and San Francisco, typically adopt much more sweeping revisions to the model codes. The codes for such cities often bear little resemblance to the underlying model codes and in some cases have no basis in them at all. Interpretations, even of the unaltered model code made by big-city building departments, often tend to be very idiosyncratic and nonuniform when compared to smaller jurisdictions that use less modified versions of the model codes. The adoption of the IBC at the state level has generated a review of big-city building codes so that these city codes are moving toward greater conformity with the model codes. For example, San Francisco and Los Angeles previously used a UBC-based state code, which has now been converted to an IBC-based, locally modified state code. This will require a careful analysis of the city-code amendments to ensure conformance with the new model code. This redevelopment of codes has also been occurring in other large cities, such as Dallas and New York, as their states adopt the IBC. Be aware of local modifications and be prepared for varying interpretations of the same code sections among various jurisdictions. Do not proceed too far in the design process based on review of similar designs in another jurisdiction without verification of the code interpretation in the jurisdiction where the project is located. Similarly, although this book offers opinions of what code sections mean, all such opinions are subject to interpretation by local authorities as codes are applied to specific projects.

OTHER CODES AND STANDARDS

Codes and standards are related, but serve different purposes. A building code (e.g., the International Building Code) establishes a jurisdictional "floor" relative to occupants' health, safety, and welfare. A building standard (e.g., NFPA 13) is a "standard practice" often referred to within the codes. In short, a code is what you must do; a standard is a guide on how you do it. There are thus a number of other codes and standards that the designer must be familiar with. They are mentioned here in brief to remind users of the International Building Code that other documents must also be consulted during project design.

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

Among other specialized codes is the Life Safety Code (NFPA-101) published by the National Fire Protection Association. This code serves as a basis for the egress provisions in the other model codes. Designers may encounter NFPA-101 when doing federal and hospital work. The NFPA also publishes various other standards that are adopted to accompany the model codes. Primary examples are NFPA-13: Standard for the Installation of Sprinkler Systems, and NFPA-70, which is the National Electrical Code.

The National Fire Protection Association has developed a new model building code, NFPA 5000, to rival the International Building Code. The development of this code is meant to offer an alternative to the "I" codes. The NFPA 5000 has, to date, been adopted in very few jurisdictions. Some jurisdictions may move to adopt either the International code family or the NFPA family of codes, or even portions of each. This is yet another reason for designers to verify in detail what model code documents are adopted by the Authorities Having Jurisdiction (AHJ)—a catch-all phrase for all planning, zoning, fire and building officials having something to say about building—where a project is located.

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

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

Code Interactions

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

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

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

Traditionally, codes have been written with new construction in mind. In recent years more and more provisions have been made applicable to alteration, repair and renovation of existing facilities. One of the emerging trends in code development is the creation of an International Existing Building Code (IEBC). As the importance of preservation of historic structures and the sustainable design implications of reusing existing buildings become more important, the IEBC will take on greater impact. The reuse of existing buildings is also of concern for accessibility issues. One of the most crucial aspects of remodeling work is to determine to what extent and in what specific parts of your project do building codes and access regulations apply. Most codes are not retroactive. They do not require remedial work apart from remodeling or renovation of a building.

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

Rating Systems

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

Standard of Care

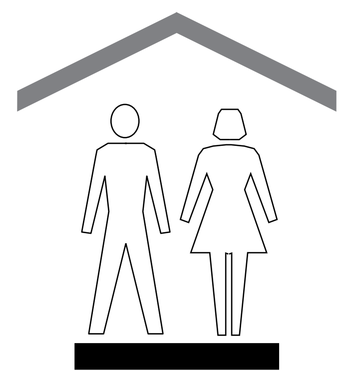
The designer should always remember that codes are legally and ethically considered to be minimum criteria that must be met by the design and construction community. The protection of health, safety and welfare is the goal of these minimum standards. It is important to also understand that registered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

