

Prescriptive construction must meet the following design parameters. Projects not meeting these parameters will require engineering.

- Segmental or intermittent bracing methods for wind exposure 'B';
- Seismic D1 with minimum panel width of 4' (before adjustments);
- Maximum 30' building height;
- Maximum 10' eave to ridge height;
- Up to 10' wall height with minimum two (2) braced wall lines;
- 10 PSF floor dead load;
- 15 PSF roof/ceiling dead loads (2011 ORSC)

### Braced Wall Summary

- Braced wall panels shall be constructed in accordance with the segmental or intermittent bracing methods specified in **R602.10.2**, or the continuous sheathing method specified in **R602.10.4 and R602.10.5**. *Identify which method will be used on the plans.*

*\*Braced wall panel mixing is permitted in the following:*

- A. *from story to story is permitted;*
- B. *mixing methods from braced wall line to braced wall line permitted, except continuous sheathed walls. Mixing types within the same braced wall line is not permitted.*

*\*The most restrictive requirements of each system shall govern.*

- Intermittent panels consist of one of the following:
  - ✓ Segmental Panels WSP (Wood Structure Panels)
  - ✓ GB (Gypsum Board Panels)
  - ✓ PBS (Particleboard)
  - ✓ PCP (Portland Cement Plaster)
  - ✓ HPS (Hardboard Panel Siding)
  - ✓ PFH (Intermittent Portal Frame)
  - ✓ PFG (Intermittent Portal Frame – Garage)
  - ✓ ABW (Alternate Braced Wall)
  - ✓ Along with segmental panels found in **Table R602.10.2**.

*\*Let-in Bracing, PFG and Structural fiberboard Sheathing methods not allowed in Seismic D1 zones. See figure 1.*

- Continuous sheathing panels approved for seismic zone D1 are one of the following:
  - ✓ CS-WSP (wood structural panel)
  - ✓ CS-PF (portal frame)

**See figure 2.**
- Determine the location and extent of the exterior braced wall-lines by drawing straight lines along or through the building that represent the location of the lateral resistance provided by the wall bracing. Locate the wall lines to meet the 25' maximum spacing rule (longitudinal and transverse), taking advantage of the 4' offsets (4' each side of the braced wall line) while maintaining the minimum amount of braced wall panel in each wall line per **R602.10.1.5; See figures 4 & 5**. *\*One room may have a maximum wall line spacing of 35' o.c., with a room not greater in floor area than 900 sq. ft. between two wall lines.*
- Identify panel lengths first, then apply (multiply) all applicable adjustment factors found in Table R602.10.1.2(3) to the minimum braced panel lengths (widths) found by first using the **Design Wind Speed Table R602.10.1.2(1)** (*see figure 7*). Then using the **Seismic Design Category Table R602.10.1.2(2)** for the same panels (*see figure 8*). The more restrictive of the two tables applies. *\*The minimum total length of bracing in a wall line, after all adjustment factors have been taken shall not be less than 48" total. See figure 3.*

## Wall Bracing Walk-Through for Plan Submittal and Field Verification

### Steps to Determine Minimum Braced Panel Lengths per Wall-Line:

1. Determine the length of each wall, the height of the walls (if over 10' wall height, apply adjustment factor  $H/10$  – *see page 10*), and the height distance from the eave face to the ridge. *\*Confirm the maximum height of the building will be 30' or less.*
2. Place the wall lines on the plans and denote the walls you are utilizing to meet the minimum wall bracing per wall line. Only walls parallel to the wall lines are used to provide the resistance for lateral loads. *\*Keep in mind that you can use a 4' offset each side of the wall line, and still be considered the same wall line. See figures 4 and 5.*
3. Per **Tables R602.10.1.2(1)-Wind** and **R602.10.1.2(2)-Seismic**, determine the minimum panel length based on the wall method chosen from **R602.10.2**, basic wind speed classification or seismic design category, affected story, and the braced wall line spacing.
4. Using the Wind/Seismic Adjustment Factors (**Figures 7 and 8**) multiply together all factors found in **Table R602.10.1.2 (3)** that apply. Then:
  - a. Multiply this result by the minimum panel length (width from #3 above) to get the minimum combined bracing length for that wall line. Do this for each wall line identified. The most restrictive answer between both tables will govern the minimum panel length per wall line.
  - b. Determine if you have provided the minimum with your design layout; adding more bracing as needed until the minimum is met. Locate the bracing appropriately. *See figure 6. \*The absolute minimum bracing per wall line is 48" after all adjustments.*
5. Follow the connection requirements and any applicable exceptions or reductions for each bracing method found in **Tables R602.3 (1)** and **R602.10.2**. Uplift connections at roof to top of wall per **R301.2 (2)** (Insert this result into **Table R802.11** to determine the uplift load value.)
  - Wall to floor/ceiling framing connections per **R602.10.6(1)** – perpendicular
  - Wall to floor/ceiling framing connections per **R602.10.6(2)** – parallel
  - Wall to foundation connections per **R602.10.11.1**
6. Include manufacturer's hardware make, model and fastening requirements – to be referenced on the plans if used to make structural connections.

