



© Cengage Learning. All rights reserved. No distribution allowed without express authorization.

# Building Code Basics: Commercial

Based on the 2012 International Building Code®

International Code Council  
Steve Thomas, CBO



Australia • Brazil • Japan • Korea • Mexico • Singapore • Spain • United Kingdom • United States

# Not For Sale

**Building Code Basics: Commercial  
Based on the 2012 International Building  
Code®****Steve Thomas**

Vice President, Technology and Trades

Professional Business Unit:

Gregory L. Clayton

Director of Building Trades:

Taryn Zlatin McKenzie

Executive Editor: Robert Person

Associate Product Manager: Nobina Preston

Director of Marketing: Beth A. Lutz

Senior Marketing Manager: Marissa Maiella

Marketing Coordinator: Rachael Torres

Senior Production Director: Wendy Troeger

Production Manager: Sherondra Thedford

Senior Content Project Manager:

Stacey Lamodi

Senior Art Director: Benjamin Gleeksman

## ICC Staff:

Executive Vice President and Director of  
Business Development: Mark A. JohnsonSenior Vice President, Business  
and Product Development: Hamid NaderiVice President and Technical Director,  
Product Development: Doug ThornburgManager, Project and Special Sales:  
Suzane Nunes

Senior Marketing Specialist: Dianna Hallmark

© 2013 International Code Council

Line Illustrations copyright © 2013 by International Code Council

ALL RIGHTS RESERVED. No part of this work covered by the copyright herein may be reproduced, transmitted, stored, or used in any form or by any means, graphic, electronic, or mechanical, including but not limited to photocopying, recording, scanning, digitizing, taping, Web distribution, information networks, or information storage and retrieval systems, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without the prior written permission of the publisher.

For product information and technology assistance, contact us at  
**Professional Group Cengage Learning Customer &  
Sales Support, 1-800-354-9706**

For permission to use material from this text or product,  
submit all requests online at [cengage.com/permissions](http://cengage.com/permissions).

Further permissions questions can be e-mailed to  
[permissionrequest@cengage.com](mailto:permissionrequest@cengage.com).

Library of Congress Control Number: 2012936300

ISBN-13: 978-1-133-28335-5

**ICC World Headquarters**

500 New Jersey Avenue, NW

6th Floor

Washington, D.C. 20001-2070

Telephone: 1-888-ICC-SAFE (422-7233)

Website: <http://www.iccsafe.org>**Delmar**

5 Maxwell Drive

Clifton Park, NY 12065-2919

USA

Cengage Learning is a leading provider of customized learning solutions with office locations around the globe, including Singapore, the United Kingdom, Australia, Mexico, Brazil and Japan. Locate your local office at: [international.cengage.com/region](http://international.cengage.com/region)

Cengage Learning products are represented in Canada by  
Nelson Education, Ltd.

For more learning solutions, please visit our corporate website at  
[www.cengage.com](http://www.cengage.com)

Visit us at [www.InformationDestination.com](http://www.InformationDestination.com)**Notice to the Reader**

Publisher does not warrant or guarantee any of the products described herein or perform any independent analysis in connection with any of the product information contained herein. Publisher does not assume, and expressly disclaims, any obligation to obtain and include information other than that provided to it by the manufacturer. The reader is expressly warned to consider and adopt all safety precautions that might be indicated by the activities described herein and to avoid all potential hazards. By following the instructions contained herein, the reader willingly assumes all risks in connection with such instructions. The publisher makes no representations or warranties of any kind, including but not limited to, the warranties of fitness for particular purpose or merchantability, nor are any such representations implied with respect to the material set forth herein, and the publisher takes no responsibility with respect to such material. The publisher shall not be liable for any special, consequential, or exemplary damages resulting, in whole or part, from the readers' use of, or reliance upon, this material.