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

Life Safety vs. Property Protection

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

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



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

Any person may propose a code revision. Any designer, material supplier, code official or interested member of the public that feels they have a better way to describe code requirements or to accommodate new life-safety developments or new technology may prepare revised code language for consideration. Proposed code changes are published for review by all interested parties. They are then categorized based on what section of the code is being revised and assigned to a committee of people experienced in those matters for review and consideration. Committees are typically organized around specific issues such as means of egress, fire safety, structural, general and so forth. Anyone may testify at these committee hearings regarding the merits or demerits of the code change. The committee then votes to make its recommendation to the annual business meeting. At the annual business meeting, testimony will be heard from all interested parties, both from non-voting industry representatives and building officials who will be able to vote on the proposed changes. After testimony is heard only the government members of the organization, typically public employees serving as building and fire officials, are allowed to vote on the proposed changes. This is described as the "governmental consensus process" by the ICC.

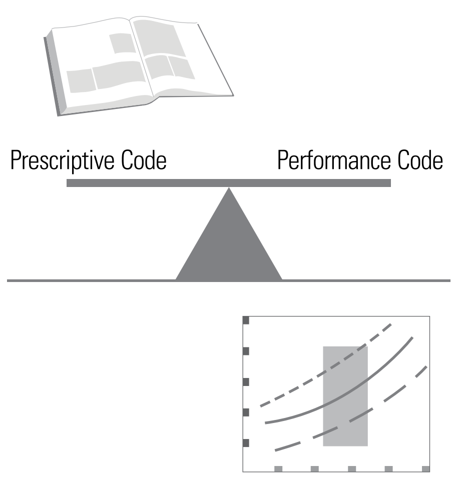
Performance vs. Prescriptive Codes

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

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

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

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



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

- Objective: What is to be accomplished? In this case the prevention of falls from heights of more than 30" (762).
- Functional Statement: Why do we want to accomplish this? We wish to safeguard building occupants by preventing them from accidentally falling from a height great enough to result in an injury.
- Performance Requirement: How is this to be accomplished? Performance codes could become prescriptive at this juncture, mandating a guardrail. More likely such a performance standard would require that the barrier be high enough, strong enough and continuous enough to prevent falls under the objective circumstances. Note that a guardrail meeting current code standards would be deemed to satisfy those requirements, but alternate means and methods could also achieve the same ends. For example, landscaping could prevent access to the grade change, or innovative railing substitutes could be designed to function like automobile air bags to catch falling persons without having a visible rail present in most conditions. Let your imagination provide other alternatives.

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

2

Navigating the Code

The key word to remember about how all building codes are developed and how they all work is *intent*. As we noted in the Preface, code sections have individual authors who had some problem in mind when they wrote a code-change proposal. The intent of the author of a building-code section is to solve a specific design problem with prescriptive language. Designers are usually trying to measure visual and spatial expressions against the language of the code. During this process, the designer should ask what problem or performance criteria the code section is addressing. The language may start to make more sense as one tries to go beyond the specific language to determine *why* the words say what they say.

Designers also have intent. They are trying to achieve certain functional or formal goals in the design of the building. Designers should measure their own intent for the design against their interpretations of the intent of the code. When examined together, the intent of the code and that of the design solution should be concurrent.

Do not try and ignore the code. Do not try and confuse or obfuscate code issues to achieve approvals. The responsibility for understanding, applying, and fulfilling the requirements of the code always rests with the design professional. Approvals by the AHJ do not relieve the designer of social and licensing responsibilities to maintain the health, safety, and welfare of society.

Each section of the code was developed to solve a certain problem. Code sections are typically written in relatively short paragraphs. Sections are organized into chapters based on common themes, but usually are developed in isolation from one another with little attention to continuity of the entire document. As you look at the code try and visualize the intent of the writer of that section and try to understand the problem they were addressing. Code language usually arises from a specific issue the code writer wishes to address based on experience or on an actual construction or life safety issue. The writer then makes the requirements general so that they will apply to more typical conditions than the specific instance that generated the concern.

