LARIMER COUNTY | COMMUNITY DEVELOPMENT

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Braced Wall Design

The International Residential Code (IRC) requires homes and accessory structures be designed to resist the strong wind pressures found in our geographic region. This "braced wall design" is most reliable if completed by a Colorado registered, licensed engineer; however, IRC prescriptive design methods may be used for building sites outside the High Wind Area. (The design wind speed for your site can be found at www.larimer.org/building "Wind and Snow Load Information.")

In the High Wind Area, where Ultimate Design Wind Speeds equal or exceed 140 miles per hour (roughly from County Road 21 west), an engineered design is required. An engineered design is also required where ground snow loads exceed 70 pounds per square foot or when not following IRC prescriptive design requirements. This handout should help you understand prescriptive braced wall design rules.

Plans missing braced wall design information will not be accepted to initiate a permit and plan review.

Requirements for Plan Submittal

IRC Section R106.1.3 Information on braced wall design
"…braced wall lines shall be identified on the *construction documents*... Pertinent information including, but not limited to, bracing methods, location and length of *braced wall panels* and foundation requirements of braced wall panels at top and bottom shall be provided. Buildings shall be braced in accordance with section R602.10 or, when applicable, Section R602.12."

1. Determine and identify your site design wind speed.

2. Determine and identify the wall bracing method you will be using per Table 602.10.4. For example, WSP – Wood Structural Panel or CS-WSP – Continuously Sheathed Wood Structural Panel.

3. Based on wind speed, wall bracing method, and spacing between braced wall lines (see definitions), determine and identify the minimum length of braced wall panels needed per Table R602.10.3(1).

NOTE: The steps below must be followed to use Table 602.10.3 (1).

Details/Notes must be provided showing that all braced wall panels will use approved uplift framing connectors to provide a continuous load path from the top of the wall to the foundation.

The values listed in Table 602.10.3 (1) are for exposure category B, 30-foot mean roof height, 10 foot wall height, and two braced wall lines. You must use all adjustment factors found in Table R602.10.3 (2) in the design of your structure. For example, in Larimer County all projects must be designed for exposure category C, so the minimum length of braced wall panels must be multiplied by 1.2 for a one-story building, 1.3 for a two story building, etc.

4. Once the minimum length of braced wall panels is determined, identify which wall segments will serve as braced wall panels. For walls longer than 16 feet, at least two braced wall panels are required. Braced wall panels must start within 10’ of the beginning and end of each wall line, with a maximum spacing of 20’ from one end of a panel to the beginning of another.

Braced wall lines and braced wall panels must be clearly shown and labeled on construction documents.

Definitions

BRACED WALL LINE. A straight line through the building plan that represents the location of the lateral resistance provided by the wall bracing.
BRACED WALL LINE, CONTINUOUSLY SHEATHED. A *braced wall line* with structural sheathing applied to all sheathable surfaces including the areas above and below openings.
BRACED WALL PANEL. A full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material and anchors.

