

by Jim Vogt, P.E.

Unclear about IRC wall bracing methods? Look no further!

The prescriptive wall bracing requirements provided in the 2006 International Residential Code® (IRC) are sometimes difficult to understand. One of the areas that seem to generate some of the most confusion has to do with the acceptability of using different wall bracing techniques in the same building.

Question

Can different wall bracing methods be used in the same house?

Answer

In many instances, yes. Section R602.10 of 2006 IRC provides prescriptive provisions for wall bracing. Within this section, the IRC recognizes eight “standard” methods, two “alternate” methods, and the “continuous structural sheathing method” for providing wall bracing. The eight standard methods are described in Section R602.10.3 and include:

Method 1. Nominal 1-inch-by-4-inch (25 mm by 102 mm) continuous diagonal braces let into top and bottom plates and intervening studs or approved metal strap devices installed in accordance with the manufacturer’s specifications. The let-in bracing shall be placed at an angle not more than 60 degrees (1.06 rad) or less than 45 degrees (0.79 rad) from the horizontal.

Method 2. Wood boards of 5/8 inch (16 mm) net minimum thickness applied diagonally on studs spaced not over 24 inches (610 mm). Diagonal boards shall be attached to studs in accordance with Table R602.3(1).

Method 3. Wood structural panel sheathing with a thickness not less than 5/16 inch (8 mm) for a 16-inch (406 mm) stud spacing and not less than 3/8 inch (9 mm) for a 24-inch (610 mm) stud spacing. Wood structural panels shall be installed in accordance with Table R602.3(3).

Method 4. One-half-inch (13 mm) or 25/32-inch (20mm) thick structural fiberboard sheathing applied vertically or horizontally on studs spaced a maximum of 16 inches (406 mm) on center. Structural fiberboard sheathing shall be installed in accordance with Table R602.3(1).

Method 5. Gypsum board with minimum 1/2-inch (13 mm) thickness placed on studs spaced a maximum of 24 inches (610 mm) on center and fastened at 7 inches (178 mm) on center with the size nails specified in Table R602.3(1) for sheathing and Table R702.3.5 for interior gypsum board.

Method 6. Particleboard wall sheathing panels installed in accordance with Table R602.3(4).

Method 7. Portland cement plaster on studs spaced a maximum of 16 inches (406 mm) on center and installed in accordance with Section R703.6.

Method 8. Hardboard panel siding where installed in accordance with Table R703.4.

The two alternate braced wall panel methods are described in Sections R602.10.6.1 and R602.10.6.2. Both require the use of minimum 3/8"-thick wood structural panel sheathing, blocked at all edges, and attached to the wall studs with special nailing requirements. In addition, these methods require tie-down devices and anchor bolts to connect the braced panel directly to the foundation, which must be continuous

at a glance

- ❑ Using different wall bracing methods on the same structure is often acceptable.
- ❑ The IRC recognizes eleven total methods for providing wall bracing.
- ❑ The continuous wood structural panel sheathing section of the code has caused confusion in terms of whether other bracing methods can be used with it.

TABLE R602.10.1
WALL BRACING

SEISMIC DESIGN CATEGORY OR WIND SPEED	CONDITION	TYPE OF BRACE ^{b,c}	AMOUNT OF BRACING ^{a,d,e}
Category A and B ($S_s \leq 0.35g$ and $S_{ds} \leq 0.33g$) or 100 mph or less	One story Top of two or three story	Methods 1, 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 16% of braced wall line for Methods 2 through 8.
	First story of two story Second story of three story	Methods 1, 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 16% of braced wall line for Method 3 or 25% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of three story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 25% of braced wall line for Method 3 or 35% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
Category C ($S_s \leq 0.6g$ and $S_{ds} \leq 0.50g$) or less than 110 mph	One story Top of two or three story	Methods 1, 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 30% of braced wall line for Method 3 or 45% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of two story Second story of three story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 16% of braced wall line for Method 3 or 25% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of three story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 45% of braced wall line for Method 3 or 60% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
Categories D ₀ and D ₁ ($S_s \leq 1.25g$ and $S_{ds} \leq 0.83g$) or less than 110 mph	One story Top of two or three story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 20% of braced wall line for Method 3 or 30% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of two story Second story of three story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 45% of braced wall line for Method 3 or 60% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of three story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 60% of braced wall line for Method 3 or 85% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
Category D ₂ or less than 110 mph	One story Top of two story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 25% of braced wall line for Method 3 or 40% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of two story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 55% of braced wall line for Method 3 or 75% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	Cripple walls	Method 3	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 75% of braced wall line.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479kPa, 1 mile per hour = 0.477 m/s.