The intent of the code is a crucial idea to understand. *Why* is a much more important question than *what* when you are puzzled by the actual language of a code passage. The code is a general document that must then be interpreted for its specific application to a specific project. If you know the code in general and think about its intent, you will be in a better position to formulate your own interpretation of code sections as they apply to your specific project. You will thus be in a position to help building officials see the validity of your opinion when interpretation of the code is required for a specific design condition. Confidence will come with experience in use of the code. Learning the code is vital to your success as a well-rounded designer.

Note that in the 2012 IBC certain terms are in *italic type*. These italicized terms appear in the definitions in Chapter 2. Where terms are used in ways intended by their definitions they are italicized in the body of the code. Italicized type is <u>not</u> used in this book in the same way. The code publisher's intent for this notification method is to highlight for the code user that the code's definitions should be read carefully to facilitate better understanding of how they are used in the context where they appear in italics. It is critical that the code user go back to the code definitions when attempting to understand the literal and figurative meaning of code requirements. When attempting to interpret a code section be sure to examine the code definitions for the terms used in the code section. Do not assume that the meanings of terms are the same as in everyday speech, especially for italicized text.

Learn the table of contents and use the index. It is very useful to get a copy of the CD-ROM of the code for use in your practice. This allows key word searches. Don't try and memorize passages of the code, as these may change or move around inside the code over time as the code is amended. Learn the organization of the code and learn where to find things that way. Use the index if the table of contents doesn't get you where you want to be. Think of synonyms for the topic you are researching to facilitate key word or index searches. You may have to scan large portions of the index to locate potential items. Try to remember associations of ideas, not specific language, to facilitate your use of the code.

In the code, solid vertical lines [▌] in the margins indicate a text change from the 2009 code edition. There will be an arrow in the margin [➔] indicating a deletion in the section. A single asterisk [*] placed in the margin indicates that text or a table has been relocated within the code. A double asterisk [**] placed in the margin indicates that the text or table immediately following it has been relocated there from elsewhere in the code.

You should probably own a personal printed copy of the model code, and the CD-ROM as well. Remember that the model code is often amended during adoption by local agencies. Be certain to find out what local code amendments to the code apply to your specific project. Also determine if the local AHJ has published written opinions regarding their interpretation of the code in their jurisdiction.

