



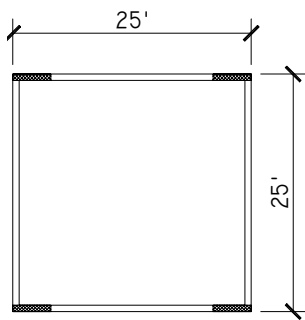
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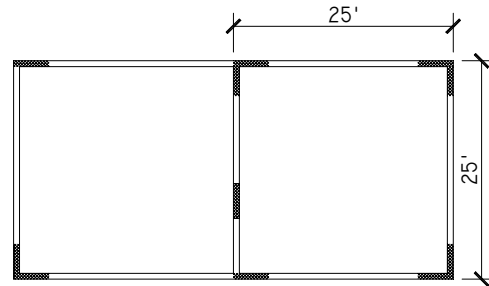
TC Fig 30 Conventional Light Frame Lateral Bracing

Braced Wall Line and Braced Wall Panel Locations

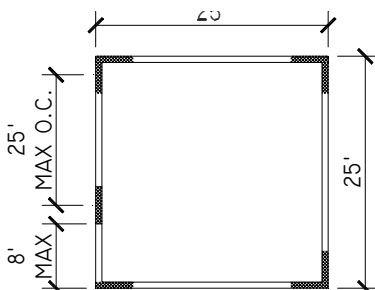
Adequate bracing of buildings against wind or earthquake loadings is required to protect life and minimize structural damage. Conventional buildings are usually shaped like a box, and if one were to experiment with cutting out panels in the sides of a cardboard box, one would find that in most cases the box would be unstable. Therefore, all buildings are required to have some form of bracing. For conventional light-frame construction, this is typically the exterior or interior wall coverings. Usually, all exterior walls are considered braced wall lines.



The code has specific requirements as to the spacing of these braced wall lines. Braced wall lines can be spaced up to 25 feet apart. A series of braced wall panels compose each braced wall line that make up boxes of 25 feet in size and form a two-dimensional grid of interior and exterior braced wall lines. Exterior walls and interior braced wall lines are required to resist wind and seismic forces.

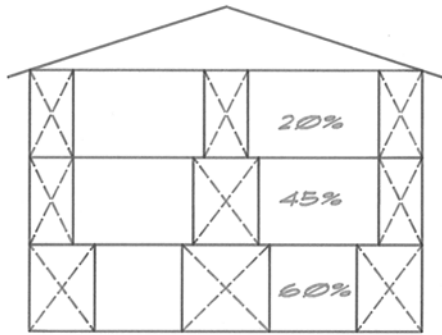
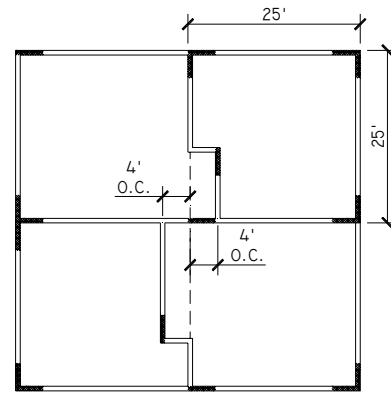


Placing braced panels within 8 feet of the ends of braced wall lines and additional panels within each 25-foot module of wall length is deemed adequate to resist wind loads and/or earthquake loads. Bracing is applied at main cross partitions that cross the building either transversely or longitudinally and that have sufficient length of wall without openings to provide the bracing required. The code now requires wall bracing to start at no more than 8 feet from each end of a braced wall line for all buildings. A designed collector is required when the bracing panel starts more than 8 feet from the ends of the braced lines. *



* Allowed under method 3 only. The end of each braced wall panel closest to the corner shall have a tie-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 tie-down device shall be capable of providing an uplift allowable design value of at least 1,800 pounds. The tie-down device shall be installed in accordance with the manufacturer's recommendations.