Printed in the United States of America

1 2 3 4 5 14 13 12

# CONTENTS

<b>Preface</b> .....	<b>ix</b>
About the International Building Code .....	x
Acknowledgments .....	x
About the Author .....	xi

## **PART I: CODE ADMINISTRATION AND ENFORCEMENT**

<b>Chapter 1: Introduction to Building Codes</b> .....	<b>2</b>
<b>History of Codes</b> .....	3
<b>Code Development</b> .....	4
<b>Construction Codes: Scope and Limitations</b> .....	5
International Building Code .....	5
International Mechanical Code .....	6
International Fuel Gas Code .....	6
International Plumbing Code .....	6
International Energy Conservation Code .....	6
International Fire Code .....	6
International Property Maintenance Code .....	7
International Existing Building Code .....	7
International Residential Code .....	7
International Green Construction Code .....	7
<b>Existing Buildings</b> .....	8
International Existing Building Code option .....	9
Using the Code .....	9
<b>Chapter 2: Legal Aspects, Permits, and Inspections</b> .....	<b>11</b>
<b>Code Adoption</b> .....	12
Codes versus standards .....	12
Standards used in the International Building Code .....	13
<b>Authority</b> .....	13
Alternate materials and methods of construction .....	15
<b>Permits</b> .....	17
Submittal requirements .....	17
Plan review process .....	19
<b>Inspections</b> .....	19
Footing and foundation inspection .....	19
Concrete slab and under-floor inspection .....	20
Lowest floor elevation .....	20
Frame inspection .....	20
Lath and gypsum board inspection .....	20
Fire-resistant penetrations .....	20
Energy efficiency inspections .....	21
Final inspection .....	21
Third-party inspections .....	21
<b>Board of Appeals</b> .....	22
<b>Definitions</b> .....	22

Not For Sale

© Cengage Learning. All rights reserved. No distribution allowed without express authorization.

# Not For Sale

## PART II: BUILDING PLANNING

<b>Chapter 3: Building Use</b> . . . . .	<b>24</b>
<b>Basic Occupancies</b> . . . . .	25
Assembly occupancies . . . . .	26
Business occupancies . . . . .	27
Educational occupancies . . . . .	27
Factory/Industrial occupancies . . . . .	27
Hazardous occupancies . . . . .	28
Institutional occupancies . . . . .	28
Mercantile occupancies . . . . .	28
Residential occupancies . . . . .	29
Storage occupancies . . . . .	29
Utility occupancies . . . . .	29
<b>Chapter 4: Construction Types</b> . . . . .	<b>30</b>
<b>Combustible versus Noncombustible</b> . . . . .	31
<b>Protected versus Unprotected</b> . . . . .	32
<b>Chapter 5: Building Size</b> . . . . .	<b>35</b>
<b>Maximum Height</b> . . . . .	36
<b>Building Area</b> . . . . .	37
<b>Interior Dimensions</b> . . . . .	40
<b>Chapter 6: Special Uses and Considerations</b> . . . . .	<b>42</b>
<b>Multituse Buildings</b> . . . . .	43
Separated occupancies . . . . .	43
Nonseparated occupancies . . . . .	44
Accessory occupancies . . . . .	45
Incidental Uses . . . . .	46
<b>High-Rise Buildings</b> . . . . .	47
<b>Atriums</b> . . . . .	50
<b>Vehicles in Buildings</b> . . . . .	51
Private garages . . . . .	51
Parking garages . . . . .	51
Repair garages . . . . .	52
Hospitals . . . . .	52
<b>Hazardous Materials</b> . . . . .	53
Maximum allowable quantities . . . . .	53
Control areas . . . . .	54
<b>Live/Work Units</b> . . . . .	55
<b>Ambulatory Health-Care Facilities</b> . . . . .	56

## PART III: FIRE SAFETY

<b>Chapter 7: Fire and Smoke Protection</b> . . . . .	<b>58</b>
<b>Spread of Fire within a Building</b> . . . . .	59
<b>Spread of Fire from Building to Building</b> . . . . .	60

© Cengage Learning. All rights reserved. No distribution allowed without express authorization.

