



## RESIDENTIAL WALL BRACING GUIDE

This step-by-step guide and worksheet is intended to assist designers in applying the prescriptive lateral wall bracing provisions of the 2011 Oregon Residential Specialty Code, in lieu of a design and calculations by a licensed engineer. The Code must be consulted while using this guide, and in the case of a conflict between the two, the Code takes precedence.

**1. Determine braced wall lines.** A braced wall line is an imaginary line which might not occur where actual braced panels are located. Identify braced wall lines and braced wall panels on a separate schematic floor plan with braced wall lines identified by numbers in one direction and letters in the opposite direction. Dimension the length of each braced wall line and the distance between braced wall lines. See Sections R602.10.1.4 and R602.10.1.5.

- Braced wall panels may be offset up to 4 ft from the braced wall line.
- The total out-to-out offset of braced wall panels in a braced wall line may not exceed 8 ft.
- The spacing between braced wall lines may not exceed 25 ft except as noted below.
- In 1 & 2 story homes, the bracing may increase to 35 ft to accommodate one room not larger than 900 SF.

**2. Determine general adjustment factors for wind.** These factors may vary in each direction and for each story.

- Exposure Factor - No adjustment is required for Exposure B, the typical condition in Portland. See Section R301.2.1.4 in Chapter 3 and Footnote b in Table R602.10.1.2 (1).
- Eave Height Factor - No adjustment is required if the eave to ridge height is  $> 5$  ft and  $\leq 10$  ft. See Footnote c in Table R602.10.1.2 (1). If an adjustment is required, the adjustment will vary with each story.
- Wall Height Factor - See Footnote d in Table R602.10.1.2 (1).
- Number of Braced Wall Lines Factor - See Footnote e in Table R602.10.1.2 (1). There is no adjustment if there are only 2 braced wall lines.

Multiply the above factors together to determine the **Total General Wind Adjustment Factor**. This must be calculated for each story and in each direction. Complete top half of Page 1 of the Worksheet.

**3. Determine specific adjustment factors for wind.** These factors only apply to certain braced wall lines, under certain conditions, and may or may not apply to any of the braced wall lines. See bottom half of Page 1 of the Worksheet.

- Gypsum Wall Board Factor - If gypsum wall board is not applied to the interior side of an exterior braced wall line, this factor will occur. See Footnote f in Table R602.10.1.2 (1).
- Gypsum Wall Board Bracing Method Factor - If special attachment methods are followed at interior braced wall lines, the required bracing length can be reduced. See Footnote g in Table R602.10.1.2 (1).
- One Sided Gypsum Wall Board Factor - If gypsum board is only attached to one side of an interior braced wall line, this adjustment factor will apply. See Footnote g in Table R602.10.1.2 (1).
- Hold Down Factor - This only applies to one story houses or the top story of multi-story houses. Hold downs must be installed at each braced panel. See Footnote i in Table R602.10.1.2 (1).
- Cripple Wall Bracing Factor - This factor applies if there is a cripple wall. Alternatively, cripple walls may be treated as an additional story. See Section R602.10.9 and R602.10.9.1 for additional requirements.

Calculate each Braced Wall Line separately. Complete the bottom half of Page 1 of the Worksheet.

**4. Determine the adjustment factors for seismic.** Except for the Story Height Factor, these factors only apply to certain braced wall lines, under certain conditions. See Page 2 of the Worksheet.

- Story Height Factor - If the story height is greater than 10 feet, see Table 602.10.1.2 (3).
- Gypsum Wall Board Factor - If gypsum wall board is not applied to the interior side of an exterior braced wall line, this factor will occur. See Section R602.10.2.1, Exception 3.
- Braced Wall Line Spacing Factor - If the spacing between braced wall lines is greater than 25 ft, the adjustment factor increases. See Section 602.10.1.5 & Table 602.10.1.5.
- Wall Dead Load Factor - If the wall dead load is less than or equal to 8 psf, (this is typical for interior walls), the adjustment factor decreases. See Table 602.10.1.2 (3).
- Roof/Ceiling Dead Load Factor - If the roof dead load is large (such as a concrete tile roof) or there is habitable space in the attic, this adjustment factor is applied. See Table 602.10.1.2 (3).
- Cripple Wall Bracing Factor - This factor applies if there is a cripple wall. Alternatively, cripple walls may be treated as an additional story. See Section R602.10.9 and R602.10.9.1 for additional requirements.



- Stone or Masonry Veneer Factor - This factor applies if there is a stone or masonry veneer. See Section 602.12, Table 602.12(2) and Section R703.7 in Chapter 7

Each braced wall line must be calculated separately. Complete Page 2 of the Worksheet.

