



Connector Solutions to Meet the Wall-Bracing Requirements of the 2009 International Residential Code®

This technical bulletin is designed to be used in conjunction with the 2009 International Residential Code (IRC). It provides information about the Simpson Strong-Tie® products that meet the requirements for constructing braced wall panels as they are listed in Section R602.10.2.

Pages 1-3 provide Simpson Strong-Tie product information, and pages 3-8 provide information on bracing methods listed in the code. Refer to the IRC for additional information. The user of this bulletin is responsible for complying with prescriptive IRC provisions and the local building code.

Section R602.10.2 outlines intermittent (occurring at isolated locations within a braced wall line) wall-bracing methods, including eight conventional braced-wall-panel methods and three narrow methods. Section R602.10.4 outlines continuous (sheathing over the full wall surface

of a braced wall line) wall-bracing methods, including two sheathing methods and two narrow methods. Additional wall-bracing requirements may apply for certain conditions, such as providing tie-down devices for braced wall panels in higher seismic design categories (including installations with stone and masonry veneer), and providing uplift framing connectors for braced wall panels with larger net uplifts.

For additional information about products meeting these requirements, consult the current Simpson Strong-Tie® *Wood Construction Connectors* catalog. Visit www.strongtie.com/wallbracing and use our free Wall Bracing Length Calculator to help determine the length of wall bracing required for your building. For alternate narrow bracing options using Simpson Strong-Tie Strong-Wall® shearwalls, consult the *Strong-Wall® Shearwalls Prescriptive Design Guide*.

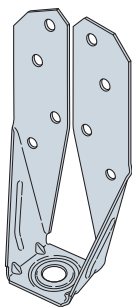
Simpson Strong-Tie® Connectors and Anchors

Tables 1-4 provide information about products that meet IRC connector and anchorage requirements. For additional options refer to the current *Wood Construction Connectors* catalog.

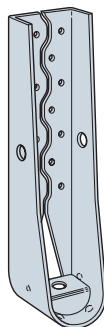
Table 1: Holdowns Attaching to Anchor Bolt

Holdown	Anchor Bolt Diameter (in.)	Min Wood Member Thickness ² (in.)	Allowable Tension (lbs.)	
			DF/SP	SPF/HF
DTT2Z	½	1.5	1825	1800
DTT2Z-SDS2.5	½	3	2145	2105
HDU2-SDS2.5	5/8	3	3075	2215
HTT4	5/8	3	3610	3105
HTT5	5/8	3	4350	3740
HDU4-SDS2.5	5/8	3	4565	3285
HDU5-SDS2.5	5/8	3	5645	4065

1. Allowable loads have been increased for wind or earthquake load durations with no further increase allowed.
2. Designer must specify anchor bolt type, length, and embedment. Refer to our *Wood Construction Connectors* Catalog for Simpson Strong-Tie SB, SSTB, and PAB anchor bolt options.
3. Post may consist of multiple members provided they are connected independently of the holdown fasteners.

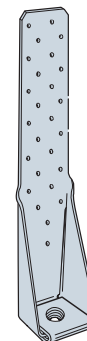


DTT2Z



HDU

U.S. Patent
6,112,495



HTT5

(HTT4 similar)
U.S. Patent 5,467,570

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Table 2: Embedded Strap-Style Holdowns

Holdown	Min Wood Member Thickness ² (in.)	Tension (lbs.) (DF/SP/SPF/HF) ^{3,4,5}	
		Midwall/Corner	Endwall
LSTHD8/LSTHD8RJ	3.5	2700	2230
STHD10/STHD10RJ	3.5	4120	3145
STHD14/STHD14RJ	3.5	5345	4210

1. Allowable loads have been increased for wind or earthquake with no further increase allowed.
2. Post may consist of multiple members provided they are connected independently of the holddown fasteners.
3. Tension values apply to uncracked concrete in wind and low-seismic regions (any structure in seismic design categories A and B and detached one- and two-family dwellings in seismic design category C). For allowable load information for other applications, refer to current *Wood Construction Connectors* catalog.
4. Tension values apply to minimum concrete strength, f'_c of 2500 psi, and minimum stemwall width of 8". For values with minimum stemwall width of 6" refer to current *Wood Construction Connectors* catalog.
5. Refer to the current *Wood Construction Connectors* catalog for installation requirements.