**Chapter 8: Passive Fire Protection . . . . .61**

**Determination of Fire-Resistance-Rated Construction . . . . .62**

    Testing . . . . .62

    Documentation . . . . .63

**Types of Fire Assemblies . . . . .64**

    Protection of the structure . . . . .65

    Exterior walls . . . . .66

    Fire walls . . . . .67

    Fire barriers . . . . .69

    Fire partitions . . . . .69

    Horizontal assemblies . . . . .70

    Vertical openings . . . . .70

    Shafts . . . . .71

    Penetrations . . . . .72

    Opening protection . . . . .72

**Interior Finishes . . . . .73**

**Stopping Heated Air and Fire Movement . . . . .74**

    Fireblocking . . . . .74

    Draftstopping . . . . .75

**Chapter 9: Active Fire Protection . . . . .76**

**Automatic Sprinkler Systems . . . . .77**

    Where are automatic sprinklers required? . . . . .78

    Sprinkler credits . . . . .80

**Fire Standpipes . . . . .82**

    Where are standpipes required? . . . . .83

**Fire Alarms . . . . .84**

    Where are fire alarms required? . . . . .84

    Single-station smoke alarms . . . . .86

**Controlling Smoke . . . . .87**

    Smoke-control methods . . . . .87

**Carbon Monoxide Detectors . . . . .88**

---

## PART IV: LIFE SAFETY

**Chapter 10: Getting People Out . . . . .90**

**Design of Exit Systems . . . . .91**

    Number of people . . . . .91

        Areas without fixed seating . . . . .91

        Areas with fixed seating . . . . .92

    Number of ways out . . . . .92

        Exits from spaces . . . . .92

        Exits from buildings . . . . .94

    Exit paths . . . . .95

        Making it wide enough . . . . .95

        Horizontal travel . . . . .96

        Vertical travel . . . . .97

        Path identification . . . . .98

Not For Sale

# Not For Sale

<b>Means of Egress Components</b> .....	99
Doors .....	99
Stairways .....	101
Ramps .....	102
<b>Chapter 11: Getting People In.</b> .....	<b>104</b>
<b>Federal Regulations</b> .....	105
<b>Accessibility</b> .....	105
Accessible path .....	106
Into the building .....	106
Through the building .....	107
<i>Ramps</i> .....	107
<i>Elevators</i> .....	107
Usable spaces .....	107
Toilet facilities .....	108
Water closets .....	108
Kitchens .....	110
Assembly seating areas .....	111
<b>Rescue for People with Physical Disabilities</b> .....	113
<b>Chapter 12: Building Safety</b> .....	<b>116</b>
<b>Protection from Falling</b> .....	117
Guards .....	117
Stairways .....	117
Ramps .....	119
Window-sill height .....	119
<b>Safety Glazing</b> .....	120
<b>Swimming Pools</b> .....	123
Entrapment avoidance .....	124

## PART V: HEALTH SAFETY

<b>Chapter 13: Weather Protection</b> .....	<b>126</b>
<b>Exterior Walls</b> .....	127
Keeping the water out! .....	127
Drainage plane .....	128
Flashing .....	128
Vapor retarders .....	128
Materials .....	130
<b>Roofing</b> .....	133
Flashing .....	134
Low-slope roofs .....	134
Steep roofs .....	137
Asphalt shingles .....	137
Clay and concrete tiles .....	138
<b>Chapter 14: Interior Environment</b> .....	<b>139</b>
<b>Light and Ventilation</b> .....	140
Natural and artificial lighting .....	140
Natural ventilation .....	141
Exhaust systems .....	142

**Temperature** .....142  
**Moisture Control** .....143  
 Attic spaces .....143  
 Under-floor ventilation .....143  
**Plumbing Facilities** .....144  
 Minimum plumbing facilities .....144  
 Location of toilet facilities .....144  
 Toilet/bathing room finishes .....146

