TJ® SHEAR BRACE

Featuring Trus Joist® TJ® Shear Braces for Engineered and Prescriptive Applications

- Prefabricated Shear Wall Engineered for Performance, Designed for Safety
- Quick and Simple to Install
- Perfect for Narrow Wall Sections
- Tall Shear Braces for Walls up to 20'
- Complies with 2009 IBC/IRC
- Limited Product Warranty

Field Trimmable !

The products in this guide are readily available through our nationwide network of distributors and dealers. For more information on other applications or other Trus Joist® products, contact your Weyerhaeuser representative.

Code Evaluation:
See ICC ES ESR-2652 and RR-25730

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WHAT IS THE TRUS JOIST® TJ® SHEAR BRACE?

The TJ® Shear Brace (TJSB) is a specially designed, prefabricated, engineered-wood panel that helps structures resist lateral forces such as those created by earthquakes and high winds. The International Residential Code (IRC) and International Building Code (IBC) require wall bracing for lateral loads in all structures. The TJ® Shear Brace can help you meet those requirements efficiently and confidently with the following features:

- Field adjustable—can be trimmed and drilled
- Suitable for residential, multifamily, and light commercial construction
- Narrow panel widths have high allowable loads
- Works in tall wall and multistory applications
- 12" braces up to 9' tall and 18" and 24" braces up to 12' tall can be substituted for field-built, prescriptive wall bracing

Available TJ® Shear Braces

TJ® Shear Brace	Width	Height(1)	Weight (lbs)	Portal Kit (Included with Brace)	Typical Applications
TJSB 12x7	12"	78"	100	Yes	First story only
TJSB 12x7.5	12"	85½"	110	Yes	
TJSB 12x8	12"	93¼"	115	Yes	
TJSB 12x9	12"	105¼"	125		First or second story(2)
TJSB 12x10	12"	117¼"	135		First story only
TJSB 12x11	12"	129¼"	150		
TJSB 12x12	12"	141¼"	160		
TJSB 18x7	18"	78"	145	Yes	First story only
TJSB 18x7.5	18"	85½"	155	Yes	
TJSB 18x8	18"	93¼"	165	Yes	
TJSB 18x9	18"	105¼"	180		First or second story(2)
TJSB 18x10	18"	117¼"	200		
TJSB 18x11	18"	129¼"	215		
TJSB 18x12	18"	141¼"	235		
TJSB 18x13	18"	153¼"	250		First story only
TJSB 18x20	18"	240"	385		
TJSB 24x8	24"	93¼"	220	Yes	First story only
TJSB 24x9	24"	105¼"	240		First or second story(2)
TJSB 24x10	24"	117¼"	265		
TJSB 24x11	24"	129¼"	290		
TJSB 24x12	24"	141¼"	315		
TJSB 24x13	24"	153¼"	340		First story only
TJSB 24x20	24"	240"	515		

(1) **For heights not listed, order the next taller brace and trim to fit. Minimum trimmed height is 74½".**

(2) For stacked braces, see page 12 for requirements and limitations.

- All braces come standard with two pre-attached holdowns, two slotted nuts, two washers, 6¾" screws, and an installation guide.
- All braces are 3½" thick.