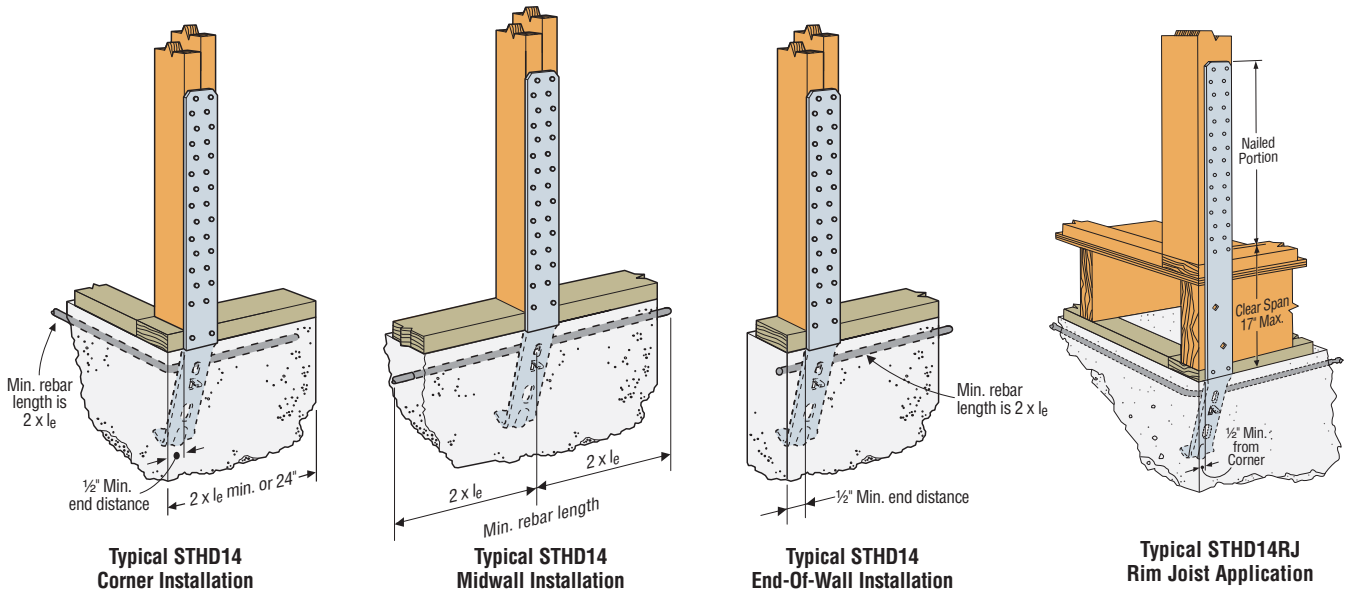
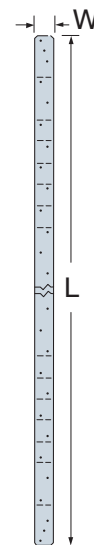


Table 3: Straight Straps

Strap	Fasteners (Total)	Dimensions (in.)		Capacity (lbs.) (DF/SP/SPF/HF)
		W	L	
LSTA21	(16) 10d	1 1/4	21	1235
LSTA30	(22) 10d	1 1/4	30	1640
MSTA30	(22) 10d	1 1/4	30	1820
(2) LSTA30 ²	(44) 10d	1 1/4	30	3280
(2) MSTA30 ²	(44) 10d	1 1/4	30	3640

1. Allowable loads have been increased for wind or earthquake load durations with no further increase allowed.
2. Double jack stud required; one strap installed per stud.
3. Use half the nails in each member being connected to achieve the listed loads.
4. 10d x 1 1/2" nails may be substituted where 10d are specified at 100% of the table loads except where installed over sheathing.



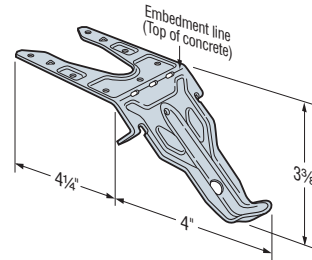
LSTA and MSTA
(Pilot holes not shown)



Table 4: Sill Plate Anchors

Anchor Type	Model Number	Size (in.)	Sill Plate Size	Minimum Concrete End Distance
Post-Installed ¹	Titen HD THD50600H ^{2,3}	½"x6"	Single 2x	6"
	Titen HD THD50800H ^{2,3}	½"x8"	Single 3x or Double 2x	6"
Cast-in-place	MASA/MASAP ⁴	—	Single 2x or 3x	4"

1. Provide plate washers beneath the anchor head when required by code. The Simpson Strong-Tie® BPS½-3 meets section R602.11.1 requirements.
2. Mechanically-galvanized anchors may be required by code when used with treated wood. Add 'MG' to model number for mechanically galvanized option. For additional information, visit www.strongtie.com.
3. Minimum concrete edge distance required = 1 ¾".
4. ZMAX® (galvanized G185) coating may be required by code when used with treated wood. Add 'Z' to model number for ZMAX option.
5. Minimum concrete strength, f'c = 2500 psi.