---

## PART VI: STRUCTURAL SAFETY

### Chapter 15: Structural Design .....150

**Basic Loads** .....151  
 Live loads .....151  
 Dead loads .....152  
 Deflection .....152  
 Environmental loads .....154  
 Snow loads .....154  
 Wind loads .....155  
 Earthquake loads .....156  
 Flood loads .....158  
**Soils** .....159  
 Excavation .....159  
 Grading .....160

### Chapter 16: Materials .....161

**Structural Materials** .....162  
 Concrete construction .....162  
 National standards .....162  
 Durability requirements .....163  
 Foundations .....164  
 Formwork .....164  
 Reinforcement .....165  
 Quality control .....167  
 Masonry construction .....169  
 Foundations .....169  
 Materials .....169  
 Quality control .....170  
 Steel construction .....171  
 Protection .....171  
 Connections .....172  
 Quality control .....172  
 Wood .....173  
 Protection .....173  
 Grade marks .....175  
 Cutting, boring, and notching .....176  
 Floor construction .....177  
 Walls .....179

Not For Sale

# Not For Sale

Ceilings and roofs . . . . .	181
Crawl space and attic access . . . . .	182
Engineered wood products . . . . .	184
Trusses . . . . .	184
<b>Nonstructural Materials . . . . .</b>	<b>185</b>
Gypsum board . . . . .	185
Plastics . . . . .	186
<b>Glossary . . . . .</b>	<b>187</b>
<b>Index . . . . .</b>	<b>190</b>

© Cengage Learning. All rights reserved. No distribution allowed without express authorization.





## PREFACE

Construction of buildings has progressed over the centuries from stone buildings to the steel and concrete monuments to the industrial revolution and technology today. People have an expectation that when they enter a building, it has been constructed in such a manner that if an emergency situation occurs in the building, they will be protected. As new building practices improve and new building technologies are developed, the complexity of the buildings has increased. As these complexities increase, building regulations must keep up with the technology. The codes adopted by governmental agencies should not prohibit or limit the use of new materials or technologies. However, buildings must be constructed to be safe for the occupants. Therefore, the building code has had to keep up with the complex building practices and has become a complex document in itself. The codes and standards used to regulate the construction of buildings can overwhelm the casual user of the code. Navigating the complex and detailed provisions of the code can be daunting. Not all of the provisions apply to every building.

This text, *Building Code Basics: Commercial* has been written to provide an easy-to-read overview of the *International Building Code*® (IBC). It is an illustrated look at the most common code provisions. This text provides an overall understanding of the provisions of the building code. It is presented in a user-friendly manner with emphasis on the technical accuracy and clear noncode language. This book targets readers who have a basic understanding of architecture and construction but a limited knowledge of the code requirements.

Anyone who is involved in the design, construction, or regulatory aspects of building construction can gain from this book. People with all levels of experience can profit from the information provided. The user will be able to use this document for learning the fundamental provisions and intents of the building code. The most common and most used provisions of the *2012 International Building Code*® have been addressed.

The information in *Building Code Basics: Commercial* has been organized by the different purposes of the code. It discusses the administrative provision that building departments use to enforce the provisions of the building code. The provisions used to design the overall building use, construction, size, and specific occupancy requirements are covered in the building planning portion of the code. The fire safety topics include the use of passive and active fire protection. The discussion of life safety issues includes the methods used in the design and construction to ensure that occupants are provided with a safe means of evacuating a building in an emergency. It also provides the provisions that allow people with physical disabilities to access buildings. Health safety provisions regarding weather protection and interior environment have been provided. Finally, the structural provisions of the code have been put into easy-to-understand language.

Not For Sale

# Not For Sale

This book is not intended to cover all of the provisions of the building code or all of the acceptable materials and methods of construction. This is not to say that the information *not* included in this book is not important. This book should be used with the *2012 International Building Code*, which should be referenced for more details and information. This book only provides a basic understanding of a very complex document and referenced standards.