a. Wall bracing amounts are based on a soil site class “D.” Interpolation of bracing amounts between the S_{ds} values associated with the seismic design categories shall be permitted when a site specific S_{ds} value is determined in accordance with Section 1613.5 of the *International Building Code*.

b. Foundation cripple wall panels shall be braced in accordance with Section R602.10.2.

c. Methods of bracing shall be as described in Section R602.10.3. The alternate braced wall panels described in Section R602.10.6.1 or R602.10.6.2 shall also be permitted.

d. The bracing amounts for Seismic Design Categories are based on a 15psf wall dead load. For walls with a dead load of 8 psf or less, the bracing amounts shall be permitted to be multiplied by 0.85 provided that the adjusted bracing amount is not less than that required for the site’s wind speed. The minimum length of braced panel shall not be less than required by Section R602.10.3.

e. When the dead load of the roof/ceiling exceeds 15 psf, the bracing amounts shall be increased in accordance with Section R301.2.2.2.1. Bracing required for a site’s wind speed shall not be adjusted.

Figure 1.

across the entire length of the braced wall line. The method described in Section R602.10.6.2 is most often referred to as the “portal frame” method and is intended for applications adjacent to door and window openings with a full-length header. Braced wall panels constructed in accordance with the two alternate methods set out in Sections R602.10.6.1 or R601.10.6.2 are narrower than methods 1 through 8 above, which may be advantageous for applications where wall

lengths are limited. All referenced code sections can be found in **Support Docs** at www.sbcmag.info.

The requirements for location and amount of braced wall panels within a braced wall line for the eight standard methods and two alternate methods described above are provided in Sections R602.10.1 and R602.10.4 and Table R602.10.1 (see Figure 1). The requirements vary depending on the type of

Continued on page 14

method used, the seismic design category, the wind speed and the number of stories in the building. Although not specifically stated in the text of Section R602.10, the provisions of Table R602.10.1 infer that the various braced panel methods can be used interchangeably in the same building and/or story.

The Nuances of Continuous Wood Structural Panel Sheathing

There has been some confusion with the requirements of Section R602.10.5, continuous wood structural panel sheathing, as to whether or not the other bracing methods can be used in conjunction with it. Section R602.10.5 contains provisions for using wood structural panel sheathing, such as plywood or oriented strand board (OSB), as a method of providing braced wall panels in a braced wall line. The text in this section of both the 2003 and 2006 versions of the IRC states (underline added for emphasis):

R602.10.5 Continuous wood structural panel sheathing. When continuous wood structural panel sheathing is provided in accordance with Method 3 of Section R602.10.3 on all sheathable areas of all exterior walls, and interior braced wall lines, where required, including areas above and below openings, bracing wall panel lengths shall be in accordance with Table R602.10.5. Wood structural panel sheathing shall be installed at corners in accordance with Figure R602.10.5. The bracing amounts in Table R602.10.1 for Method 3 shall be permitted to be multiplied by a factor of 0.9 for wall with a maximum opening height that does not exceed 85 percent of the wall height or a factor of 0.8 for walls with a maximum opening height that does not exceed 67 percent of the wall height.

The underlined portion of this provision is often incorrectly interpreted to mean that *all sheathable areas of all exterior walls and interior braced wall lines* be continuously sheathed with wood structural panels whenever the continuous wood structural panel method is used anywhere on a building. If interpreted in this manner, this provision would effectively exclude the use of other code-compliant wall bracing methods and sheathing products on all other walls of such buildings and unintentionally limit the use of proven and accepted wall bracing techniques.

Extensive revisions have been made to Section R602.10, Wall Bracing, in the 2007 Supplement to the 2006 IRC with the intention of clarifying the prescriptive wall bracing requirements. Section R602.10.1 of the Supplement clearly defines the interchangeability of the various wall bracing methods (underline added for emphasis):

R602.10.1 Braced wall lines. Braced wall lines, both interior and exterior, shall be provided with braced wall panels in the percentage and location specified in this section.

Braced wall panels shall be in accordance with one of the bracing methods specified in Section R602.10.2, the alternate braced wall method of Section R602.10.3.2, or the continuous structural panel sheathing method of Section R602.10.4. Bracing method shall be

permitted to vary as follows:

1. Variation in bracing method from story to story is permitted.
2. Variation in bracing method from braced wall line to braced wall line within a story is permitted, except that continuous structural panel sheathing shall conform to the additional requirements of Section R602.10.4.
3. In Seismic Design Categories A and B, and detached dwellings in Seismic Design Category C, variation in bracing method within a braced wall line is permitted. The required sheathing percentage for the braced wall line with mixed sheathing types shall have the higher bracing percentage, in accordance with Table R602.10.1(1), of all types of bracing used. Wall lines using continuous wood structural panel sheathing shall conform to the additional requirements of Section R602.10.4.