MASA



Titen HD®

Common Wall-Bracing Methods and Code Sections Requiring Connectors and Anchors

The following wall-bracing methods and code sections require connectors and/or anchors. Connector and anchor requirements appear in bold. Refer to Tables 1-4 for Simpson Strong-Tie® product solutions.

Intermittent Narrow Braced-Wall-Panel Methods

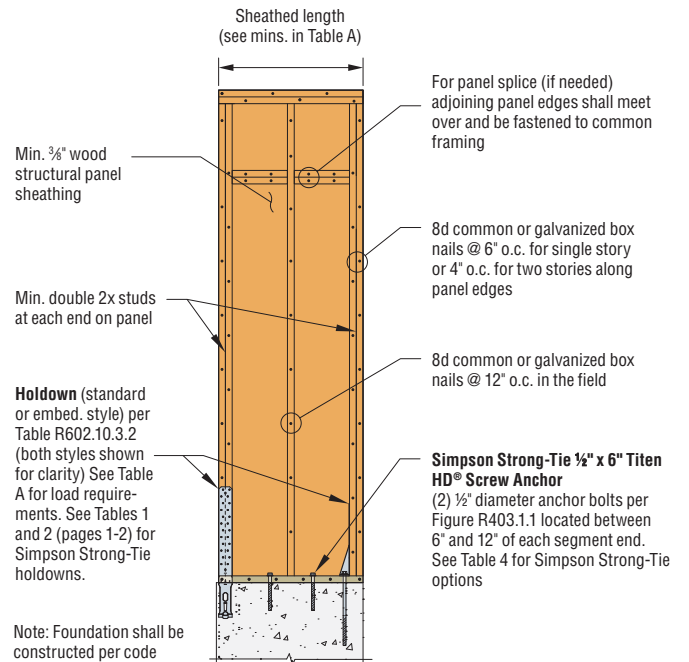
Method ABW: Alternate Braced Wall Panels SECTION R602.10.3.2

Panels shall be supported directly on a foundation or on floor framing supported directly on a foundation that is continuous across the entire length of the braced wall line.

Table A – Holdown Forces for Alternate Braced Wall Panels (lbs.)
(Based on 2009 IRC Table R602.10.3.2)

Alternate Braced Wall Panel Location	Height of Braced wall panel				
	8 ft.	9 ft.	10 ft.	11 ft. ¹	12 ft. ¹
	Minimum Sheathed Length				
	2'-4" ²	2'-8"	2'-10"	3'-2" ¹	3'-6" ¹
One-Story	1800	1800	1800	2000 ¹	2200 ¹
First Story of Two-Story	3000	3000	3000	3300 ¹	3600 ¹

1. Alternate braced wall panels in Seismic Design Categories D₀, D₁ and D₂ are limited to a maximum height of 10'.
2. 8' Alternate braced wall panels in Seismic Design Categories D₀, D₁ and D₂ are limited to a minimum width of 2'-8".



