

National Building Codes Handbook

- *Includes forms, tables, fire ratings, occupancy codes & inspector checklists*

- *Provides Customary & metric units*

- *Covers all major codes & other fire & life safety provisions*

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National Building Codes Handbook

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**National
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Handbook**

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*This book is dedicated to the cast of the
construction process:
the designers, builders, engineers, and
inspectors of the American Construction
Industry.*

There's a great old traditional saying that an *architect* is a person who knows a very little about a great deal and keeps knowing less and less about more and more until he knows practically nothing about everything. An *engineer* is a person who knows a great deal about very little and who goes along knowing more and more about less and less until he knows practically everything about nothing. A *contractor* is a person who starts out knowing practically everything about all things, but winds up knowing nothing about anything, due to his association with architects and engineers.

Inspectors, of course, are there to referee.

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From a declaration of principles jointly adopted by a committee of the American Bar Association and committee of the Publishers Association.

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Preface

In retrospect of my career in construction management, I have had the extraordinary good fortune of meeting a wide variety of great people in the industry from designers, contractors, engineers, inspectors, and architects to commercial developers, financiers, and city planners. Though all were very different individuals, those who were really successful in any field had two common traits: They loved their work, and they truly cared about the unseen public who would inhabit their buildings long after the building was certified for occupancy. That is really what the model national building codes are all about: The fire-, life-, and safety-protection of the public. Any builder worth his or her salt comes to learn that there is more to construction than just making a profit. Knowledge of the *intent* as well as the letter of the law of the codes is vital in modern code compliance construction and in the business survival of your company.

The construction industry has changed in the last decade dramatically from companies who once dominated their markets by size, bidding, and bonding power to the modern, lean, downsized builder/designer/contractor companies of today who use strategic personnel in definitive operations management. In the trades, these contractors are called *paper contractors*, because all they handle is paper. We also call them smart. No tools, no trucks, few employees. Their success formula is simple: Tight bid + lower overhead = we get the job. Other job markets outside your local region are the new markets that can profit through knowledge of what is being built and where, as well as the relative national building codes to plan and estimate with. This book provides the necessary cross-link between all the national codes and can be used effectively at work tomorrow.

In addition to new sophistication in modern construction codes, the new age of technology has also brought in new materials, new technology, and powerful computer systems using dedicated software programs, opening the way for further changes in the American construc-

tion industry. I have earned my living in the construction industry for more than 20 years now, from a high school laborer to apprentice, to journeyman, to foreman, to contractor; in management roles from estimator to project manager, to project scheduler, to state teaching credentials in construction technologies. In those two decades I have seen many changes that foreshadow even bigger changes in the future for the American builder as the new century accelerates toward us. Of all the things we build with today, 75% have been invented within the last 50 years.

Of those, 80% have been invented in the last 10 years. It is estimated that, of all the things we will be building with by the year 2025, 90% *have not even been invented yet*. Graphite composite plastics that are stronger than steel, airentrained lightweight concrete, and ultra-light metal alloys are all space-age technology being used in modern construction today. And even as you read this, the clock on their obsolescence is ticking. *Paradigm* is a word that means the currently accepted parameters of any specific thing, such as an industry. And the construction industry's paradigm is changing as fast as the clouds above your head. More important, as Alan Toffler so correctly stated in his prescient book, *Future Shock*, the *rate* of that change is accelerating exponentially.

Worldwide, in residential construction, American Western Platform Framing is the accepted standard of excellence in homebuilding. After serving as an estimator and consultant for the insurance industry's reconstruction efforts in both the 7.6 Loma Prieta Earthquake of 1989 and the 7.8 Northridge–Los Angeles firsthand, I now understand why the rest of the world sends their building officials and industry representatives to America to learn our methods of construction. When one stops and reflects, the reason the world looks to us for leadership in construction is quite clear.