Brace Naming System

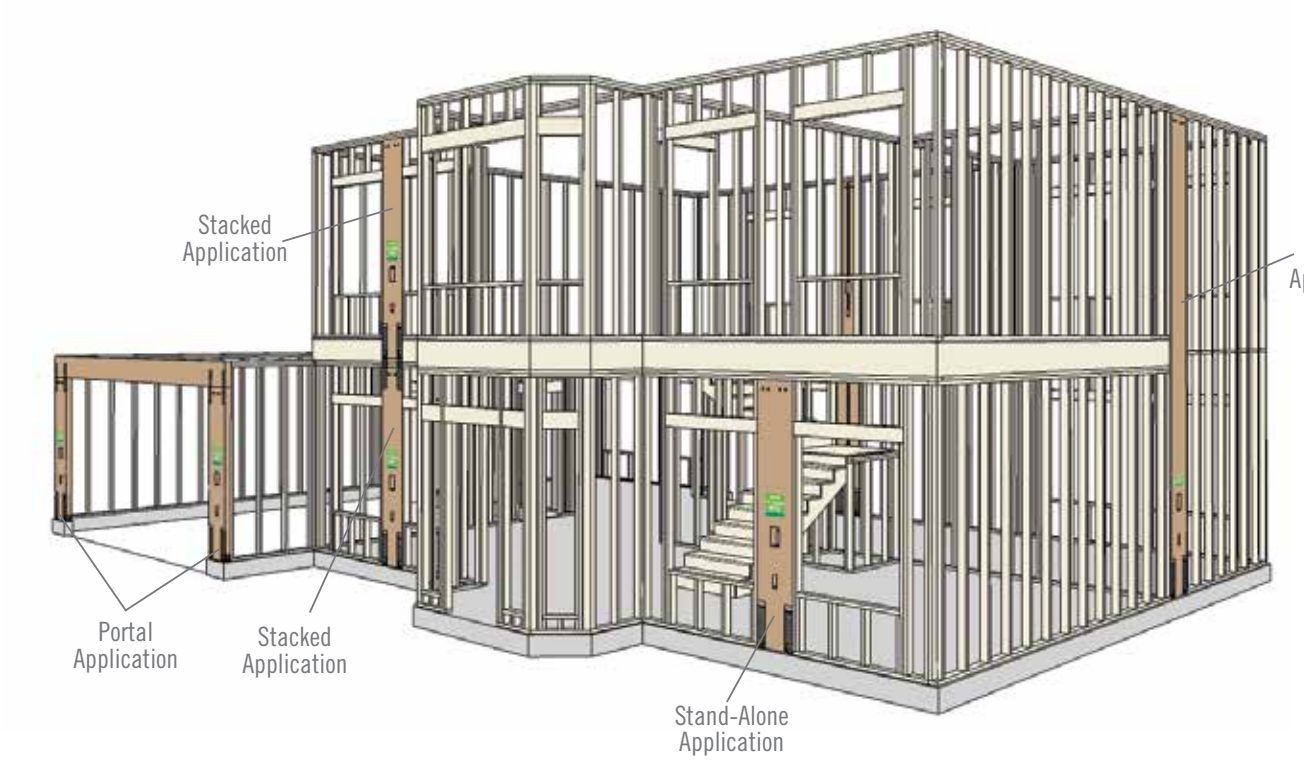
TJSB 18x8
- TJSB: TJ® Shear Brace
- 18: Width (in.)
- 8: Nominal height (ft.)

Available Kits

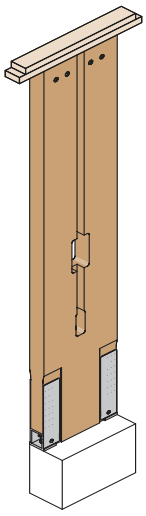
(see page 4 for parts lists and descriptions)

- **Anchor kit:** Required for all braces except those in the second story.
- **Portal kit:** Required for brace-to-header connections. Portal kits are included with all braces that are 100" or less in height. Order straps separately for braces taller than 100".
- **Multistory kit (MSK):** Required for stacked-brace applications.

TJ® SHEAR BRACE APPLICATIONS



TJ® Shear Braces may be trimmed in all applications. See pages 14, 16, and 18 for details.



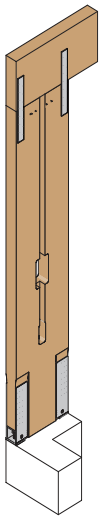
Convenient chase for wiring

Field drillable and trimmable

Simple connection to foundation for all applications

Stand-Alone Applications

- Narrow wall spaces
- Wall heights up to 20'



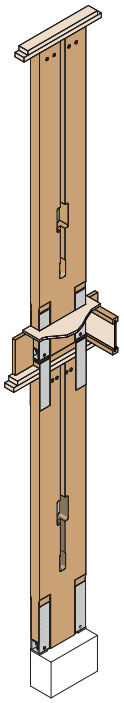
Easy header connections

Resists bowing, twisting, and shrinking

Field drillable and trimmable

Portal Applications

- Narrow wall spaces
- Garages
- Large windows and doors
- Increased capacities when used in a portal



MSK for stacked applications, includes upper holdowns

Field drillable and trimmable

Stacked Applications

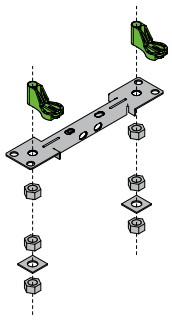
- Narrow wall spaces
- Multistory installation kit (MSK) required (order separately)
- Total assembled heights up to 24'

KIT DESCRIPTIONS

Anchor Kits
(sold separately)

Required for all braces, except the top braces in stacked applications. Kit includes two hex nuts, two double-nut and washer assemblies, two TJ®-BoltCollar anchor bolt holders, and one anchor bolt spacer (specify width).