*Building Code Basics: Commercial* includes full-color photos and illustrations to help the reader understand the provisions and application of the building code requirements. It provides examples, simplified tables, and highlights to explain the fundamental requirements of the *International Building Code* and to gain compliance with its regulations. References to the applicable sections or standards have been provided to assist the reader in locating more detailed and complete information in the code. A glossary of code and construction terms clarifies the meaning of the technical provisions.

---

## ABOUT THE INTERNATIONAL BUILDING CODE

The IBC covers all buildings except detached one- and two-family dwellings and townhouses not more than three stories in height. This comprehensive code features time-tested safety concepts; structural, fire, and life safety provisions covering means of egress; interior finish requirements; comprehensive roof provisions; seismic engineering provisions; innovative construction technology; occupancy classifications; and the latest industry standards in material design. It is founded on broad-based principles that make possible the use of new materials and new building designs.

The IBC is one of the codes in the family of *International Codes* published by the International Code Council® (ICC). All of these codes are maintained and updated through an open code-development process and are available internationally for adoption by the governing authority to provide consistent enforceable regulation for the built environment.

---

## ACKNOWLEDGMENTS

*Building Code Basics: Commercial* is the result of many hours of research and collaborative effort. The author would like to thank those people who provided valuable assistance and contribution to developing this book. The knowledge and experience of the ICC staff were instrumental in its development. Hamid Naderi, PE, Vice President of Product Development, came up with the concept of the book and provided the initial direction. Doug Thornburg, AIA, Technical Director of Product Development, provided his services as the technical editor during the

writing. Doug was also a friend and provided moral support during the long nights and weekends. Finally, thanks go to Scott Stookey and Kermit Robinson, senior technical staff, for their assistance with the fire protection, special occupancies, and building planning provisions. All of these people contributed to the accuracy and quality of this document.

The author would like to dedicate this book to Perry (Pete) Tyree, PE. Pete mentored me as a young building official and taught me how to interpret and use the codes in a reasonable and fair way. He served as president of the International Conference of Building Officials (ICBO) in 1972 while serving as the building official for the Pikes Peak Regional Building Department in Colorado Springs, Colorado, for 18 years. He has continued to support the ideals and importance of the model code concept ever since. It is because of Pete Tyree that I have been able to get where I am now and have experienced the success I have enjoyed. He provided the guidance and support that I needed to become the code official and code consultant that I have become. Thank you, Pete!

---

## ABOUT THE AUTHOR

Steve Thomas, CBO  
Colorado Code Consulting, LLC  
President

Mr. Thomas has over 30 years experience in building code plan review, inspection, and administration. He is currently the president of Colorado Code Consulting, LLC. He served as the Building Official for the City of Glendale, Colorado, for 18 years. Starting a building code consulting firm in 1999, his firm provides building department services for governmental agencies, code consulting services for architectural clients and building code education across the country. Mr. Thomas served on ICBO Code Development Committees and the ICBO Chairman's Advisory Committee for Small Jurisdictions. He currently serves the Chair of the ICC Means of Egress Code Development Committee. Mr. Thomas received his bachelor of science in business administration degree from the University of Phoenix. Mr. Thomas is a Certified Building Official and holds seven other ICC certifications.

### About the International Code Council

The International Code Council® (ICC®) is a member-focused association dedicated to helping the building safety community and construction industry provide safe, sustainable and affordable construction through the development of codes and standards used in the design, build and compliance process. Most U.S. communities and many global markets

# Not For Sale

# Not For Sale

choose the International Codes®. ICC Evaluation Service (ICC-ES), a subsidiary of the International Code Council, has been the industry leader in performing technical evaluations for code compliance fostering safe and sustainable design and construction.

**Headquarters:**

500 New Jersey Avenue, NW, 6th Floor  
Washington, DC 20001-2070

**District Offices:**

Birmingham, AL; Chicago, IL; Los Angeles, CA

1-888-422-7233

[www.iccsafe.org](http://www.iccsafe.org)

© Cengage Learning. All rights reserved. No distribution allowed without express authorization.