



Code Check[®] Building Third Edition

BY DOUGLAS HANSEN & REDWOOD KARDON

Illustrations & Layout: Paddy Morrissey

© 2011 by The Taunton Press, Inc. ISBN-13: 978-1-60085-329-6

Code Check[®] is a registered trademark of The Taunton Press, Inc., registered in the U.S. Patent & Trademark Office. Printed in China.

Based on Chapters 1 through 10 of the 2009 International Residential Code[®]

For updates and information related to this book, visit www.codecheck.com

Code Check Building is a condensed guide to the building portions of the 2009 International Residential Code (IRC) for One- & Two-Family Dwellings. The IRC is the most widely used residential building code in the United States. Significant code changes are highlighted in the text and summarized in the inside back cover, which means that the book is also applicable in areas using older editions of the IRC. Check with the local building department to determine which code is used in your area, and for local amendments.

REFERENCE DOCUMENTS

The IRC is part of the suite of codes published by the **International Code Council**. It is limited to one- and two-family dwellings and townhouses not more than 3 stories above grade. It is a prescriptive document containing rules and instructions. Aspects of a building that exceed the scope of the IRC are built to the IBC, a more comprehensive document containing engineering regulations for structural design. It is acceptable to use any of the specific performance-based provisions of the International Codes as an alternative to the prescriptive rules in the IRC.

The American Forest and Paper Association publishes the *Wood Frame Construction Manual for One- and Two-Family Dwellings (WFCM)*, which can be used as an alternate to IRC designs for wood framing.

The American Iron and Steel Institute (AISI) publishes the *Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings (AISI S230)*, which can be used as an alternative to the IRC.

The American Concrete Institute (ACI) publishes two documents that supplement the prescriptive rules of the IRC. These are *ACI 318—Building Codes for Structural Concrete* and *ACI 530—Building Code Requirements for Masonry Structures*.

The Truss Plate Institute (TPI) publishes *TPI 1—National Design Standard for Metal Plate Connected Wood Truss Construction*, which is mandatory for metal-plate-connected truss design. TPI also contributes to *BCSI 1-03—Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses*.

KEY TO USING THIS BOOK

The line for each code rule starts with a checkbox and ends with an IRC code reference in brackets. Exceptions and lists start with a bullet and also end with the code reference in brackets. Changes to the 2009 code are highlighted by having the reference in a different color and an endnote to the table on the inside back cover.

Example from p.8:

- Floor or landing min 36in deep on each side of door EXC _____ [311.3]
 - Balconies <60sq. ft OK for landing to be <36in deep _____ [311.3X]¹⁹

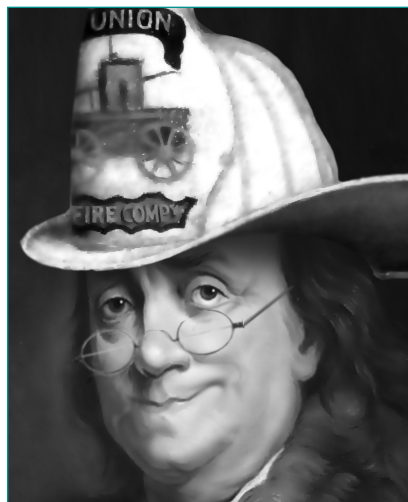
These lines give the basic rule that landings at least 36 inches deep are required on each side of a door, and the code reference in the IRC is section 311.3. (In the IRC, the number is actually R311.3. We omit the letter "R" at the beginning to save space and include more information on each line.) The line that follows is an exception to the rule, and the code reference is 311.3 Exception. This exception is a new code change, and is explained further on the inside back cover as code change #19.

Tables and Figures are referenced in the code text lines in the following way:

Example from p.17:

- Notching & boring per **F30 & T14** _____ [502.8.1]

This line says that the rules for notching & boring joists are found in section 502.8.1 and illustrated in figure 30, with further explanation in table 14.