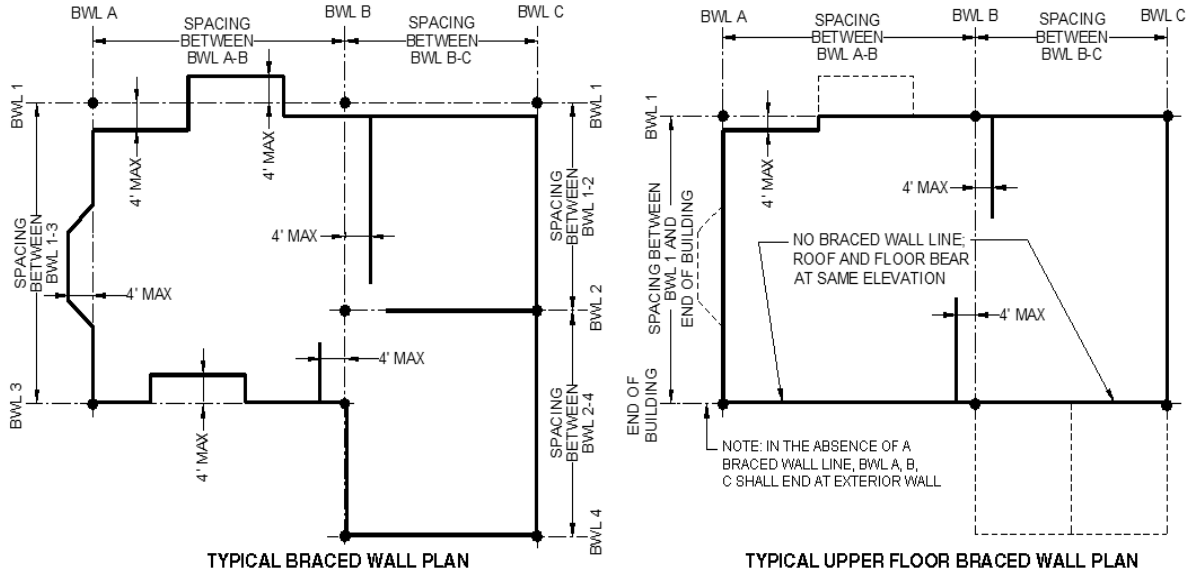
Braced Wall Line Requirements

R602.10.1.1 Length of a braced wall line. The length of a *braced wall line* shall be the distance between its ends. The end of a *braced wall line* shall be the intersection with a perpendicular *braced wall line*, an angled *braced wall line* as permitted in Section R602.10.1.4 or an exterior wall as shown in Figure R602.10.1.1.

R602.10.1.2 Offsets along a braced wall line. Exterior walls parallel to a *braced wall line* shall be offset not more than 4 feet (1219 mm) from the designated *braced wall line* location as shown in Figure R602.10.1.1. Interior walls used as bracing shall be offset not more than 4 feet (1219 mm) from a *braced wall line* through the interior of the building as shown in the below Figure R602.10.1.1.

R602.10.1.3 Spacing of braced wall lines. The spacing between parallel *braced wall lines* shall be a maximum of 60 feet per Table R602.10.1.3. Intermediate *braced wall lines* through the interior of the building shall be permitted.

FIGURE R602.10.1.1 - BRACED WALL LINES



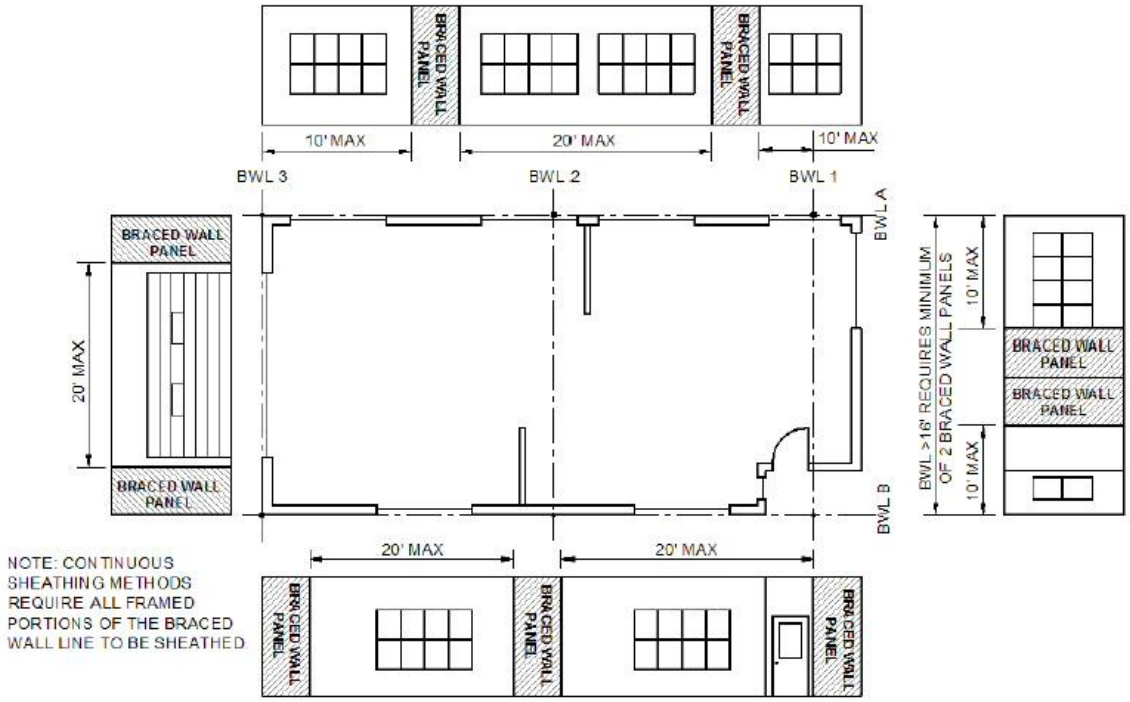
Braced Wall Panel Requirements

R602.10.2 Braced wall panels. *Braced wall panel*s shall be full-height sections of wall that shall not have vertical or horizontal offsets. *Braced wall panel*s shall be constructed and placed along a *braced wall line* in accordance with this section and the bracing methods specified in Section R602.10.4.