Section R602.10.4 provides the specific requirements for continuously-sheathed braced wall lines using wood structural panels as follows. Note that the underlined language defines situations in which other methods are permissible:

R602.10.4 Continuously-sheathed braced wall line using Method 3 (wood structural panel). Continuously sheathed braced wall lines using wood structural panels shall comply with this section. Different bracing methods shall not be permitted within a continuously sheathed braced wall line. Other bracing methods prescribed by this code shall be permitted on other braced wall lines on the same story level or on different story levels of the building.

Exception: All exterior braced wall lines shall be continuously sheathed where required by Section R602.10.4.7.

Section R602.10.4.7 adds further restrictions for high seismic or wind areas:

R602.10.4.7 Continuously-sheathed braced wall lines. Where a continuously-sheathed braced wall line is used in Seismic Design Categories D0, D1, and D2 or regions where the basic wind speed exceeds 100 miles per hour, all other exterior braced wall lines in the same story shall be continuously sheathed.

The 2007 ICC Supplement Language was developed by the ICC Ad Hoc Committee on Wall Bracing (AHCWB) to specifically address issues with the previous IRC wall bracing language. The 2007 supplement language will form the basis for the development of the 2009 wall bracing language in the IRC.

There has been a great deal of confusion surrounding the braced wall sections of the 2003 and 2006 IRC to the point of having specifiers, builders and building officials take the path of least resistance and require that all braced wall lines use method 3 techniques. This has never been the intent of the IRC. This is made clear in that it gives multiple approaches that are technically justified and can provide sufficient capacity to resist the applied loads. It makes good sense that several methods be available for specifiers and builders to have flexibility in braced wall line applications so that the most affordable wall solution can be provided for the specific end use. **SBC**

To pose a question for this column, call the WTCA technical department at 608/274-4849 or email technicalqa@sbcmag.info.

Register Today!



March 26 - 28 * Las Vegas, NV



Join us for 1 or all of the following sessions:

Wednesday, March 26

1 to 5
pm pm

Key Issues in Cold-Formed Steel Components

- ◆ A market outlook for cold-formed steel
- ◆ Cold-formed steel operational issues and expanding business
- ◆ Cutting-edge ideas for using steel structural building components

Thursday, March 27

8 to 12
am pm

Building Your Business in a Downturn – Business Operations and HR

- ◆ Component industry benchmarks to track your operation's effectiveness
- ◆ Improving your truss shop costing
- ◆ Training *all* of your employees to sustain your business

1 to 5
pm pm

Building Your Business in a Downturn – Sales and Marketing

- ◆ Educating your sales staff to sell your product smartly
- ◆ Making your name meaningful in your market
- ◆ Bringing your builders and framers on board

Friday, March 28

8 to 12
am pm

Current Events and Technical/Design Matters

- ◆ How technology influences our industry's direction
- ◆ Profiting from your role in the construction process
- ◆ Component manufacturing responsibilities and business strategies
- ◆ Open forum on current industry topics and trends

With educational sessions and group lunches and dinners, the Annual Workshop is an excellent opportunity to reward yourself or your employees with a fun learning experience. You can earn TTT recertification, CEUs and/or PDHs for participation, too! Register online at:

www.sbcindustry.com

For reader service, go to www.sbcmag.info/wtca.htm

This event is made possible by our generous Workshop sponsors. Please support the suppliers that support our industry.



STRUCTURAL BUILDING **COMPONENTS**TM

THE FUTURE OF FRAMING

www.sbcmag.info

Dear Reader:

Copyright © 2008 by Truss Publications, Inc. All rights reserved. For permission to reprint materials from **SBC Magazine**, call 608/310-6706 or email editor@sbcmag.info.

The mission of **Structural Building Components Magazine (SBC)** is to increase the knowledge of and to promote the common interests of those engaged in manufacturing and distributing of structural building components to ensure growth and continuity, and to be the information conduit by staying abreast of leading-edge issues. SBC will take a leadership role on behalf of the component industry in disseminating technical and marketplace information, and will maintain advisory committees consisting of the most knowledgeable professionals in the industry. The opinions expressed in SBC are those of the authors and those quoted solely, and are not necessarily the opinions of any affiliated association (WTCA) .



6300 Enterprise Lane • Suite 200 • Madison, WI 53719
608/310-6706 phone • 608/271-7006 fax
www.sbcmag.info • admgr@sbcmag.info