**TABLE R602.10.2 INTERMITTENT BRACING METHODS**

METHOD	MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA
DWB	Diagonal wood boards	$\frac{3}{4}$ " (1" nominal) for maximum 24" stud spacing		2-8d ( $2\frac{1}{2}$ " x 0.113") nails or 2 staples, $1\frac{3}{4}$ " per stud
WSP	Wood structural panel (see Section R604)	$\frac{3}{8}$ "		For exterior sheathing see Table R602.3(3) For interior sheathing see Table R602.3(1)
GB	Gypsum board	$\frac{1}{2}$ "		Nails or screws at 7" spacing at panel edges including top and bottom plates; for all braced wall panel locations for exterior sheathing nail or screw size, see Table R602.3(1); for interior gypsum board nail or screw size, see Table R702.3.5
PBS	Particleboard sheathing(see Section R605)	$\frac{3}{8}$ " or $\frac{1}{2}$ " for maximum 16" stud spacing		$1\frac{1}{2}$ " galvanized roofing nails or 8d common ( $2\frac{1}{2}$ " x 0.131) nails at 3" spacing (panel edges) at 6" spacing (intermediate supports)
PCP	Portland cement plaster	See Section R703.6 For maximum 16" stud spacing		$1\frac{1}{2}$ ", 11 gage, $\frac{7}{16}$ " head nails at 6" spacing or $\frac{7}{8}$ ", 16 gage staples at 6" spacing
HPS	Hardboard panel siding	$\frac{7}{16}$ " For maximum 16" stud spacing		0.092" dia., 0.225" head nails with length to accommodate $1\frac{1}{2}$ " penetration into studs at 4" spacing (panel edges), at 8" spacing (intermediate supports)
ABW	Alternate braced wall	See Section R602.10.3.2		See Section R602.10.3.2
PFH	Intermittent portal frame	See Section R602.10.3.3		See Section R602.10.3.3
PFG	Intermittent portal frame at garage	See Section R602.10.3.4		See Section R602.10.3.4

Figure 1

**TABLE R602.10.4.1 CONTINUOUS SHEATHING METHODS**

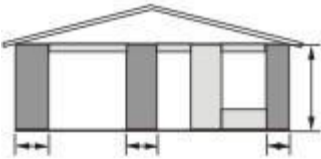
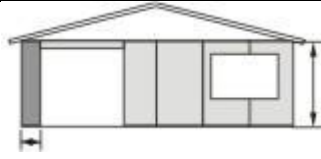
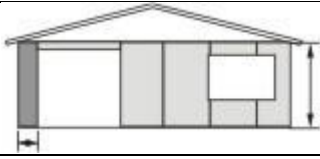
METHOD	MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA
CS-WSP	Wood Structural panel	3/8"		6d common (2" × 0.113") nails at 6" spacing (panel edges) and at 12" spacing (intermediate supports) or 16 ga. × 1 3/4" staples at 3" spacing (panel edges) and 6" spacing (intermediate supports)
CS-G	Wood structural panel adjacent to garage openings and supporting roof load only <sup>a,b</sup>	3/8"		See Method CS-WSP
CS-PF	Continuous portal frame	See Section R602.10.4.1.1		See Section R602.10.4.1.1

Figure 2

**TABLE R602.10.1.2(3) ADJUSTMENT FACTORS TO THE LENGTH OF REQUIRED SEISMIC WALL BRACING**

ADJUSTMENT BASED ON:		MULTIPLY LENGTH OF BRACING PER WALL LINE BY:		APPLIES TO:
Story height <sup>b</sup> (Section R301.3)	≤ 10 ft.		1.0	All bracing methods - Sections R602.10.2, R602.10.4 and R602.10.5
	> 10 ≤ 12 ft.		1.2	
Braced wall line spacing townhouses in SDC A-C <sup>b,c</sup>	≤ 35 ft.		1.0	
	> 35 ≤ 50 ft.		1.43	
Wall dead load	> 8 ≤ 15 psf		1.0	
	≤ 8 psf		0.85	
Roof/ceiling dead load for wall supporting <sup>b</sup>	roof only or roof plus one story	≤ 15 psf	1.0	
	roof only	< 15 psf ≤ 25 psf	1.2	
	roof plus one story	< 15 psf ≤ 25 psf	1.1	
Walls with stone or masonry veneer in SDC C-D <sub>2</sub>	See Section R703.7			
Cripple walls	See Section R602.10.9			