R602.10.2.1 Braced wall panel uplift load path. The bracing lengths in Table R602.10.3(1) apply only when uplift loads are resisted in accordance with Section R602.3.5.

R602.10.2.2 Locations of braced wall panels. A *braced wall panel* shall begin within 10 feet (3810Â mm) from each end of a *braced wall line* as determined in Section R602.10.1.1.Â. The distance between adjacent edges of *braced wall panels* along a *braced wall line* shall be no greater than 20 feet (6096 mm) as shown in Figure R602.10.2.2.

FIGURE R602.10.2.2
LOCATION OF BRACED WALL PANELS



For SI: 1 foot = 304.8 mm.

SIMPLIFIED WALL BRACING

Where the Ultimate Design Wind Speed is 130 mph or less (Exposure B or C), and all of the following requirements are met, you may use the Simplified Wall Bracing method found in IRC Section R602.12. The building must be not more than three stories above the top of a concrete or masonry foundation or basement wall, with wall heights not greater than 10 feet, floors not cantilevering more than 24 inches, a roof eave-to-ridge height of 15 feet or less, exterior walls with at least ½" gypsum on the interior and fastened in accordance with Table R702.3.5, and no cripple walls allowed in three story buildings.

Bracing Methods

TABLE R602.10.4—continued
BRACING METHODS

	METHODS, MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA[a]	
				Fasteners	Spacing
Intermittent Bracing Methods	**PFH** Portal frame with hold-downs	$^3/_8$"		See Section R602.10.6.2	See Section R602.10.6.2
	PFG Portal frame at garage	$^7/_{16}$"		See Section R602.10.6.3	See Section R602.10.6.3
Continuous Sheathing Methods	**CS-WSP** Continuously sheathed wood structural panel	$^3/_8$"		Exterior sheathing per Table R602.3(3)	6" edges 12" field
				Interior sheathing per Table R602.3(1) or R602.3(2)	Varies by fastener
	CS-G[b,c] Continuously sheathed wood structural panel adjacent to garage openings	$^3/_8$"		See Method CS-WSP	See Method CS-WSP
	CS-PF Continuously sheathed portal frame	$^7/_{16}$"		See Section R602.10.6.4	See Section R602.10.6.4
	CS-SFB[d] Continuously sheathed structural fiberboard	$^1/_2$" or $^{25}/_{32}$" for maximum 16" stud spacing		$1^1/_2$" long × 0.12" dia. (for $^1/_2$" thick sheathing) $1^3/_4$" long × 0.12" dia. (for $^{25}/_{32}$" thick sheathing) galvanized roofing nails	3" edges 6" field

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad, 1 pound per square foot = 47.8 N/m^2, 1 mile per hour = 0.447 m/s.

a. Adhesive attachment of wall sheathing, including Method GB, shall not be permitted in Seismic Design Categories C, D_0, D_1 and D_2.

b. Applies to panels next to garage door opening where supporting gable end wall or roof load only. Shall only be used on one wall of the garage. In Seismic Design Categories D_0, D_1 and D_2 roof covering dead load shall not exceed 3 psf.

c. Garage openings adjacent to a Method CS-G panel shall be provided with a header in accordance with Table R602.7(1). A full-height clear opening shall not be permitted adjacent to a Method CS-G panel.

d. Method CS-SFB does not apply in Seismic Design Categories D_0, D_1 and D_2.

e. Method applies to detached one- and two-family dwellings in Seismic Design Categories D_0 through D_2 only.

WSP Wood structural panel (See Section R604)	$^3/_8$"		Exterior sheathing per Table R602.3(3)	6" edges 12" field
			Interior sheathing per Table R602.3(1) or R602.3(2)	Varies by fastener

Reference Material Needed for Design

1)Larimer County Land Information Locator – Can be found at the below link.
https://maps1.larimer.org/gvh/?Viewer=LIL&run=Theme&theme=Wind%20and%20Snowload%20Information

2)The 2021 International Residential Code – Free online copy can be found at the below link.
https://codes.iccsafe.org/content/IRC2021P1 Also can be purchased through International Code Council, or read in the county Building Division offices.