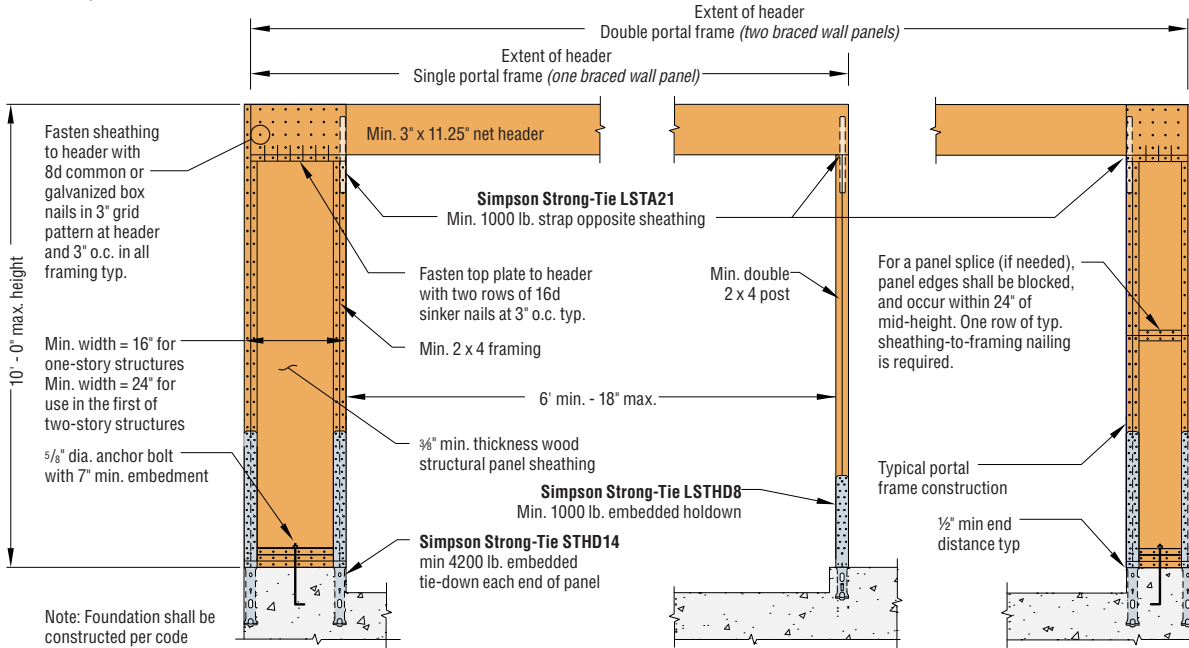
Method ABW: Alternate Braced Wall Panels

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Method PFH: Portal Frame with Holdowns SECTION R602.10.3.3

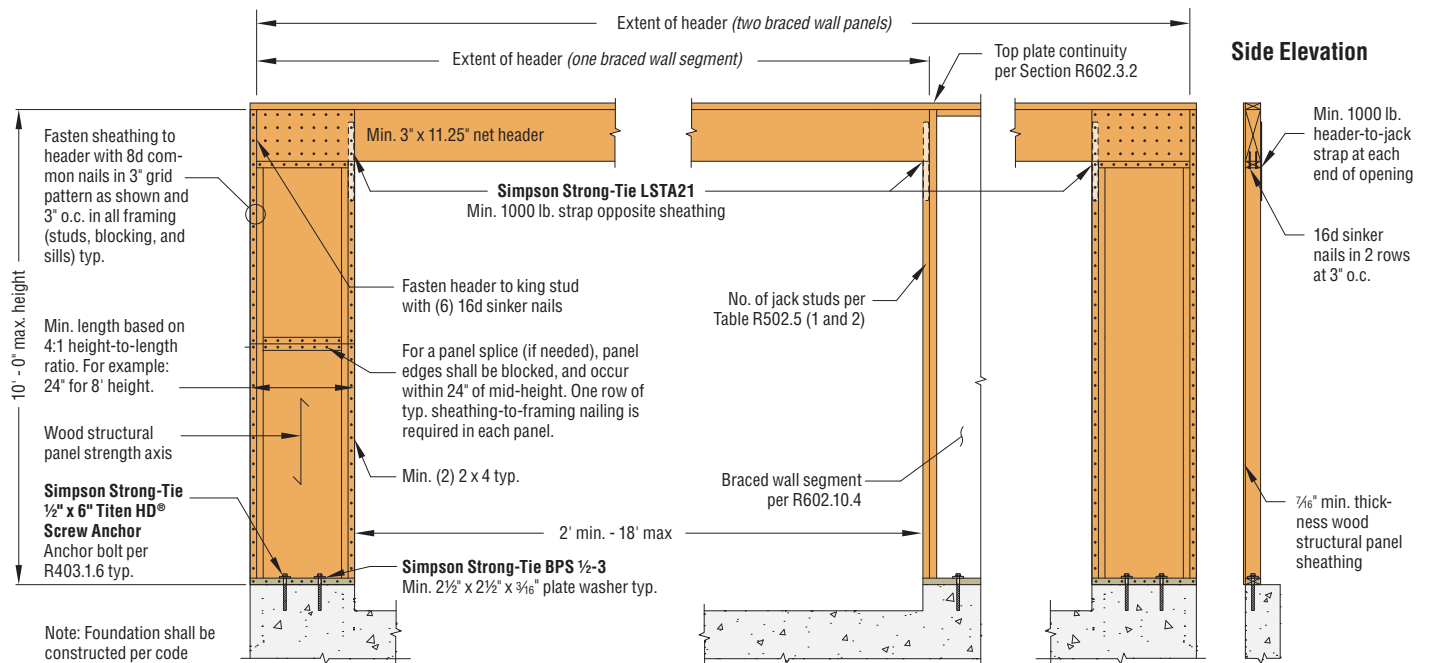
Walls must be supported directly on a concrete foundation (*not permitted on masonry foundations*) and require additional foundation reinforcement.