- Order threaded rod separately.



Anchor Kit Naming System

Anchor Kit 18

Brace width (in.)

Kit name

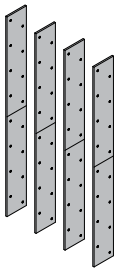
Anchor Kit Specifications

Anchor Bolt Spacer Length(1)	TJ®-BoltCollar Diameter	NutType	WasherType
12"	⅞"	9 UNC, Grade 5	2" Square
18"	⅞"	9 UNC, Grade 5	2" Square
24"	1"	8 UNC, Grade 5	2¼" Square

(1) Flat anchor bolt spacers are available in 12", 18", and 24" lengths for CMU and epoxy anchor applications.

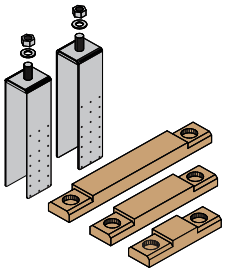
Portal Kits
(included with all braces 100" or less in height)

Required for brace-to-beam portal connections. Kit includes four Trus Joist® straps and comes standard with all braces that are 100" or less in height. Order the kit separately if using braces that are over 100" tall in a portal application.



Multistory Kits (MSK)

Required for stacked brace applications. One universal MSK fits all brace widths and includes two holdowns with welded-on bolts, two nuts, two washers, and 12", 18", and 24" bearing blocks. Use the bearing block that matches the width of the top brace. See detail SB10 for stacked brace installation details.



ACCESSORY DESCRIPTIONS **(sold separately)**

Shear Brace Wrenches

Wrenches are available to help ease installation but are not required. Standard box or open-ended wrenches can be used. 12" and 18" braces use the 1$^{5}/_{16}$" wrench, and 24" shear braces use the 1½" wrench.

Concrete Bearing Plates

Supplemental steel bearing plates ($^{3}/_{8}$" x 3½" x 4¼" for 12" and 18" wide braces, and $^{3}/_{8}$" x 3½" x 6½" for 24" wide braces) are available to increase allowable design values. Use in engineered-design applications when specified by the design professional. The allowable design load tables indicate when bearing plates are required.

Flat Anchor Bolt Spacers

The anchor bolt spacer is a flattened steel plate that is required when placing the shear brace on concrete masonry walls. This plate transfers the lateral shear force from the Trus Joist® TJ® Shear Brace to the wall. See detail SBA4.

Screw Installation Templates

A screw installation template is made from OSB and is optional. It helps to properly locate and set the angle of the screws for the Option A connection. See details SB1, SB3, and SB14.

C-Shims

$^{1}/_{8}$"-thick metal c-shims are used to level braces on uneven concrete. They slip around the anchor bolts, under the shear brace.

GENERAL ASSUMPTIONS FOR ENGINEERED DESIGN

1. TJ® Shear Braces meet the *Acceptance Criteria for Prefabricated Wood Shear Panels* (ICC-ES AC 130), and their design values are consistent with typical wood-framed construction. Use the following values when designing:

Building Code	R	Ω_0	C_d
1997 UBC	5.5	2.8	N.A.
2000 IBC	6	3(1)	4
2003, 2006, and 2009 IBC	6.5	3(1)	4

(1) When shear braces are installed in structures with flexible diaphragms (as defined in Section 12.3.1 of the ASCE-7), Ω_0 may be reduced per ASCE-7, Table 12.2.1, footnote g.

2. Concrete anchorage table values shown in this guide are for single anchors designed in accordance with ACI 318 Appendix D using concrete that has a minimum f'_c of 2,500 psi or 3,000 psi, as specified.

3. Anchorage embedment depths and footing dimensions on pages 20 and 29 assume concrete breakout cones do not overlap. Breakout cones are defined by the C_1, C_2, and C_3 dimensions. Analysis of anchors with overlapping breakout cones are the responsibility of the design professional of record. Overlapping cones can occur when braces are doubled up, wide-face to wide-face.