intent

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interpretation

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- **intent**
- **intent**

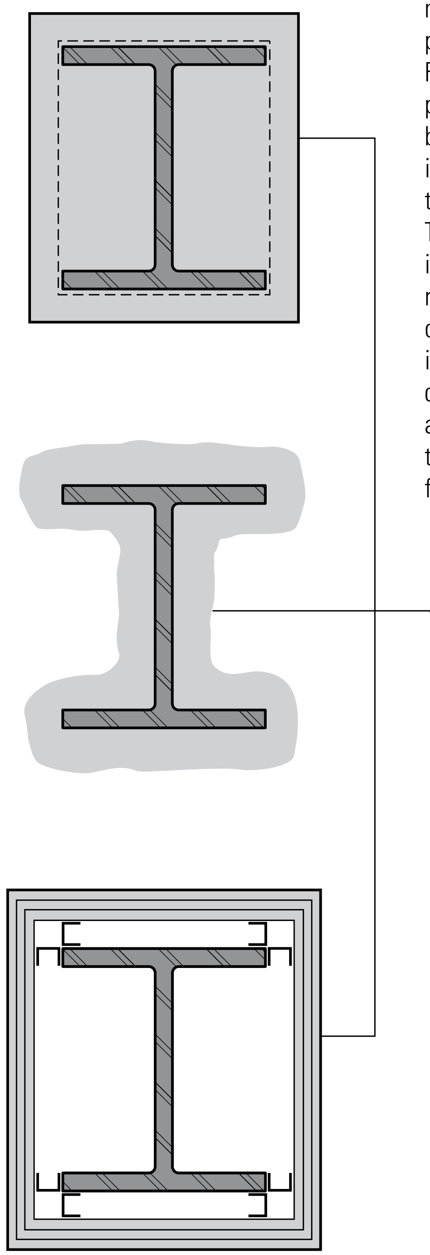
Alternate Means and Methods

§ 104.11 states that the provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. While written around prescriptive descriptions of tested assemblies and rated construction, the code recognizes that there may be many different ways of solving the same design problems. It recognizes that there will be innovations in building types, such as covered malls, mixed-use buildings and atrium buildings that do not fit neatly into prescribed occupancy classifications. The code also recognizes that there will be innovations in materials and construction technology that may happen faster than code revisions are made. Thus the code sets up a method for the building official to approve proposed alternative designs. Deviations from prescribed standards must be submitted for review and approval of the building official. The criteria they are to use are spelled out in the code. We have highlighted some of the key provisions of the approval in ***bold italics***. The alternative is to be approved when "the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the ***equivalent of that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety***" (emphasis added). These words are also the fundamental criteria for why each and every code section is included in the basic code.

Evaluation of Innovative Products

Innovations in construction materials and methods need to be evaluated for code compliance. Testing agencies often perform standardized tests on new products. These tests and data about the product must then be evaluated for code compliance. One popular way of demonstrating compliance to the AHJ for products or construction methods is through the use of ICC Evaluation Service reports.

ICC-ES is a nonprofit, limited liability company that does technical evaluations of building products, components, methods and materials. Reports are prepared at the request of companies wishing their products to be evaluated by ICC-ES. Supporting data, such as product information and test reports, is reviewed by the ICC-ES technical staff for code compliance. The evaluation process culminates with the issuance of a report on code compliance. The reports are public documents, readily available on the Internet. They may be used by designers in determining whether an innovative or unusual construction material or process is code-compliant. The designer may then use the ICC-ES report to demonstrate code compliance by submitting it for review by the AHJ.