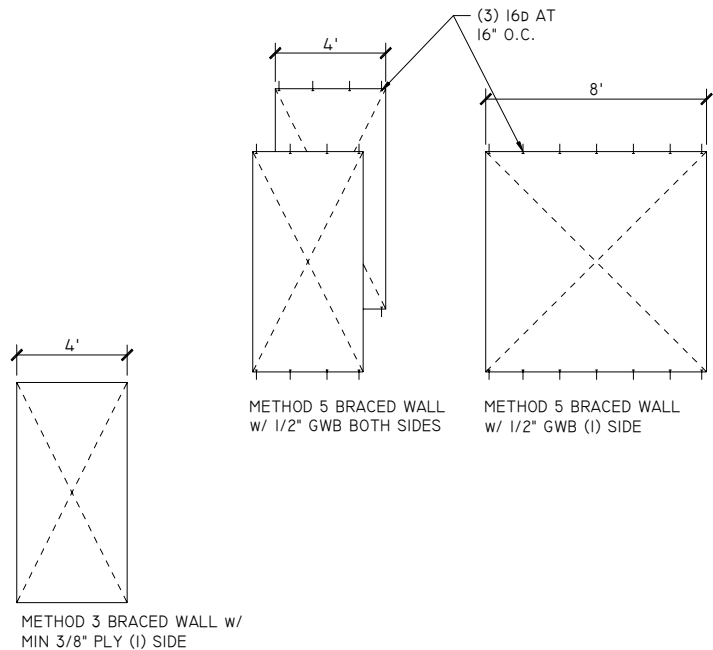
Out-of-plane offsets of braced wall panels can occur at both interior and exterior braced wall lines. As noted in the code, offsets of up to 4 feet can occur between the braced wall panels in any given braced wall line. However, if more than one offset occurs in the same interior braced wall line, the code limits the sum of the offsets to 8 feet. Additionally, "L" shaped buildings will require some type of wall bracing at or near the two legs of the building that intersect at the "L."



A one story building must have at least 20 percent braced wall panels. The first story of a two-story building must have at least 45 percent braced wall panels. Another way of saying this is that the complying one-story "building" is stacked on a properly braced first story of a two-story building. Also, in this seismic design category, the first story of a three-story building must have at least 60 percent braced wall panels. Another way of saying this is that the complying two-story "building" is stacked on a properly braced first story of a three-story building.

Construction of Braced Wall Panels.

1. Not Used
2. Wood boards of 5/8-inch net minimum thickness applied diagonally on studs spaced not over 24 inches o.c.
3. Wood structural panel sheathing with a thickness not less than 5/16 inch for a 16-inch stud spacing and not less than 3/8 inch for a 24-inch stud spacing.
4. Fiberboard sheathing panels not less than 1/2 inch thick applied vertically or horizontally on studs spaced not over 16 inches o.c
5. Gypsum board [sheathing 1/2 inch thick by 4 feet wide wallboard or veneer base] on studs spaced not over 24 inches o.c. and nailed at 7 inches o.c.
6. Particleboard wall sheathing panels.
7. Portland cement plaster on studs spaced 16 inches o.c.
8. Hardboard panel siding.



METHOD 3 BRACED WALL W/
MIN 3/8" PLY (1) SIDE

METHOD 5 BRACED WALL
W/ 1/2" GWB BOTH SIDES

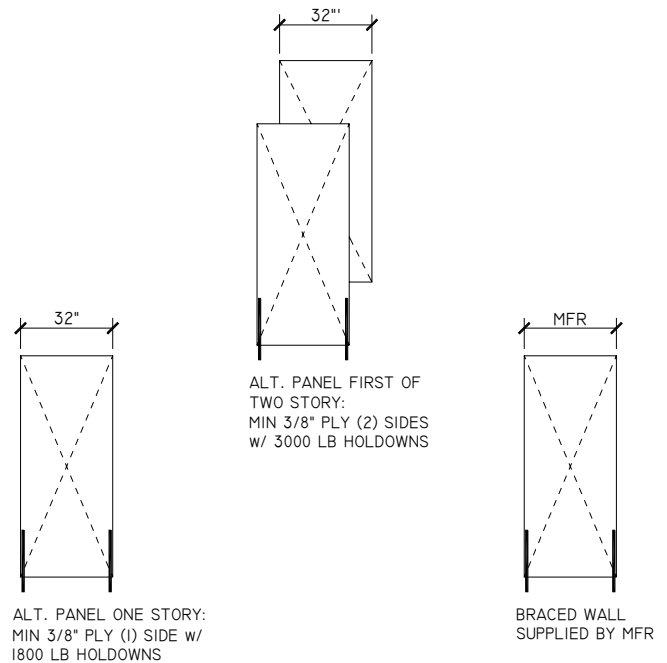
METHOD 5 BRACED WALL
W/ 1/2" GWB (1) SIDE

ALL HORIZONTAL JOINTS SHALL BE BLOCKED
FOR GWB NAILS OR SCREWS AT 7" O.C.

Braced wall panel sole plates shall be fastened to the floor framing and top plates shall be connected to the framing above with 16ds at 16" o.c. Where joists are perpendicular to the braced wall lines above blocking shall be provided under and in line with the braced wall panels. All vertical joints of panel sheathing shall occur over studs. Horizontal joints in braced wall panels shall occur over blocking of a minimum of 1 1/2 inch thickness.