Method PFH: Portal Frame with Holdowns

Method PFG: Portal Frame at Garage Door Openings (*Seismic Design Categories A, B and C*) SECTION R602.10.3.4

Refer to Table 3 (page 2) in conjunction with Table B (page 5) for straps required due to pony walls constructed on headers.

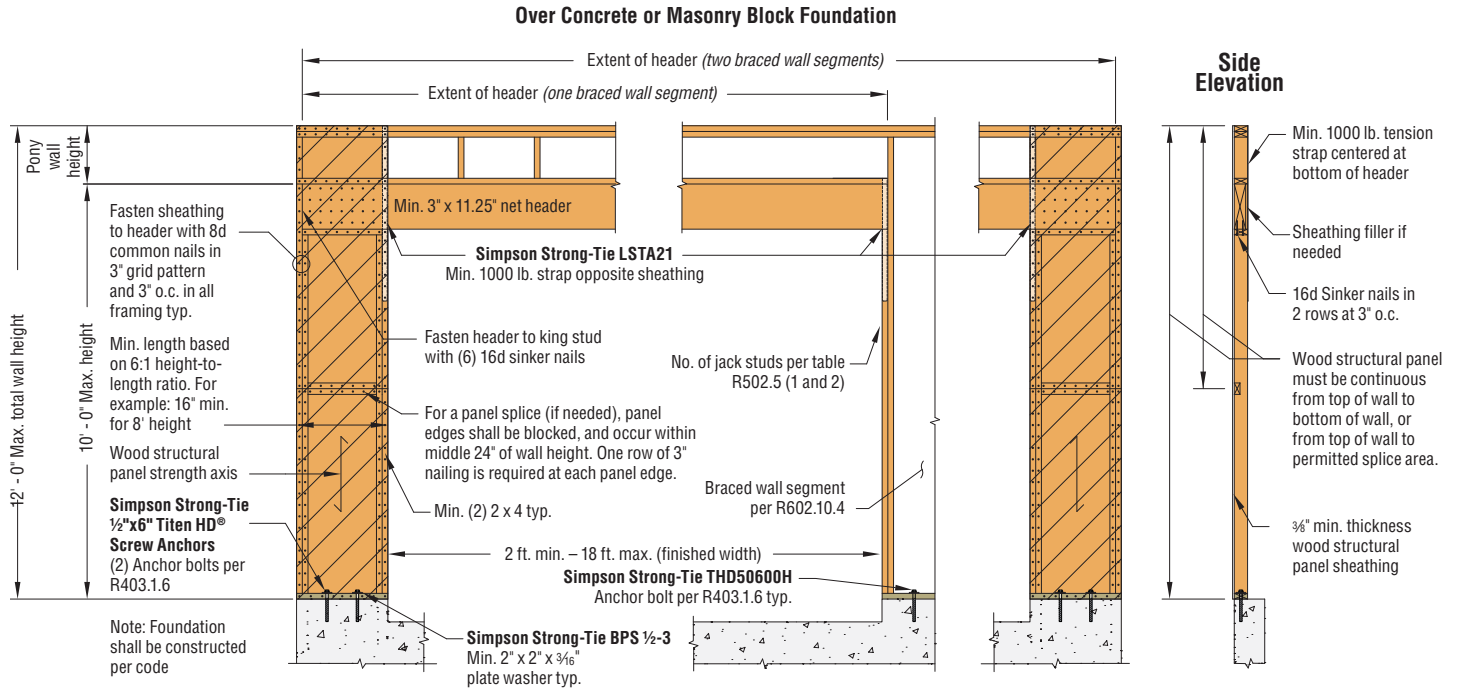


Method PFG: Portal Frame at Garage Door Openings in Seismic Design Categories A, B and C

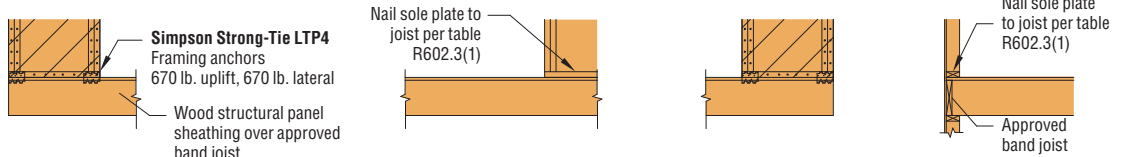
Continuous Narrow Braced Wall Panel Methods

Method CS-PF: Continuous Portal Frame
SECTION R602.10.4.1.1

Refer to Table 3 (page 2) in conjunction with Table B (page 5) for straps required due to pony walls constructed on headers.