Figure 3

**R602.10.1.4 Braced wall panel location.** *Braced wall panels* shall be located in accordance with Figure R602.10.1.4 (1). *Braced wall panels* shall be located not more than 25 feet (7620 mm) on center and shall be permitted to begin no more than 12.5 feet (3810 mm) from the end of a *braced wall line* in accordance with Section R602.10.1 and Figure R602.10.1.4(2). 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 feet (3810 mm). *Braced wall panels* may be offset out-of-plane up to 4 feet (1219 mm) from the designated *braced wall line* provided that the total out-to-out offset of *braced wall panels* in a *braced wall line* is not more than 8 feet (2438 mm) in accordance with Figures R602.10.1.4(3) and R602.10.1.4(4). All *braced wall panels* within a *braced wall line* shall be permitted to be offset from the designated *braced wall line*.

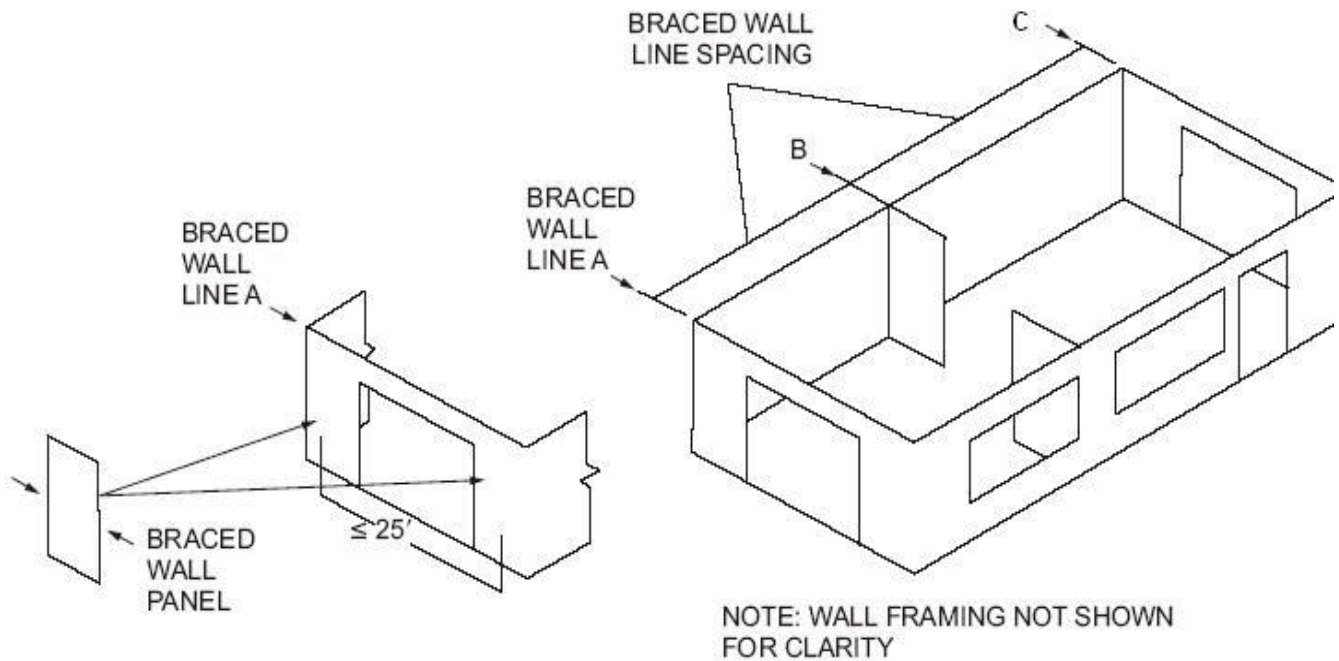


Figure 4

**FIGURE R602.10.1.4(3) OFFSETS PERMITTED FOR BRACED WALL LINES**

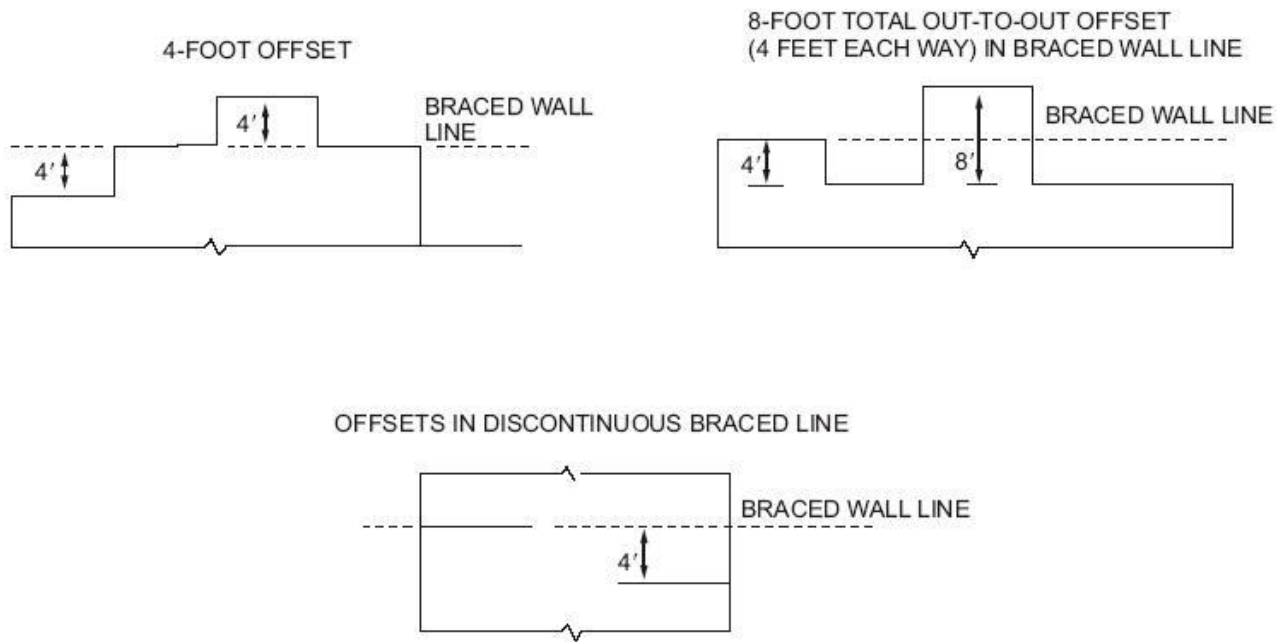


Figure 5

**R602.10.1.4.1 Braced wall panel location in Seismic Design Categories D<sub>0</sub>, D<sub>1</sub> and D<sub>2</sub>.** *Braced wall lines at exterior walls shall have a braced wall panel located at each end of the braced wall line.*

**Exception:** For *braced wall panel* construction Method WSP of Section R602.10.2, the *braced wall panel* shall be permitted to begin no more than 8 feet (2438 mm) from each end of the *braced wall line* provided one of the following is satisfied in accordance with Figure R602.10.1.4.1:

1. A minimum 24-inch-wide (610 mm) panel is applied to each side of the building corner and the two 24-inch-wide (610 mm) 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 a 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. The hold-down device shall be capable of providing an uplift allowable design value of at least 1,800 pounds (8 kN). The hold-down device shall be installed in accordance with the manufacturer's recommendations.