**5. Complete the wind calculation for braced wall length** - Refer to top half of Page 3 of the Worksheet.

- Identify bracing method. If Intermittent Sheathing is proposed - the most common options are WSP (Wood Structural Panel) for exterior walls and GB (Gypsum Board) for interior walls. If Continuous Sheathing is proposed, it is sufficient to note CS (Continuous Sheathing). See Table R602.10.2 for Intermittent Bracing Methods and Table R602.10.4.1 for Continuous Sheathing Methods.
- Identify the braced wall line spacing. This is the distance between the braced wall lines, not braced wall panels (see Step 1.) For interior braced walls the largest dimension must be selected.
- Indicate the Required Bracing Length based on Table R602.10.1.2(1). The Basic Wind Speed for Portland is  $\leq 95$  mph. Select the appropriate story location. The Required Bracing Length can be interpolated. For example, if the table requires 2.5 ft of bracing for 10 ft wall line spacing and 5 ft of bracing for 20 ft wall line spacing, the actual required length of bracing for 15 ft wall line spacing would be 3.75 ft.
- Multiple the Required Bracing Length by the General Wind Adjustment Factor and the Specific Wind Adjustment Factors and enter the result in **Total Adjusted Bracing Length**.

**6. Complete the seismic calculation for braced wall length** - Refer to bottom half of Page 3 of the Worksheet.

- Identify bracing method. See Item 5 above.
- Determine the Braced Wall Line Length - See Figure R602.10.1.3.
- Indicate the Required Bracing Length based on Table R602.10.1.2(2). The Seismic Design Category for Portland is D1. Select the appropriate story location. The Required Bracing Length can be interpolated.
- Multiple the Required Bracing Length by the Seismic Adjustment Factors to determine the **Total Adjusted Bracing Length**. If there are multiple adjustments for one braced wall line, multiply these factors together.

**7. Compare the Total Adjusted Bracing Lengths for Wind and for Seismic. Use the greater of the two.**

**8. Identify Braced Wall Panels on floor plan. Indicate the type of each panel, its location and length.**

- For intermittent bracing methods DWB, WSP, SFB, PBS, PCP, HPS, and GB the minimum panel length is 48". See Section R602.10.3. The effective length of the panel shall be equal to the actual length of the panel. Method ABW is limited to the 1<sup>st</sup> story of 1 or 2 story houses and a maximum wall height of 10 ft. and the minimum required length and hold down varies based on wall height and number of stories. See Section R602.10.3.2, Table R602.10.3.2 and Figure R602.10.3.2. Method ABW is the equivalent of 48" of braced wall panel. Method PFH is limited to the 1<sup>st</sup> story of 1 or 2 story houses and a maximum wall height of 10 ft. The minimum required length varies based on wall height and number of stories. See Section R602.10.3 and Figure R602.10.3.3. Method PFH is the equivalent of 48" of braced wall panel.
- For all continuous bracing methods the minimum panel length varies, based on wall height and adjacent clear opening height. See Section 602.10.4.3 and Table 602.10.4.2. Method CS-PF requires a tension strap. See Section R602.10.4.1.1, Figure 602.10.4.1.1 and Table R602.10.4.1.1.
- At exterior wall a Braced Wall Panel shall be located at each end of the braced wall line and the distance between braced wall panels shall not exceed 25 feet. The Braced Wall Panel shall be permitted to begin no more than 8 ft from each end of the braced wall line provided the following occurs:  
For the Intermittent braced wall method WSP. Either 1) a minimum 24" wide panel is applied to each side of the building corner and the two 24" panels at the corner are attached to framing in accordance with Figure R602.10.4.4(1) or 2) the end of each Braced Wall Panel closest to the corner shall have an 1800 lb hold-down device fastened to the stud at the edge of the Braced Wall Panel closest to the corner and to the foundation or framing below. See Figure R602.10.1.4.1.  
For the Continuous Sheathing method. Either 1) a minimum 24" wide panel is applied to each side of the building corner in accordance with Figures R602.10.4.4(1) and R602.10.4.4(5) or 2) the braced wall panel closest to the corner shall have an 800 lb hold-down device fastened to the stud at the edge of the braced wall panel closest to the corner and to the foundation or framing below. See Figure R602.10.4.4 (5).
- At interior braced wall lines, the total combined distance from each end of a braced wall line to the outermost braced wall panel or panels in the line shall not exceed 12.5 ft.



PRESCRIPTIVE WALL BRACING WORKSHEET

See Residential Wall Bracing Guide for step-by-step instructions on how to use this worksheet

WIND ADJUSTMENT FACTORS

Table R602.10.1.2(1) assumes wind exposure category B, 30 ft mean roof height, 10 ft eave to ridge height, 10 ft wall height, and 2 braced wall lines sharing load in a given plan direction on a given story level. For any other conditions, apply the appropriate adjustment factors.