In 1735, Benjamin Franklin organized the first volunteer fire department in Philadelphia, which still remains the model for U.S. fire departments.

SEQUENCE OF THIS BOOK

This book follows the same basic sequence as the IRC. It begins with the administrative sections in the IRC chapter 1, followed by the planning and nonstructural topics in the IRC chapter 3. The structural sections are arranged "from the ground up," beginning with foundations (chapter 4), followed by floors (5), wall construction (6), wall coverings (7), roof-ceiling construction (8), roof assemblies (9), and chimneys and fireplaces (10).

ABBREVIATIONS

AAMA = American Architectural Manufacturers Association	in = inches
ACI = American Concrete Institute	L&L = listed and labeled
AMI = in accordance with manufacturer's instructions	max = maximum
ASTM = American Society for Testing & Materials	min = minimum
BO = building official	mph = miles per hour
BWL = braced wall line	o.c. = on center
BWP = braced wall panel	PL = property line
cfm = cubic feet per minute	PT = pressure treated
CMU = concrete masonry unit	psf = pounds per square foot
EXC = exception to rule will follow in the next line	psi = pounds per square inch
FSD = fire separation distance	req = require
ft = feet	req'd = required
GB = gypsum board	req's = requires, requirements
hr = hour	SDC = Seismic Design Category
IBC = International Building Code	sq. = square, as in sq. ft
ICF = insulating concrete form	w/ = with
	w/o = without
	WRB = water-resistive barrier
	WSP = wood structural panel

PLANNING, PERMITS & INSPECTIONS

Before beginning a building or project, plans must be approved by the local building department and must conform to applicable climatic and geographic design criteria. The plans must include setbacks from the property lines and adjacent slopes.

Plans & Permits **09 IRC**

- Scope of code is 1- & 2-Family Dwellings & Townhouses _____ [101.2]
- Approved plans & permit card on site _____ [106.3.1]
- Plans to include braced wall line locations & methods _____ [106.1.1]⁴
- Alternative materials, design & methods OK when approved by BO _____ [104.11]
- Local statutes may req registered design professional to draw plans _____ [106.1]
- Site plan or plot plan to be included in construction documents _____ [106.2]
- Permits req'd for new work, additions, repairs & alterations _____ [105.1]
- Permits not req'd for: _____ [105.2]
 - Detached accessory structures (tool sheds) ≤200 sq. ft⁵
 - Fences ≤6ft, sidewalks, driveways, swings & playground equipment
 - Retaining walls ≤4ft bottom of footing to top of wall & w/ no surcharge
 - Water tanks on grade ≤5,000 gallons & height/width ratio ≤2:1
 - Painting, tiling, carpeting, cabinets, counters & similar finish work
 - Awnings projecting ≤54in from exterior wall & supported from wall
 - Decks ≤200 sq. ft & ≤30in above grade & not attached to dwelling or serving req'd exit door⁶

Required Inspections **09 IRC**

- Inspection & approval prior to concealing any work _____ [109.4]
- Foundation forms & steel prior to placing concrete _____ [109.1.1]
- In flood hazard areas, registered design professional req'd to document lowest floor elevation before construction above it _____ [109.1.3]
- Rough plumbing, mechanical & electrical before concealment _____ [109.1.2]
- Frame & masonry after fireblocking & bracing in place _____ [109.1.4]
- Air barrier & insulation inspection (may be 3rd party) _____ [102.4.2.2]
- Drywall nailing of fire-resistance rated walls prior to taping _____ [109.1.5.1]
- Special inspections as authorized by BO _____ [109.2]
- Final inspection _____ [109.1.6]

DESIGN

The IRC assigns a Seismic Design Category (SDC) from A to E, with A the least likely to experience seismic activity and E the most vulnerable. Category D is broken into three subparts, D₀, D₁ & D₂. Buildings in SDC E must be designed to the IBC. The BO can allow an E to be designated as D₂ in some circumstances, such as buildings of "regular shape" with wall bracing continuous in one plane from the foundation to the uppermost story and no cantilevers.