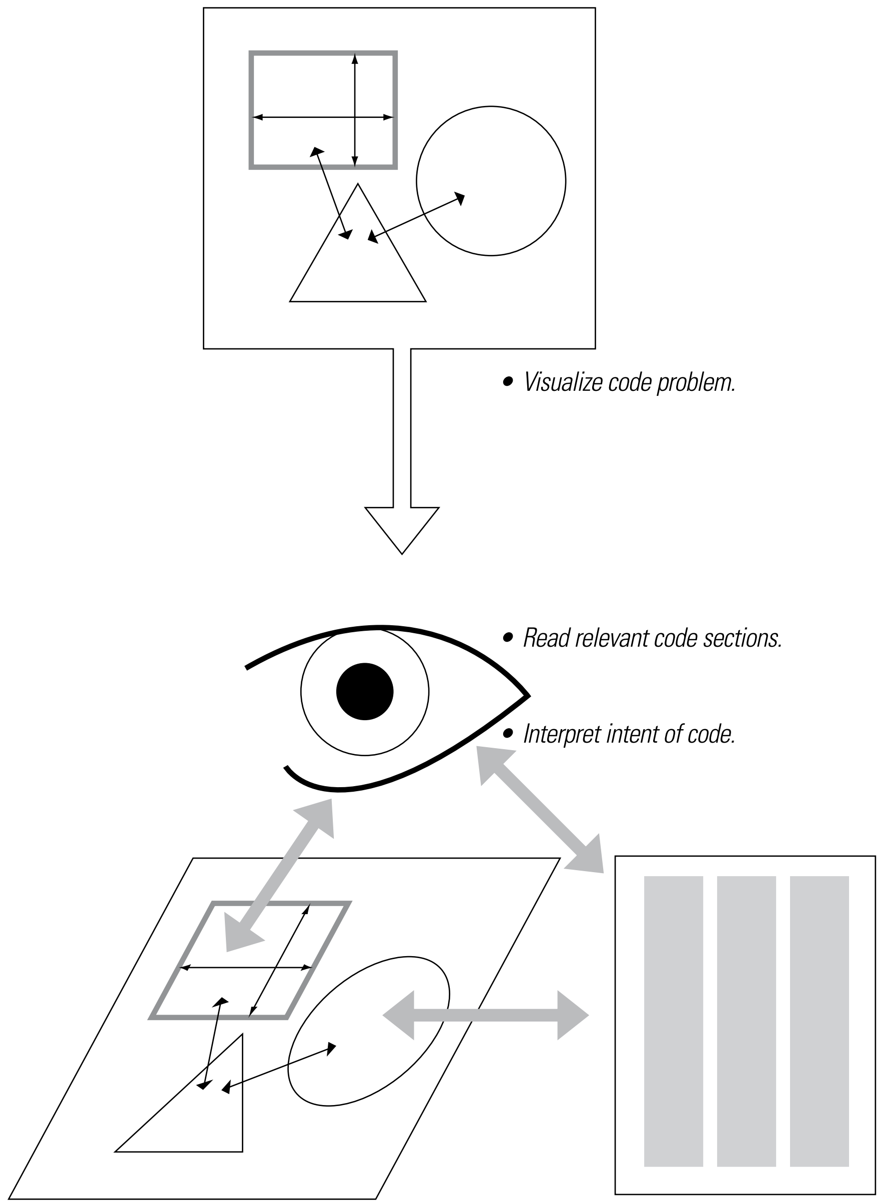


- *Concrete, spray-on fireproofing or gypsum board provide alternate means of fireproofing a structural steel member.*

Code Interpretations

Designers and code officials approach interpretations from quite different perspectives. The designer is trying to make a functional or formal design code compliant while satisfying project requirements in an aesthetic, economical and practical way. The AHJ examines completed drawings for compliance with code requirements. While the AHJ is not unaware of the practical requirements contained in the building design, they are charged first and foremost with protecting the health, safety and welfare of the public by verifying code compliance. It is the responsibility of the designer to demonstrate code compliance and to modify noncompliant areas identified during plan review by the AHJ while continuing to meet the project requirements.

Both the designer and the AHJ are working to apply generalized code provisions to a specific project. It is differences in opinion about the application of the general to the specific that most often give rise to differences in interpretation. Code officials also see many more similar examples of the relationship of code sections to various designs. Thus they may generalize interpretations from one project to another even though the projects may be different in significant ways. On the other hand, designers may find that similar designs receive quite different interpretations by the AHJ in different jurisdictions. When differences of opinion about interpretation occur, the designer must work with the AHJ to reconcile the intent of the design to the interpretations of the intent of the code. If reconciliation cannot be reached the designer must decide whether to revise the project to obtain approval or appeal the ruling of the AHJ to some civic body prescribed in the jurisdiction for hearing appeals. Often the AHJ can be requested to apply to the model-code agency that published the code for a ruling as to the publisher's opinion of the intent of the code section in question. Such appeals to the ICC are allowed to be made by any ICC member. It is thus prudent for design professionals to be ICC members to be able to access this service. In addition members receive discounts on ICC codes and have access to other interpretive and educational materials. Members may also participate in the code development process and gain deeper insights into code interpretations.

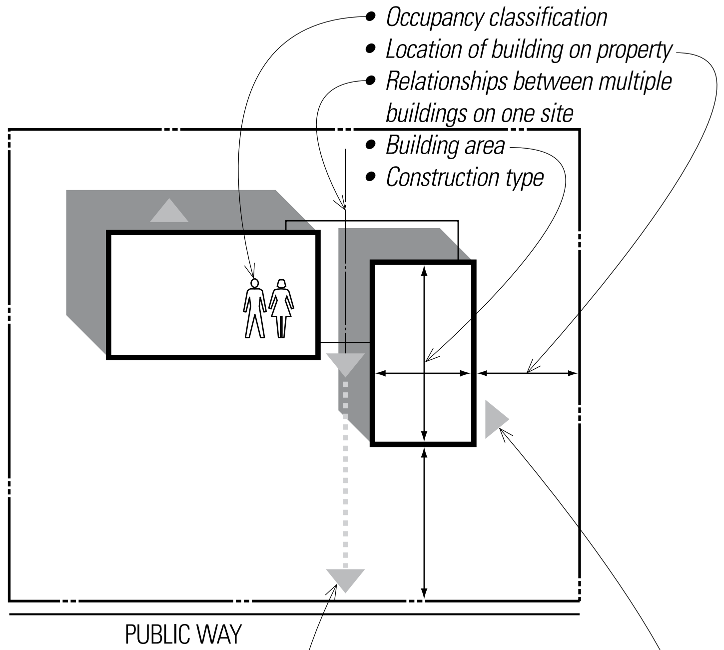


- *Visualize code problem.*
- *Read relevant code sections.*
- *Interpret intent of code.*
- *Re-visualize possible solution that satisfies both design intent and intent of the code.*