EXPOSURE FACTOR - select adjustment factor based on exposure and story height: (Exposure B is typical. Exposure C only occurs where exposed to open terrain such as shorelines)

- Exposure B - 1 story = 1.0 -2 story = 1.0 - 3 story = 1.0
Exposure C - 1 story = 1.2 - 2 story = 1.3 - 3 story = 1.4

EAVE HEIGHT FACTOR - select support condition & height to determine adjustment factor:

Table with columns: Support Condition, Roof Eave To Ridge Height (≤ 5 ft, ≤ 10 ft, ≤ 15 ft, ≤ 20 ft). Rows include 1 Story or Top Story of 2 or 3 Story, 1st Story of 2 Story or 2nd Story of 3 Story, 1st Story of 3 Story.

WALL HEIGHT FACTOR - select adjustment factor based on ceiling height:

- 8 Ft Ceiling = 0.90 - 9 Ft Ceiling = 0.95 - 10 Ft Ceiling = 1.0
- 11 Ft Ceiling = 1.05 - 12 Ft Ceiling = 1.10

NO. OF BRACED WALL LINES FACTOR

- select adjustment factor based on number of braced wall lines:
- 2 Wall Lines: 1.0 - 3 Wall Lines: 1.30 - 4 Wall Lines: 1.45 - 5 Wall Lines: 1.60

TOTAL GENERAL WIND ADJUSTMENT FACTORS

Multiply all of the above adjustment factors for each story:

Large grid table for recording adjustment factors. Columns: Numbered Wall Lines (1st, 2nd, 3rd Story), Lettered Wall Lines (1st, 2nd, 3rd Story). Rows correspond to Exposure Factor, Eave Height Factor, Wall Height Factor, No. of Braced Wall Lines Factor, and Total General Wind Adjustment Factors.

SPECIFIC WIND ADJUSTMENT FACTORS - Specific to certain types of bracing methods or building conditions:

GYPSUM WALL BOARD FACTOR - Apply 1.4 adjustment factor if all the following conditions occur:

- Bracing method is either DWB, WSP, FSB, PBS, PCP or HPS and
- Gypsum board is not applied to inside face of braced wall panels.

\_\_\_\_\_ @ Braced Wall Lines \_\_\_\_\_
@ Story \_\_\_\_\_

GYPSUM WALL BOARD BRACING METHOD - Apply 0.7 adjustment factor if all of the following conditions are met:

- Bracing method is GB and
- Gypsum board is attached with 4" spacing at panel edges, including top and bottom plates and
- Blocking is provided at all horizontal joints.

\_\_\_\_\_ @ Braced Wall Lines \_\_\_\_\_
@ Story \_\_\_\_\_

ONE SIDED GYPSUM WALL BOARD FACTOR - Apply 2.0 adjustment factor if all of the following conditions are met:

- Bracing method is GB and
- Gypsum board is only attached to one side.

\_\_\_\_\_ @ Braced Wall Lines \_\_\_\_\_
@ Story \_\_\_\_\_

HOLD DOWN FACTOR - Apply 0.8 adjustment factor if all of the following conditions are met:

- Bracing method is DWB, WSP, SFB, PBS, PCP and HPS methods and
- Limited to 1 story buildings or top story of 2 or 3 story buildings and
- 800# hold down installed at each end of braced wall panels along the braced wall line.

\_\_\_\_\_ @ Braced Wall Lines \_\_\_\_\_
@ Story \_\_\_\_\_

CRIPPLE WALL BRACING - Apply 1.15 adjustment factor if cripple walls occur

Wall panel spacing shall be decreased to 18 ft. See additional requirements in Section 602.10.9.1

\_\_\_\_\_ @ Braced Wall Lines \_\_\_\_\_





**CALCULATIONS FOR LENGTH OF BRACED WALL PANELS** STORY \_\_\_\_\_

Multiply all adjustment factors and the required wall bracing lengths to determine the total adjusted wall bracing length for each wall line for wind and for seismic. The bracing length provided shall be equal to or greater than the higher of the two. Provide a separate calculation for each story.

**WIND CALCULATION** Refer to Table R602.10.1.2 (1)

Braced Wall Line	Bracing Method	Braced Wall Line Spacing	Required Bracing Length	General Wind Adjustment Factor	Specific Wind Adjustment Factor(s) *	Total Adjusted Bracing Length (Required Bracing Length X All Adjustment Factors)	Bracing Length Provided
1							
2							
3							
4							
5							
A							
B							
C							
D							
E							

\* A braced wall line may have more than one specific wind adjustment factor.

**SEISMIC CALCULATION** Refer to Table R602.10.1.2 (2)

Braced Wall Line	Bracing Method	Braced Wall Line Length	Required Bracing Length	Seismic Adjustment Factor(s) *	Total Adjusted Bracing Length (Required Bracing Length X All Adjustment Factors)	Bracing Length Provided
1						
2						
3						
4						
5						
A						
B						
C						
D						
E						

\* A braced wall line may have more than one seismic adjustment factor. Show all adjustment factors.