Design Criteria General **IRC 09**

- Nonconventional elements designed per IBC _____ [301.1.3]
- Determine climatic & geographic design criteria **T1** _____ [301.2]
- Complete **T1** from maps & BO _____ [T301.2(1-6)]
- In flood hazard areas, determine design flood elevation _____ [322.1.4]
- BO may req soil tests if expansive, compressible, or questionable _____ [401.4]

TABLE 1 CLIMATIC AND GEOGRAPHIC CONDITIONS [T301.2(1)]

Ground Snow Load	Wind Speed (mph) ^A	Seismic Design Category ^A	Weathering (Concrete) ^B	Frost Line Depth ^A	Termites Hazard ^A	Flood Hazards ^C

A. To be filled in by local building department.
 B. Choose negligible, moderate, or severe—affects strength of concrete & grade of CMUs.
 C. To reference entry date into National Flood Insurance Program, date of Flood Insurance Study & numbers & dates of currently effective maps.

Wind Design **IRC 09**

- Determine basic wind speed from maps _____ [301.2.1.4&T301.2(4)]
- If history of damage due to wind speed-up at hills, modify map values to consider topographic effects _____ [301.2.1.5]⁷
- If basic wind speed >100mph in hurricane-prone region or >110mph, design per ICC-600, ASCE-7, WFCM, or AISI S230 _____ [301.2.1.1]
- Cladding, covering & fenestration req design for specified pressure loads or per T301.2(2&3) & F301.2(7) _____ [301.2.1]
- Windows in windborne debris regions to ASTM E 1886 & E 1996 impact resistance standards EXC _____ [301.2.1.2]
 - 1- & 2-story buildings WSP protection precut & predrilled to fit on permanently installed anchors on building _____ [301.2.1.2X]

FIRE PROTECTION

Fire-resistive construction materials such as gypsum board provide passive protection against the rapid spread of a fire. Fireblocking slows the spread of fire in small concealed spaces, and draftstopping accomplishes the same function in larger concealed areas.

Separation between Townhouses

09 IRC

- Each unit req's its own 1-hr separation wall to adjacent unit EXC **F2** _____ [302.2]
 - Common 1-hr wall OK if no plumbing/mechanical in wall cavity _____ [302.2X]⁹
 - Electrical boxes meeting penetration rules OK in common wall **F2** _____ [302.2X]
- Common walls continue in rated parapet to 30in above roof EXC _____ [302.2.2]
 - Noncombustible roof deck or GB wrapback for 4ft _____ [302.2.2X]
 - Roofs w/ >30in elevation difference _____ [302.2.2]

Separation in Two-Family Dwellings

09 IRC

- 1-hr common wall req'd from foundation to underside of roof EXC _____ [302.3]
 - 1/2-hr OK if building protected by automatic sprinkler system _____ [302.3X1]
 - Attic separation can be draft stop if ceilings 5/8in Type X _____ [302.3X2]

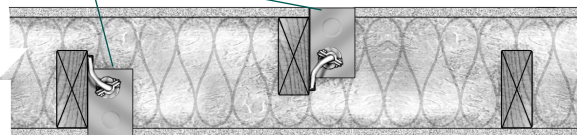
Penetrations of Fire-Resistive Membranes

09 IRC

- Steel electrical boxes allowed in wall membrane if max 16sq. in & aggregate area of openings ≤100sq. in _____ [302.4.2X1]
- Steel boxes on opposite sides of wall min 24in horizontal separation or protected by insulation, fireblocking, or listed putty pads **F2** _____ [302.4.2X1]
- L&L fire-rated boxes allowed in walls AMI **F2** _____ [302.4.2X2]
- Through penetrations req listed firestop penetration system _____ [302.4.1]

FIG. 2 **Townhouse Separation Wall**

Electrical boxes fire-rated, steel, protected, or separated by insulation



A 1-hour rated wall typically has 1 layer of 5/8 in. Type X gypsum board on each side. A wall with staggered studs helps lower sound transmission between units.