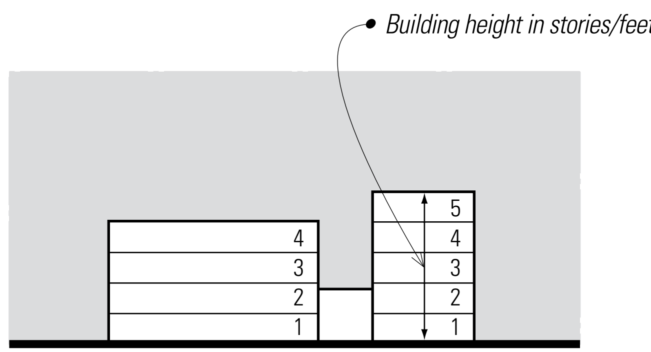
Documenting Code Interpretations

Every project should receive a detailed code analysis that is recorded as a permanent part of the permit documents. All code interpretations and citations should have a reference to the code section in question to allow retracing steps in the code analysis. Without a code section citation it is very difficult to have a productive discussion about interpretations. Recording citations focuses code issues for the designer during the design process and facilitates plan reviews by the AHJ.

At minimum the analysis should contain the following items. We recommend the following format to unify code analysis for all projects. The code section citations used should be specific for the project and sections, not as limited as in our example.



Proposed Condition	**Allowed per Code**	**Code Section or Table**
Occupancy Classification	Select from Chapter 3	Chapter 3
Fire Protection (active)	Select per occupancy	Chapter 9
Building Height (stories/feet)	Allowed per proposed type	Table 503, as adjusted
Building Area	Select per construction type	Table 503, as adjusted
Type of Construction	Determine from design	Chapters 5, 6, 7
Means of Egress	Select per occupancy	Chapter 10



A site plan and floor plan should be included that describes the location of the building on the property and any height area or construction-type credits or requirements related to location on the site and proximity to streets and other structures. The floor plan should also detail egress requirements, such as exit access widths, exit quantities and locations, and exit discharge paths to the public way. A recommended code room tag is shown below.

####	Room Number
Room Name	Assigned Room Use
Occupancy Group	Per IBC Chapter 3
Area - SF	Net per IBC §1002
Occ. Load Factor	Per IBC Table 1004.1.1
# of Occupants	Area x OLF
Door Width	Width if required door(s) > 36" min.

For the designer, many elements required to determine how the code should apply to a project are a given from the program and the site or zoning constraints:

- Occupancy classification—the client determines what functions they want;
- Location of building on property—determined by the building footprint, zoning, natural features, etc.;
- Building height and area—given the scope of the project, the designer will note how large the building needs to be and how many floors will be required.

