INTRODUCTION  CODES  ABBREVIATIONS

INTRODUCTION

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. 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]

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.X Exception. This exception is a new code change, and is explained further on the inside back cover as code change 119.

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 posts are found in section 502.8.1 and illustrated in figure 30, with further explanation in table 14.
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.

Plants & 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]
- 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:
  - Detached accessory structures (tool sheds) ≤ 200 sq. ft
  - 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
  - Awning projecting ≥ 54in from exterior wall & supported from wall
  - Decks ≤ 200 sq. ft & ≤ 30in above grade & not attached to dwelling or serving req’d exit door

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) [1102.4.2.2]
- 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 [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)]

<table>
<thead>
<tr>
<th>Ground Snow Load</th>
<th>Wind Speed (mph)</th>
<th>Seismic Design Category</th>
<th>Weathering (Concrete)</th>
<th>Frost Line Depth</th>
<th>Termites Hazard</th>
<th>Flood Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
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<tr>
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<td>2</td>
<td>C</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

A. To be filed in by local building department.
B. Choose negligible, moderate, or severe—affects strength of concrete & grade of CMU.
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]
- 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  ♦  SEPARATIONS  ♦  FIREBLOCKING

FIRE PROTECTION

Fire-resistant 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 F2 [302.2X]
  - Electrical boxes meeting penetration rules OK in common wall F2 [302.2X]
  - 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]
  - ½-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 [302.4.2X2]
- Through penetrations req listed firestop penetration system [302.4.1]

Separation from Garages 09 IRC
- Min 5/8in 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 [302.6]
- Min 5/8in GB on walls, beams, or other structures that support ceilings providing separation between house and garage [302.6]
- 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 1/2in 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 [302.11#4]
- Detached garages <3ft req 5/8in GB on garage side of walls facing house & openings protected as above [302.6]

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.

FIG. 3
Fire Separation from Garage

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

Full-height wall between house & garage

Common attic over house & garage

LIVING AREA

GARAGE

LIVING AREA

GARAGE

1/2 in. gypsum board

1/2 in. gypsum board

Roof sheathing
Fire Protection & Separations

Fireblocking

- Purpose is to cut off concealed draft openings. [302.11]
- Materials can be 2in lumber, 2 thicknesses 1in lumber, 1/4in WSP, 1/4in particleboard, 1/4in 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. [302.11.1.2]
- Caulking does not have to comply with ASTM E 136. [302.11#4]

Fireblocking at Wall/Ceiling

Pipes, vents, ducts, wires, and cables are 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).

Finish Surfaces & Insulation

- Wall & ceiling finishes max flame spread index 200, max smoke-developed index 450 in accordance with ASTM E 84 / UL 723. [302.9]
- Insulation & facing max flame spread index 25, max smoke-developed index 450 in accordance with ASTM E 84 / UL 723 EXC. [302.10.1]
  - Facing material exempt when in substantial contact with an exposed surface of wall, floor, or ceiling – i.e., not visible in finished job. [302.10.1X1]
- Foam plastic max flame spread index 75, min smoke-developed index 450 in accordance with 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 1/8in 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]

Draftstopping

- Req’d at floor/ceiling assemblies to limit concealed space to 1,000 sq. ft when using suspended ceiling or open-web trusses. [302.12]
- Materials min 1/8in GB, 3/16in 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**

- 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]

**Bracing Wall Lines (BWLs)**

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

**Bracing Wall Panel (BWP) Locations**

- BWP max 25ft o.c., max 12.5ft total from ends of BWL F40 [602.10.1.4]
- SDC D0, D1, & D2 BW must start at corners EXC [602.10.1.4.1]
- 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**

- SDC D0, D1, & D2 spacing between BWLs max 25ft EXC [602.10.1.5]
- 35ft allowed to accommodate 1 room ≤ 900sq. ft [602.10.1.5X]
- 35ft allowed w/ increased bracing & fastening [602.10.1.5X]

**Bracing Methods**

- Acceptable methods include intermittent bracing methods T19 or continuous sheathing (CS) method [602.10.1.1]
- Mixed bracing methods allowed story to story [602.10.1.1]
- Mixed bracing methods in different BWL of same story [602.10.1.1]
- Mixed bracing methods in same BWL only in SDC A, B & C [602.10.1.1]

**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]**

- 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]

**Abbreviation**

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

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

**Fig. 39** Braced Wall Lines

- Braced wall line 1: Use this length when calculating the amount of bracing.
- Length of braced wall line 2 when calculating the amount of bracing.
- Braced wall line 3: Braced wall panels can offset up to 4 ft. from braced wall line.
- Braced wall panel (BWP) Locations

**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.

**Fig. 41** Portal Frame with Hold-Downs

- 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.