Over Raised Wood Floor or Second Floor – Framing Anchor Option



Method CS-PF: Continuous Portal Frame Panel Construction

Table B – Tension Strap Capacity Required for Resisting Wind Pressures Perpendicular to 6:1 Aspect Ratio Walls – Exposure B and C (Based on 2009 IRC Table R602.10.4.1.1)

Minimum Wall Stud Framing Nominal Size and Grade	Max. Pony Wall Height (ft.)	Max. Total Wall Height (ft.)	Max. Opening Width (ft.)	Exposure B			Exposure C		
				Basic Wind Speed (mph)			Basic Wind Speed (mph)		
				85	90	100	85	90	100
2x4 No. 2 Grade	0	10	18	1000	1000	1000	1000	1000	1000
			9	1000	1000	1000	1000	1000	1275
	1	10	16	1000	1000	1750	1800	2325	3500
			18	1000	1200	2100	2175	2725	DR
			9	1000	1000	1025	1075	1550	2500
	2	10	16	1525	2025	3125	3200	3900	DR
			18	1875	2400	3575	3700	DR	DR
			9	1000	1200	2075	2125	2750	4000
	2	12	16	2600	3200	DR	DR	DR	DR
			18	3175	3850	DR	DR	DR	DR
			9	1775	2350	3500	3550	2350	3500
	4	12	16	4175	DR	DR	4175	DR	DR

1. Select strap from Table 3 based on capacity required
2. DR = Design required.
3. Strap shall be installed in accordance with manufacturer's recommendations.



Additional Applications that May Require Connectors

Holddown Requirements for Continuously-Sheathed Braced Wall Panel Applications

SECTION R602.10.4.4

- A 24" wood structural panel return (or 32" structural fiberboard return), as shown in Figures R602.10.4.4(1) and R602.10.4.4(2), must be provided at the ends of continuously sheathed, braced wall lines. A holddown device with a min. 800 lb. allowable tension load may be installed at the corner in lieu of the required return, as shown in Figure R602.10.4.4(3).
- An exception to Section R602.10.4.4 allows for the first braced wall panel to begin up to 12'-6" from the braced wall line end in SDC A, B or C (8' in SDC D₀, D₁ or D₂). Either full-height wood structural panels (24" minimum) constructed in accordance with Figure R602.10.4.4(1) must be provided at both sides of the corner or a holddown device with a min. 800 lb. allowable tension load may be installed at the end of the braced wall panel closest to the corner, as shown in Figure R602.10.4.4(5).

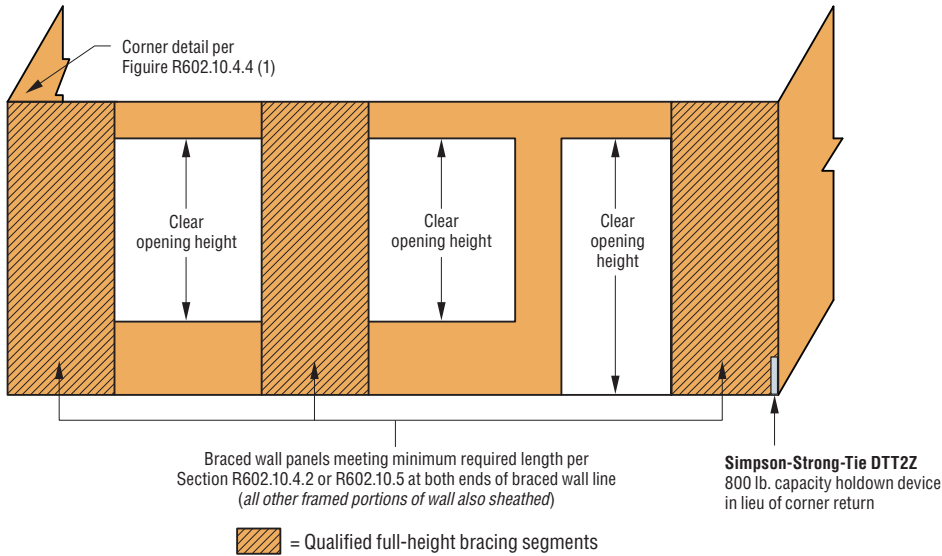


Figure based on R602.10.4.4 (3)
Braced wall line with continuous sheathing without corner return panel