Construction of Alternate Braced Wall Panels.

1. In one-story buildings, each panel shall have a length of not less than 2 feet, 8 inches and a height of not more than 10 feet. Each panel shall be sheathed on one face with 3/8-inch minimum thickness wood structural panel sheathing nailed with 8d common or galvanized box nails and blocked at all wood structural panel sheathing edges. Two anchor bolts shall be provided in each panel. Anchor bolts shall be placed at panel quarter points. Each panel end stud shall have a tie-down device fastened to the foundation, capable of providing an uplift capacity of at least 1,800 pounds. The panels shall be supported directly on a foundation or on floor framing supported directly on a foundation which is continuous across the entire length of the braced wall line. This foundation shall be reinforced with not less than one No. 4 bar top and bottom.



2. In the first story of two-story buildings, each braced wall panel shall be in accordance with Item 1 above, except that the wood structural panel sheathing shall be provided on both faces, sheathing edge nailing spacing shall not exceed four inches on center, at least three anchor bolts shall be placed at one-fifth points, and tie-down device uplift capacity shall not be less than 3,000 pounds.

Manufactured Panels

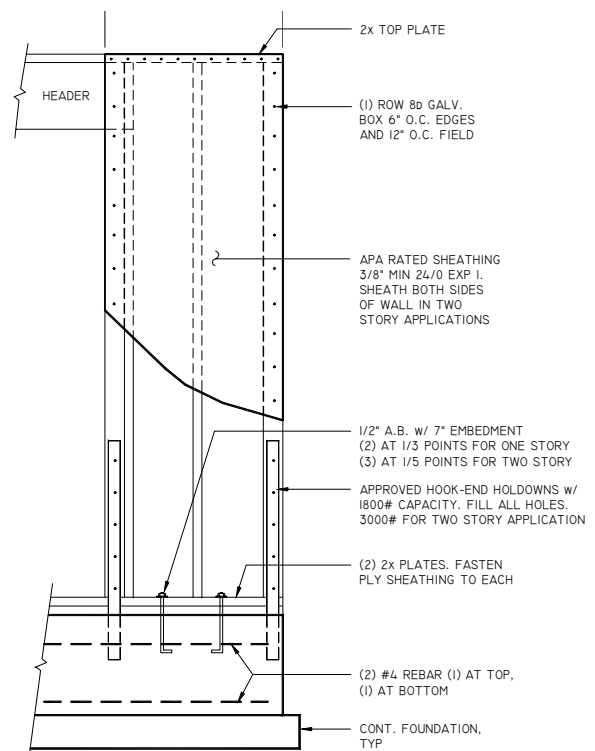
Alternate braced wall panels manufactured for use in conventional construction may also be installed

- The wall must have a listing or report pre accepted by ICC that recognizes it as a direct replacement for a braced wall panel.
- The wall must be installed as per manufacture's instructions.

Engineered Panels

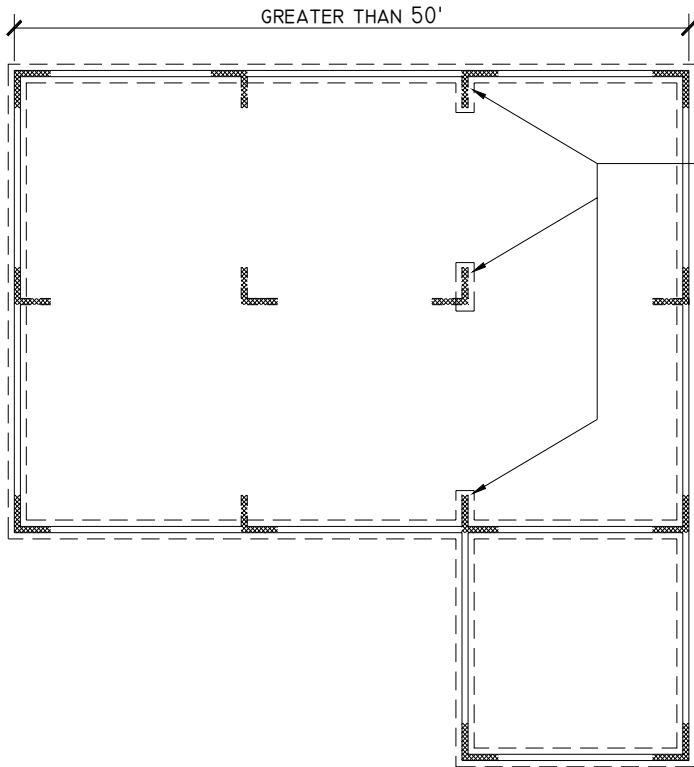
Alternate braced wall panels may be designed under IRC 301.1.3

- The wall design must be prepared by an engineer licensed to practice in the State of Washington.
- Documentation must follow IRC 301.1.3 and IBC 1603 for conventional light frame construction



The braced wall panels at exterior walls of all buildings located in Seismic Design Categories D1 shall be supported by continuous footings. All required interior braced wall panels in buildings with plan dimensions greater than 50 feet shall also be supported by continuous footings.