Separation from Garages

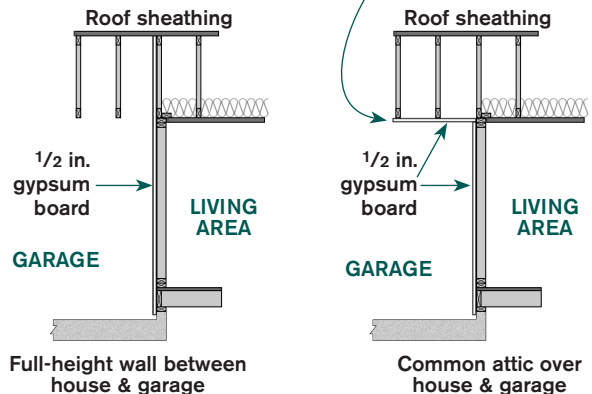
09 IRC

- Min 1/2in GB or equivalent on garage side of walls & ceilings common to house or shared attic space EXC **F3** _____ [302.6]
 - Min 5/8in Type X GB ceiling under habitable room **F3** _____ [T302.6]
- Min 1/2in GB on walls, beams, or other structures that support ceilings providing separation between house and garage _____ [T302.6]
- Garage walls perpendicular to dwelling OK unprotected unless supporting floor/ceiling separations _____ [302.6]
- No direct openings between garage and sleeping rooms _____ [302.5.1]
- Door to house rated 20-minute, steel or 1 3/8in solid wood _____ [302.5.1]
- Ducts in garage & penetrating common walls min 26 gage steel _____ [302.5.2]
- No duct openings in garage _____ [302.5.2]
- Seal penetrations of common walls w/ approved material _____ [302.5.3]
- Sealant does not have to comply w/ ASTM E 136 _____ [302.5.3 & 302.11#4]
- Detached garages <3ft req 1/2in GB on garage side of walls facing house & openings protected as above _____ [T302.6]¹⁰

FIG. 3

Fire Separation from Garage

If habitable space over garage, ceiling must be 5/8 in. type X.



Finish Surfaces & Insulation

09 IRC

- Wall & ceiling finishes max flame spread index 200, max smoke-developed index 450 in accordance w/ ASTM E 84 / UL 723 _____ [302.9]
- Insulation & facing max flame spread index 25, max smoke-developed index 450 in accordance w/ ASTM E 84 / UL 723 EXC _____ [302.10.1]
 - Facing material exempt when in substantial contact w/ unexposed surface of wall, floor, or ceiling – i.e., not visible in finished job ____ [302.10.1X1]
- Foam plastic max flame spread index 75, max smoke-developed index 450 in accordance w/ ASTM E 84 / UL 723 _____ [302.10.1]
- Foam plastic not OK to be exposed to building interior _____ [316.4]
- Foam req's thermal barrier of min 1/2in GB EXC _____ [316.4]
- In roof assembly separated by wood structural panels _____ [316.5.2]
- Crawlspace & attics only entered for repairs or maintenance alternate lesser covering barriers allowed _____ [316.5.3&4]

Fireblocking

09 IRC

- Purpose is to cut off concealed draft openings _____ [302.11]
- Materials can be 2in lumber, 2 thicknesses 1 in lumber, 3/4in WSP, 3/4in particleboard, 1/2in GB, 1/4in millboard, mineral wool or glass fiber batts securely retained in place _____ [302.11.1]
- Unfaced fiberglass must fill entire cavity to height of 16in **F6** ____ [302.11.1.2]
- Caulking does not have to comply w/ ASTM E 136 _____ [302.11#4]¹¹

FIG. 4

Fireblocking at Wall/Ceiling

Pipes, vents, ducts, wires, and cables req. fireblocking where the wall intersects the ceiling. If more than 2 NM cables in a single hole are fireblocked, they must be derated (see *Code Check Electrical*).