We build the best. That is not just my opinion; that is documented fact. Here are the statistics. Sixty-one casualties in Northridge–Los Angeles compared to 5000 in Kobe, Japan. Both earthquakes rated 7.8 on the Richter scale. The difference is due to our highly evolved standards of construction building codes. In commercial and industrial construction, our methods of reinforced concrete and steel construction are unequaled in history. This is the last proud American industry still retaining global leadership and justifiably so. The construction industry is the largest single business enterprise in America. This industry is comprised of a diverse spectrum of highly trained and skilled professionals, but this book was geared for a specific foursome: the architect, the engineer, the contractor, and the inspector. The construction process begins with the design professionals. The two major professions within the design disciplines are the

architect and engineer. Architecture is, in essence, the pursuit of the art and science of habitat for humans in the environment. However, architectural services usually extend beyond the phase of building design and the production of plans and drawings. An equally important task of the architect begins after the building design, cost estimates, and time schedules have been approved by the owner. The architect's knowledge of the national building codes relative to his or her clients' construction types in different cities and states is a distinct business advantage. But the job is not finished there.

Upon approval of the plans and specifications, the architect incorporates his or her design into the package of articles termed *contract documents*. These documents are a collection of related drawings, plans, specifications, legal notices, and contracts used by contractors to bid on a project. The drawings, plans, and specifications must be in compliance with the national building code having jurisdiction where the project is located. Multiproject jobs in different states, such as franchises, anchor tenants, and mall construction point out the need for a book like this that will provide the design professional a path to the required reference in any of the national building codes. The architect normally also presides over the bidding, assists in selection of a bidder, and aids in establishing contracts between the owner and the contractor. The architect, in essence, becomes the agent of the owner. The final and equally critical service the architect provides is overseeing the construction of the project. This includes the interpretation of the contract documents when necessary, assisting the contractor in dealings with the owner, ensuring that all contracts are being expedited in accordance with the plans and specifications, and that all contractual obligations have been satisfied by all parties to the contract.

During the construction process, an architect may retain consultants to supplement his or her own skills and to deliver a more complete, well-coordinated service to the client. The architect is trained in the integration of all building systems (structural, mechanical, electrical, etc.) and has basic knowledge and design skill in each of these areas. However, on large projects he or she will rely on the design capabilities of specialists in these engineering areas. In some architect offices, the engineers are placed on retainer or under contract for services. In large offices the staff usually includes one or more of these design professionals in a variety of disciplines. The major distinction between architects and engineers runs along generalist and specialist lines. Each is a true professional, certified and licensed through rigorous examinations. The engineer, however, is focused on an exhaustive study of a single technical area such as structural, civil, geotechnical and soils, or mechanical engineering. Both these

design professionals must have as thorough an understanding of the letter and intent of the national building codes as do the builders and inspectors.

The national building codes have become standardized, and the differences in regulations between them have become less varied over the past years. Standardized section numbers and regulations have been done in a conscious effort by the national building codes publishers to standardize the many regulations into a cohesive nationwide format. The national building codes are revised and republished every 3 years in legal form for ready adoption by each local city and county jurisdictional authority nationwide. Most local communities typically adopt the relative code in routine entirety, but they are free to make changes in some sections, add material to others, or delete sections as they see fit. Therefore, the exact local code verbiage may differ slightly or significantly from the regional national building code. Always check with your local building department or official for specific local regulations and specifications. This handbook is unique and the first of its kind to cross-reference the national building codes. It does not replace the national building codes; it complements the national building code adopted by your local jurisdiction and provides commentary and analysis of those areas that have common historical points of contention.