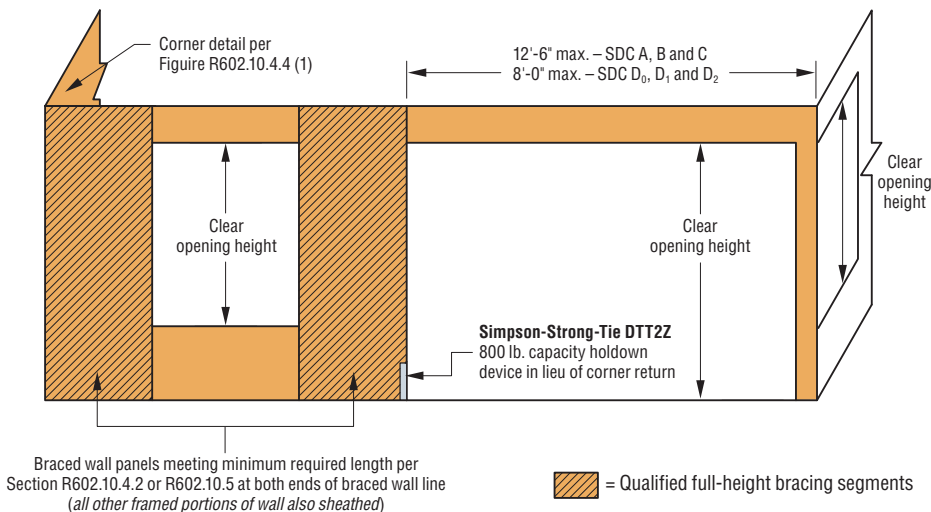


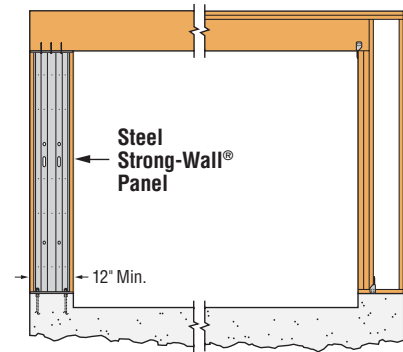
Figure based on R602.10.4.4 (5)
Braced wall line with continuous sheathing - First braced wall panel away from end-of-wall line with holddown

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Narrow Bracing Alternatives

In areas where window or door openings do not provide enough space to fit the code wall bracing options, consider using a code-listed shear wall product that meets the intent of the code while providing a narrow-wall solution, such as a Simpson Strong-Tie® Strong-Wall® shearwall (wood or steel).

Refer to the *Strong-Wall® Shearwalls Prescriptive Design Guide* for complete wall bracing replacement solutions, including anchorage.



Additional Bracing Considerations

Other elements can influence wall-bracing requirements, such as construction in higher seismic design categories, installations with stone and masonry veneer, and braced wall panels located at exterior walls supporting roof rafters or trusses.

Braced Wall Panel Locations

SECTION R602.10.1.4

- In SDC D₀, D₁ or D₂, braced wall panels must be located at each end of a braced wall line. An exception for Method WSP braced wall panels allows a braced wall panel to begin no more than 8' from each braced wall line end, provided a minimum 24" panel is present on both sides of the corner in accordance with Figure R602.10.4.4(1), or the end of each braced wall panel closest to the corner shall have a holddown device installed with a minimum uplift capacity of 1,800 lbs. These options are shown in the figure below.