The interior footings must be continuous under each wall segment. The footings must be attached to the floor framing, blocking between framing or to the floor sheathing. Sheathed pony walls are acceptable. Fastening of the pony wall and the sheathing shall be as per the requirements for a method three interior braced wall.

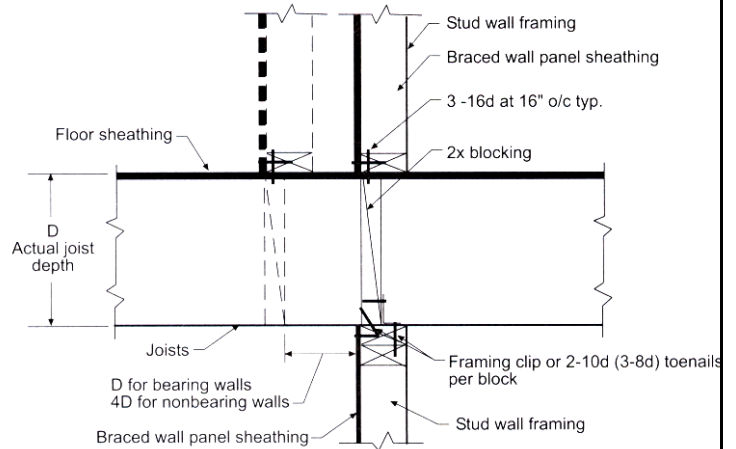


FOOTING UNDER WALLS

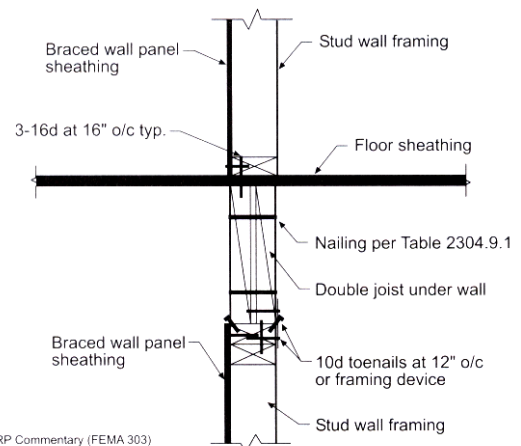
Note: All braced walls and connection details must be clearly illustrated on the building plan for permit application.

These descriptions and details are intended as an introduction to conventional wall bracing in light frame residential construction. Specific requirements governing residential bracing can be found in the International Residential Code chapter 3.

Braced wall connections - Seismic Design Categories A, B, C, D, and E



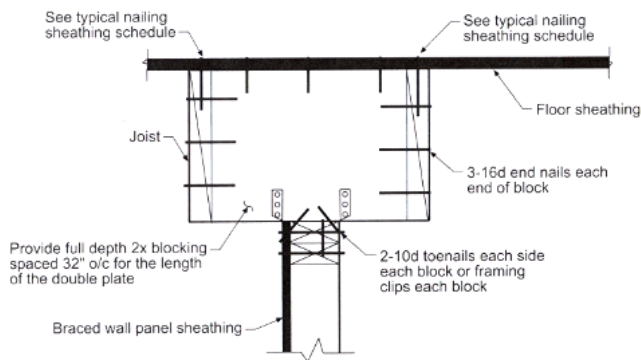
Interior braced wall at perpendicular joist



Interior braced wall at parallel joist

Typical sheathing nailing

- $1/2$ " or less 6d common or deformed shank at 6" o/c at panel edges
- $19/32$ " - $3/4$ " 8d common or 6d deformed shank at 6" o/c at panel edges
- $7/8$ " - 1" 8d deformed shank at 6" o/c at panel edges
- $1 1/8$ " - $1 1/4$ " 10d common or 8d deformed shank at 6" o/c at panel edges



Diaphragm connection to braced wall below

Source: 1997 NEHRP Commentary (FEMA 303)
For SI: 1 inch = 25.4 mm.

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For SI: 1 inch = 25.4 mm.