The three national model building codes used in America are the *Standard Building Code* (SBC), *Uniform Building Code* (UBC), and the *National Building Code* (BOCA). All modern construction materials and practices are covered within these national building codes. These are the main focus of this book. Noted, but not covered herein, is the *1995 ASTM Standards in Building Codes*, 32d edition, the current edition at the time of this writing. It is a huge work, encompassing four volumes, some 7080 pages in all. This massive reference contains 1300 ASTM specifications as adopted by all model building codes including BOCA, UBC, CABO, and standard codes. The covered national building codes herein are

- The *Standard Building Code*. As do the other two model codes, this code adopts by reference the nationally recognized industry standards of materials and installations. The 1994 edition, current at the time of this writing, is referenced herein. The SBC was first adopted by the Southern Building Code Congress International in November of 1945 at the Annual Research Conference. Revised editions have been published since that time at approximately 3-year intervals. The 1994 Standard Building Code has been reformatted into the common building code format that was developed cooperatively by SBCCI, BOCA, ICBO, AIA, and SFPE under the auspices

of the Council of American Building Officials (CABO).

- The *Uniform Building Code*. This code was first published in 1927 by the International Conference of Building Officials. The 1994 edition, current at the time of this writing, is cross-referenced by section number herein. Like all the model national building codes, the UBC has had revised editions published at 3-year intervals, and the new editions incorporate changes approved since the previous edition.
- The *National Building Code*. This code is the major model building code used in the eastern United States. The 1996 edition, current at the time of this writing, is cross-referenced by section number herein. The current edition includes changes approved through 1993 and changes made to standardize all 1996 BOCA codes and to update the references to standards. The oldest of the national building codes, BOCA was founded in 1915. It is a nonprofit, member-serviced organization dedicated to professional code administration and enforcement for the protection of public health, safety, and welfare.

Accordingly, the purpose of this book is not to reprint volumes of these many different code specifications, but to serve as a reference handbook of a specific topic section with discussion, commentary, and analysis of the most commonly encountered sections and regulations. It is based on the *Standard Building Code* with the related section numbers in UBC and BOCA codes bracketed for easy cross-reference. This book is also updated to contain both English units and metric equivalents to meet the new federal requirements of metric standardization on all federally funded projects. Analysis and explanations are included to give the reader a practical application understanding of the national building codes as they are meant to be adopted as law and are therefore worded in necessarily terse “legalese.” Tables not shown in text appear in the Appendix.

The procedures under which the national building codes are prepared are designed to provide for an orderly introduction of new developments as construction technologies continue to improve in the industry (with particular emphasis on safety from the standpoint of end use). The committee panels who develop the different national building codes include parties of interest having expertise or technical competence in varying fields of construction management, building safety, or related industries working together with the objective of safeguarding the life-, safety-, and fire-protection of the public. This system of national building codes evolution has historically proven itself to be above the reach of special interests and has pro-

duced a worldwide standard for residential and light commercial buildings.

The designated purpose of the national building codes is to provide *minimum* standards to guard the life and safety of the public by regulating and controlling the design, construction, and quality of materials used in modern construction. The codes have also come to govern the use and occupancy, location of a type of building, and the ongoing maintenance of all buildings and facilities. Once adopted by a local jurisdiction, these national building code standards then become law. The provisions of the national building codes apply to the construction, alteration, moving, demolition, repair, structural maintenance, and use of any building or structure within the local jurisdiction, except public works projects located primarily in a deeded public way, utility towers and poles, mechanical equipment not specifically regulated in the codes, or hydraulic flood control structures.

The national building codes are the legal instruments that enforce public safety in modern construction of human habitation and assembly structures. They are used as such not only in the construction industry but also by the insurance industry for compensation appraisals and claims adjustments and by the legal industry for court litigation. Accordingly, the theme of the work is to show the intent as well as the letter of the regulations through analysis of the specific sections and regulations therein. As stated previously, the reader will note in this work that the section is preceded by the *Standard Building Code* (SBC) section number relative to that chapter, followed by the UBC- and BOCA-related section numbers respectively. These appear in brackets following the SBC section number throughout the book for ease in cross-referencing the national building codes. Brackets also indicate analysis to keep those passages separate from actual section wordage.