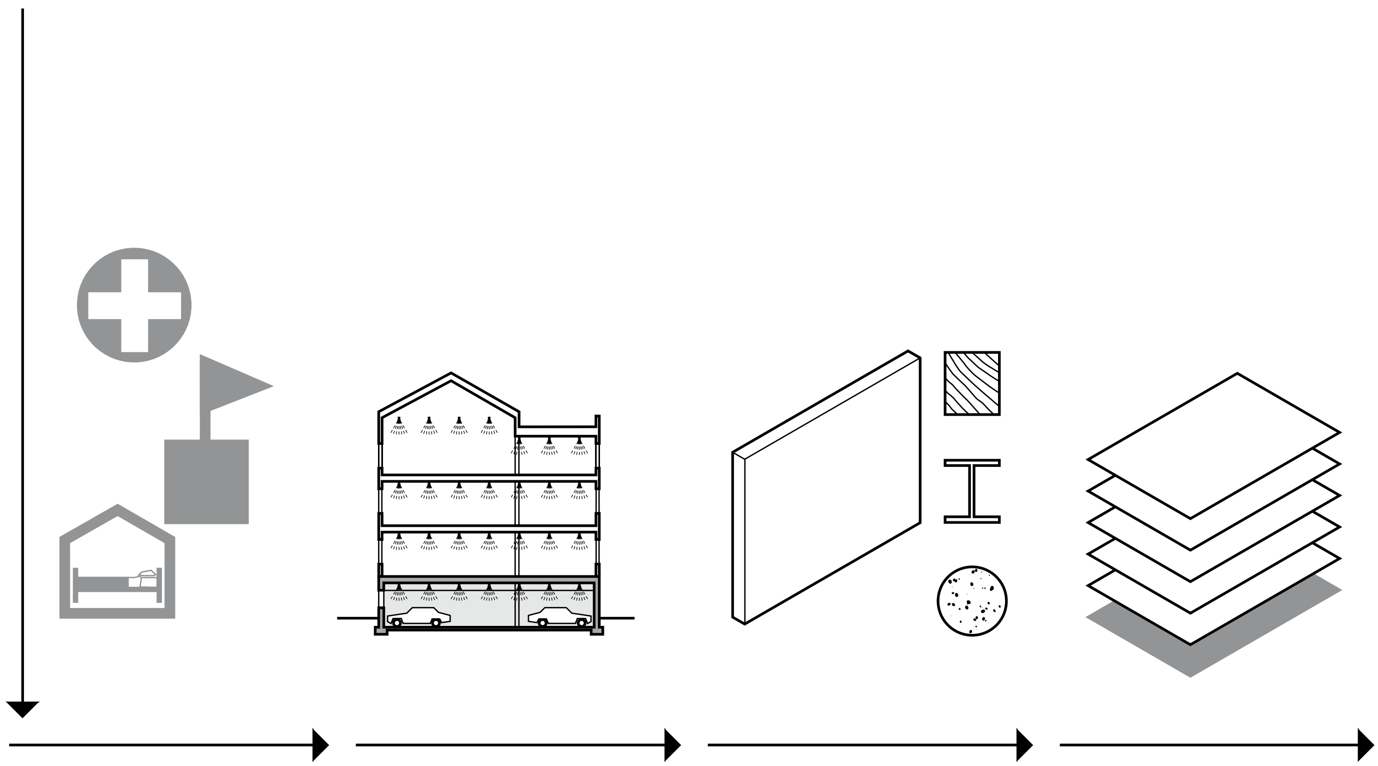
With these pieces of information it is possible to determine how the code prescribes the minimum for:

- Construction type—determined by calculation;
- Exit locations and quantities;
- Exit access widths;
- Exit discharge to a public way.

USING THE CODE

The following procedure is recommended as being helpful in using the International Building Code. Note that most of the major issues are interactive and that iteration of relationships will be required to optimize design solutions. The procedure can be paraphrased as follows.

1. Classify the building according to occupancy, type of construction, location on property, floor area, height and number of stories.



A. Occupancy Classification
Determine the occupancy group that the use of the building or portion thereof most nearly resembles. Compute the floor area and occupant load of the building or portion thereof. See the appropriate sections in Chapter 5 for requirements for buildings with mixed occupancies.

B. Sprinkler Systems
Determine if the occupancy is required to be protected by a sprinkler system and identify the threshold(s). Determine if the anticipated height of the building will require fire sprinklers. See the appropriate sections in Chapter 9 for thresholds based on the occupancy.

C. Type of Construction
Determine the required minimum type of construction based on the occupancy, fire protection, and the designed height and area. This will dictate the materials used and the fire-resistance of the parts of the building as limited in Chapter 6.

D. Allowable Floor Area
Determine the allowable floor area of the building. Use the basic allowable floor area based on occupancy group and type of construction. Determine allowable floor area of multistory buildings. Determine allowable increases based on location on property and if there is installation of an approved automatic fire-sprinkler system.