- Required locations: _____ [302.11]

- In walls vertically at ceiling & floor levels, horizontally max 10ft
- Intersections of concealed vertical/horizontal spaces (e.g., soffits) **F5,6,7**
- Concealed spaces between stair stringers at top & bottom of run
- Openings around vents, ducts, pipes & cables at ceilings & floors **F4**
- In space between chimneys & combustible framing
- In two-family dwelling cornices at line of unit separation

FIG. 5

Air Flow through Soffit

Air communicates through soffit to attic or ceiling space above.

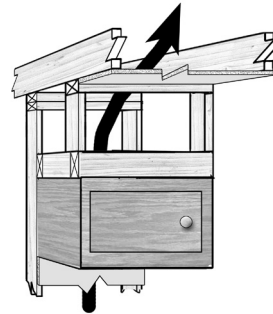


FIG. 6

Soffit Fireblocking Options

Fireblocking achieved by 1, 2, or 3.

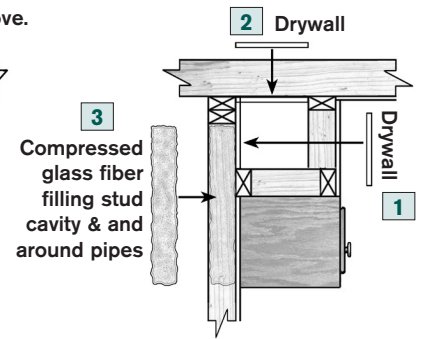
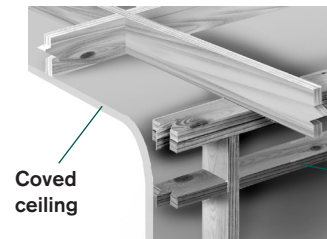


FIG. 7



Coved ceiling

Coved or Dropped Ceiling

Fireblock

Draftstopping

09 IRC

- Req'd at floor/ceiling assemblies to limit concealed space to 1,000sq. ft when using suspended ceiling or open-web trusses _____ [302.12]
- Materials min 1/2in GB, 3/8in WSP, or equivalent _____ [302.12.1]

WALL BRACING

Wall bracing resists the forces imposed by winds and earthquakes. The type and amount of bracing must be adequate to resist whatever is the stronger of those two forces at the building site. The horizontal elements such as floors, ceilings, and roofs collect lateral forces and must be properly connected to the walls to transmit those forces to the braced elements. When the prescriptive limits are not adequate, designs per the IBC or the reference documents at the beginning of this book should be used.

Bracing: General

09 IRC

- Comply with prescriptive IRC bracing or IBC or documents referenced in 301 (listed in introduction of this book) [602.10]
- Bracing length greater of req'd amount for seismic or wind EXC [602.10.1.2]
 - 1- & 2-family in SDC C only req's bracing for wind [602.10X]³⁴

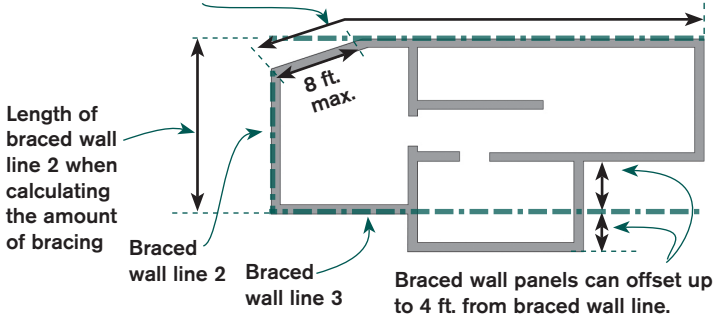
Braced Wall Lines (BWLs)

09 IRC

- BWL distance measured to perpendicular BWL or exterior walls or projection of same EXC [602.10.1]
 - Angled corners w/ diagonal ≤ 8 ft measure BWL per F39 [602.10.1.3]³⁵

FIG. 39 Braced Wall Lines

Braced wall line 1: Use this length when calculating the amount of bracing.