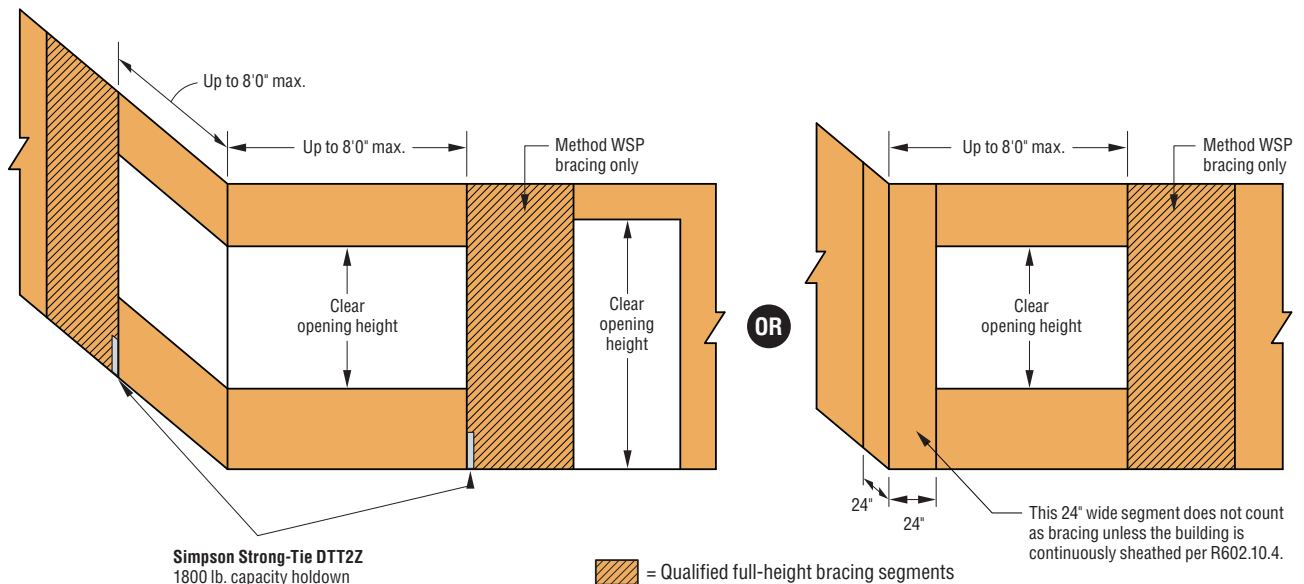


Figure based on Figure 602.10.1.4.1
Braced wall panels at ends of braced wall lines in Seismic Design Categories D₀, D₁ and D₂

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Braced Wall Panel Uplift Load Path SECTION R602.10.1.2.1

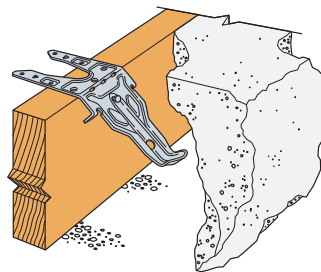
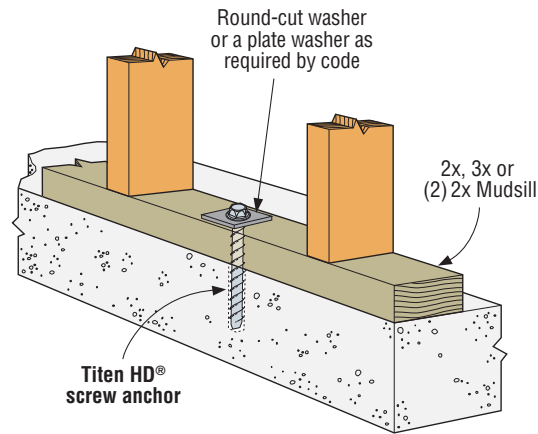
- Where the net uplift value exceeds 100 plf, uplift framing connectors shall be installed at braced wall panels to provide a continuous load path from the top of the wall to the foundation.
- Refer to the current Simpson Strong-Tie® *Wood Construction Connectors* catalog for connector options to provide that continuous load path, where required.

Wind Bracing Amount Reduction with 800 lb. Holdown SECTION R602.10.1.2

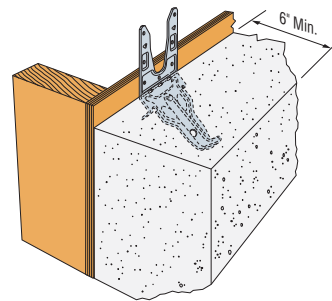
- Table R602.10.1.2(1), Note i permits the required wind bracing length to be multiplied by 0.80 for several bracing methods and story applications if min. 800 lb. holdown devices are attached to the stud at each end of each braced wall panel.

Sill Anchorage SECTION R403.1.6

- Table 4 (page 3) provides information for post-installed (*Titen HD® screw anchors*) and cast-in-place (*MASA mudsill anchors*) anchors that are a direct 1:1 replacement for ½" diameter cast-in-place anchor bolts embedded 7" into concrete that are used to anchor wood sill plates.
- BPS½-3 washers meet the additional Section R602.11.1 plate washer requirements of all buildings in SDC D₀, D₁ or D₂, and townhouses in SDC C. Testing shows that the MASA can be used in lieu of code-required anchor bolts and square washers in high-seismic zones.
- BPS½-3 washers meet the plate washer requirements for Methods PFG and CS-PF.



Typical MASA
Installation in Concrete



Typical MASAP
Installation in Concrete