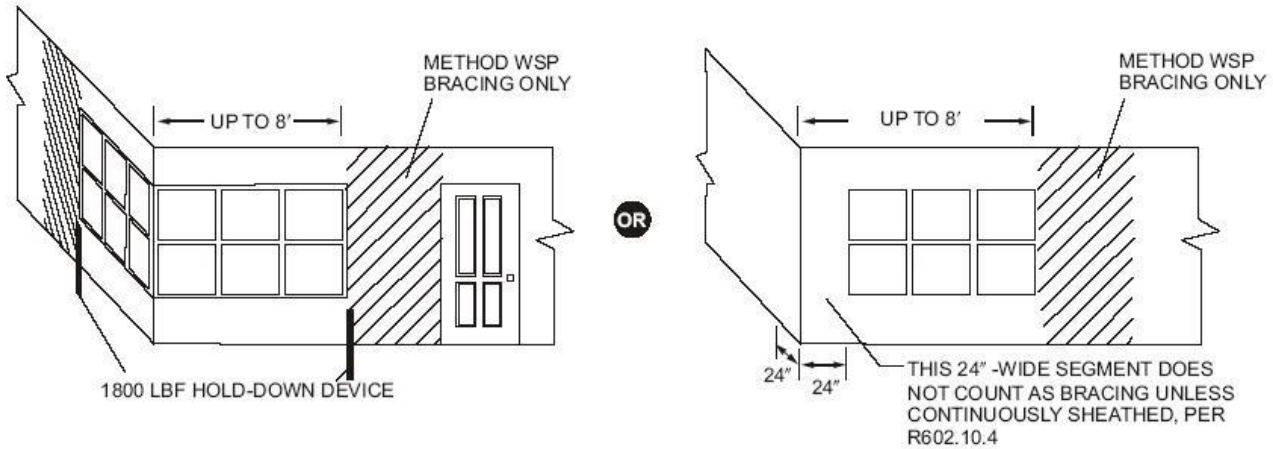


Figure 6

**BRACING REQUIREMENTS BASED ON WIND SPEED**




EXPOSURE CATEGORY B, 30 FT MEAN ROOF HEIGHT, 10 FT EAVE TO RIDGE HEIGHT, 10 FT WALL HEIGHT, 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (feet) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
Basic Wind Speed (mph)	Story Location	Braced Wall Line Spacing (feet)	Method LIB <sup>f</sup> , h	Method GB (double sided) <sup>g</sup>	Methods DWB, WSP, SFB, PBS, PCP, HPS <sup>fi</sup>	Continuous Sheathing
≤ 95 (mph)		10	4.0	4.0	2.25	2.25
		20	7.75	7.75	4.5	3.75
		30	10.75	10.75	6.25	5.5
		40	14.0	14.0	8.25	6.75
		50	17.25	17.25	10.0	8.5
		60	20.5	20.5	11.75	10.0
		10	7.75	7.75	4.5	4.0
		20	14.5	14.5	8.25	7.25
		30	20.75	20.75	11.75	10.0
		40	26.75	26.75	15.5	13.25
		50	33.0	33.0	19.0	16.25
		60	39.25	39.25	22.5	19.0
		10	NP	11.5	6.75	5.5
		20	NP	21.25	12.25	10.5
		30	NP	30.75	17.5	15.0
		40	NP	39.75	22.75	19.5
		50	NP	49.0	28.0	24.0
		60	NP	58.0	33.25	28.25

Figure 7



**BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY**

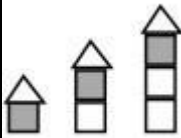
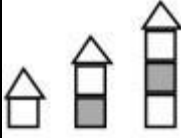

SOIL CLASS D <sup>a</sup> WALL HEIGHT = 10 FT 10 PSF FLOOR DEAD LOAD 15 PSF ROOF/CEILING DEAD LOAD BRACED WALL LINE SPACING ≤ 25 FT			MINIMUM TOTAL LENGTH (feet) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
Seismic Design Category (SDC)	Story Location	Braced Wall Line Length	Method LIB	METHODS DWB, SFB, GB, PBS, PCP, HPS	Method WSP	Continuous Sheathing
SDC D <sub>1</sub>		10	NP	3.0	2.0	1.7
		20	NP	6.0	4.0	3.4
		30	NP	9.0	6.0	5.1
		40	NP	12.0	8.0	6.8
		50	NP	15.0	10.0	8.5
		10	NP	6.0	4.5	3.8
		20	NP	12.0	9.0	7.7
		30	NP	18.0	13.5	11.5
		40	NP	24.0	18.0	15.3
		50	NP	30.0	22.5	19.1
		10	NP	8.5	6.0	5.1
		20	NP	17.0	12.0	10.2
		30	NP	25.5	18.0	15.3
		40	NP	34.0	24.0	20.4
		50	NP	42.5	30.0	25.5

Figure 8

**R602.10.3.1 Adjustment of length of braced panels.**

When *story height* (H), measured in feet, exceeds 10 feet (3048 mm), in accordance with Section R301.3, the minimum length of *braced wall panels* specified in Section R602.10.3 shall be increased by a factor H/10. See Table R602.10.3.1. Interpolation is permitted.

**TABLE R602.10.3.1 MINIMUM LENGTH REQUIREMENTS FOR BRACED WALL PANELS**

SEISMIC DESIGN CATEGORY AND WIND SPEED	BRACING METHOD	HEIGHT OF BRACED WALL PANEL				
		8 ft.	9 ft.	10 ft.	11 ft.	12 ft.
SDC A, B, C, D <sub>0</sub> , D <sub>1</sub> and D <sub>2</sub> Wind speed < 110 mph	DWB, WSP, SFB, PBS, PCP, HPS and Method GB when double sided	4'- 0"	4'- 0"	4'- 0"	4'- 5"	4'- 10"
	Method GB, single sided	8'- 0"	8'- 0"	8'- 0"	8'- 10"	9'- 8"

Figure 9