Bracing Wall Panel (BWP) Locations

09 IRC

- BWPs may offset ≤ 4 ft from braced wall line F39 [602.10.1.4]³⁶
- BWP max 25ft o.c., max 12.5ft total from ends of BWL F40 [602.10.1.4]³⁷
- SDC D₀, D₁ & D₂ BWP must start at corners EXC [602.10.1.4.1]³⁸
 - 8ft OK if 2ft wide panels attached each side of corner F40 [602.10.1.4.1X1]
 - 8ft OK if BWP begin w/ min 1,800lb hold-down F40 [602.10.1.4.1X2]
- Spacing where wind is determining factor per bracing tables [602.10.1.2]³⁹
- SDC D₀, D₁ & D₂ spacing between BWLs max 25ft EXC [602.10.1.5]⁴⁰
 - 35ft allowed to accommodate 1 room ≤ 900 sq. ft [602.10.1.5X]
 - 35ft allowed w/ increased bracing & fastening [602.10.1.5X]

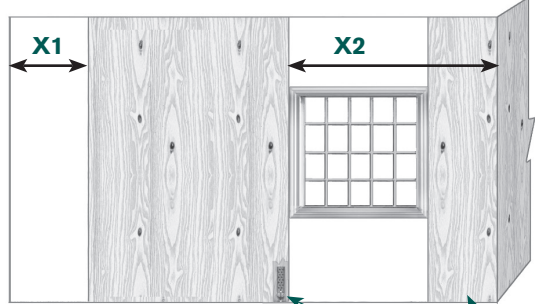
Bracing Methods

09 IRC

- Acceptable methods include intermittent bracing methods T19 or continuous sheathing (CS) method [602.10.1.1]⁴¹
- Mixed bracing methods allowed story to story [602.10.1.1]⁴²
- Mixed bracing methods OK in different BWL of same story [602.10.1.1]⁴²
- Mixed bracing methods in same BWL only in SDC A, B & C [602.10.1.1]⁴²
- Methods DWB, WSP, SFB, PBS & PCP req GB on interior side of wall unless bracing length multiplied by factor of 1.5 EXC [602.10.2.1X3]⁴³
 - Approved interior finish w/ shear capacity = to GB [602.10.2.1X2]
- SDC C, D₀, D₁ & D₂ adhesive not OK to fasten GB [602.10.2.2]

FIG. 40 Braced Wall Panel Distances from Corners

SDC A, B & C: X1 + X2 max. 12.5 ft.



SDC D₀, D₁ & D₂: X2 allowed to be 8 ft. if max. 1,800 lb hold-down at start of WSP bracing or 2 ft. bracing each side of corner.

Panel does not count toward req. amount of bracing at wall line.

TABLE 19 INTERMITTENT BRACING METHODS [T602.10.2]

Abbreviation	Bracing Method
ABW	Alternate braced wall
DWB	Diagonal wood boards
GB	Gypsum board
HPS	Hardboard panel siding
LIB	Let-in bracing ^A
PBS	Particleboard sheathing
PCP	Portland cement plaster
PFG	Portal frame at garage
PFH	Portal frame with hold-downs
SFB	Structural fiberboard sheathing
WSP	Wood structural panels

A. Let-in bracing has few allowable applications & is not recommended.

FIG. 41

Portal Frame with Hold-Downs



Inside Wall



Outside Wall

The construction methods for Alternate Braced Walls (ABW) and Portal Frames with Hold-Downs (PFH) are specified in the IRC. In practical terms, these walls are not site-built. Manufactured assemblies meeting the same load values can be used under the provision for alternate materials, design & methods. Follow all installation instructions when using these wall assemblies.