This work is focused on providing the construction designer, builder, property developer, project manager, or construction management professional a broader practical application knowledge and readily accessible understanding of the scope, meaning, and application of the their relative national building code regulations and specifications. Electrical, plumbing, and HVAC codes are not covered in this book as they each have their own respective national code. Not all the national building code chapters are covered herein as page limitation allows coverage of only the most commonly encountered or problematic of the code sections. Areas of special interest must be researched from within the national building codes themselves. The reader will note a compressed text with no traditional spacings between subheaders and text. To my previous readers, I apologize for the change in format continuity. I do this to get the maximum amount of wordage per page

without going to a smaller (and harder to read) typeset point size. This allows me to retain the standard typeset that you are now reading. The style of presentation in this book is priority divisional referencing, reflecting the systems of the national building codes.

The standardization over the last decade of the national building codes has also brought into the world a distinct advantage in fire safety of public assembly buildings. Chapter 6 in each of the national building codes is "Types of Construction." When you see reference to the fire protection codes regulations (NFIPA), that fire code regulation will correlate to the fire wall ratings that are cross-referenced to chapter 6 of the national code you are using. The same is true for chapter 7 of all the national building codes, Fire Resistant Construction.

One of the critical factors that emphasize the importance of the national building codes is the highly competitive nature of the construction industry today. As in all businesses, safety and quality have historically been sacrificed for profit. But in this business if quality is sacrificed, people die. The national building codes are the public's only effective barrier against any compromise with basic structural safety. This book's analysis of the current national building codes is most effectively used by having your local jurisdictional approved copy of the relative code book at hand and referring to each section as it is discussed. The commentary given here is intended to supplement and clarify the actual wording of the covered code regulations as given in the respective code book itself.

For the most effective use of cross-referencing code regulations, the following SBC procedure for checking code compliance should be used by the reader. Sections referred to appear in their respective chapters.

1. Determine the occupancy classification of the structure. Select the occupancy classification which most accurately fits the use of the building.
2. Determine the actual physical properties of the building:
 - (a) Determine the building area of each floor
 - (b) Determine the grade elevation for the building
 - (c) Determine the building height in feet above grade
 - (d) Determine the building height in stories
 - (e) Determine the separation distance from exterior walls to assumed and common property lines
 - (f) Determine percent of exterior openings per floor
3. Determine the minimum type of construction necessary to accommodate the proposed structure:
 - (a) Determine the maximum allowable heights and floor areas for types of construction and occupancy classification

- (b) Check allowable height and area increases permitted
- 4. Check detailed occupancy requirements.
- 5. Check detailed construction requirements:
 - (a) Fire protection of structural members
 - (b) Fire protection requirements
 - (c) Means of egress requirements
 - (d) Special restrictions if in fire district
- 6. Review design as related to standards.
- 7. Check other requirements as necessary:
 - (a) Construction projecting into public property
 - (b) Elevators and conveying systems
 - (c) Sprinklers, standpipes, and alarm systems
 - (d) Use of combustible materials on the interior
 - (e) Roofs and roof structures
 - (f) Light, ventilation, and sanitation
 - (g) Other

These steps are naturally varied in sequence by individual preferences; however, the first three are standard steps which should be followed in proper order to assist in design or review of buildings. Computing occupancy loads is tied to minimum egress requirements. Computing the size of the building is tied to allowable height and area. Classification of occupancy will determine type of construction and fire-resistance ratings.

Remember, in matters of the real-world applications of construction contracts, always research the contract specifications for code compliance thoroughly, make sure your cost estimates are as updated as possible, and consult an attorney in all contractual obligation matters. In the wordage of the national building codes, the word *may* is permissive and the word *shall* is mandatory, meaning that the code regulation is mandated by law. Further, please be informed that the facts, subjects, tables, fire ratings, and occupancy codes contained herein are as accurate as the model codes allow at this time of writing. This work is for general information purposes only and is not to be construed as legal advice. Both the publisher and the author assume no liability, either expressed or implied, for usage of this book. The contents of this book are protected from any form of physical or electronic copying, duplication, or storage retrieval, worldwide, by United States federal copyright law.

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