4. Per ACI 318 Appendix D requirements for seismic design categories C-E, the anchorage details for seismic design shown in this guide are based on the brace's anchorage attachment undergoing ductile yielding at a load level below the design strength of the concrete. For seismic design categories A-B/Wind, the anchorage details shown in this guide are based on the uplift at full allowable shear. For anchorage design, the effects of gravity loads are considered only for bearing.

5. Anchorage details in this guide consider factored holdown uplift, compression, and shear. Factored properties are based on the following:

Property	TJ® Shear Brace Width	Moment Arm (MA) Without Supplemental Bearing	Moment Arm (MA) With Supplemental Bearing	SDC A-B/ Wind	SDC C-E
Factored Holdown Uplift	12"	8.69"	8.69"	$\frac{F(1.6 \times AS \times h)}{MA}$	17,357 lbs
	18"	14.56"	14.56"		32,400 lbs
	24"	19.31"	19.31"		39,867 lbs
Factored Compression	12"	8.69"	8.06"	$1.6(OH) + \frac{F(1.6 \times AS \times h)}{MA}$	$1.4(OH) + \frac{F(1.4 \times AS \times h)}{MA}$
	18"	14.56"	13.94"		
	24"	19.31"	18.81"		
Factored Shear (per brace)	12"	–	–	2,417 lbs	2,417 lbs
	18"	–	–	4,928 lbs	6,722 lbs
	24"	–	–	8,320 lbs	9,871 lbs

Where:

F . . . . = 1.0 for stand-alone braces
= 0.8 for 12" portal braces, 93¼" tall and less, that are connected per details in this guide
= 0.9 for 18"portal braces, 93¼" tall and less, that are connected per details in this guide
= 1.0 for all other portal braces

AS . . . Allowable shear per brace (lbs)

h . . . . Brace height (in.)

MA. . . Moment arm (in.); value from the table

OH. . . Portion of applied vertical load (lbs) distributed to the holdown

6. For SDC A–B/Wind, holdown uplift at allowable shear is based on loads applied at the top of the brace. Uplift calculations for multistory applications and other loading schemes are the responsibility of the design professional of record. See page 13 for a multistory design example.

7. Install products according to this specifier's guide. Changes in installation methods or modifications to the product and associated systems (other than those indicated in this guide) should only be made by a design professional of record. Altered installation procedures and the performance of modified products are the sole responsibility of the design professional of record.

AC130 cyclic testing in the lab.

8. The building shall be designed in accordance with the appropriate building code and meet local, state, and federal requirements. Verify design requirements with the local building official. Concrete foundation design remains the responsibility of the design professional of record.

9. TJ® Shear Braces are part of the overall lateral-force-resisting system of the structure. The design of this system, including a complete load path to transfer lateral forces from the structure to the ground, is the responsibility of the design professional of record.

10. In prescriptive specification, TJ® Shear Braces up to 141¼" high (105¼" for 12" braces) can be counted as 4' of bracing, and are a 1-for-1 substitution for site-built shear wall sections. For more information on prescriptive specification, see pages 24–27.

11. TJ® Shear Braces are designed to resist the loads published in this guide. If these design loads are exceeded during an event, the integrity of the shear brace should be evaluated by a qualified technical professional to determine whether or not the brace needs to be replaced.

12. **Vertical Loading on TJ® Shear Braces:** If there is a vertical-load transfer element, such as a rim board or beam that bears along the entire width of the brace, then a vertical load can be located anywhere. Otherwise, a vertical load must be located at the center of the brace or be a uniform load equaling a point load that does not exceed the allowable vertical load. Alternatively, a vertical load (maximum of ½ the allowable vertical load) may be located on either side of the center of the brace. For other loading conditions, contact your Weyerhaeuser representative.

Allowable Design Loads—Stand-Alone Brace on Concrete Foundation

Nominal Brace Height[1]	TJ® Shear Brace	Total Vertical Load[4] (lbs)	2,500 psi Concrete Strength				2,500 psi Concrete Strength with Bearing Plate[2]				3,000 psi Concrete Strength[3]			
			Seismic (SDC C-E)		Wind (SDC A-B)		Seismic (SDC C-E)		Wind (SDC A-B)		Seismic (SDC C-E)		Wind (SDC A-B)	
			Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)
7'	TJSB 24x7[5]	4,000	5,150	0.29	5,200	0.30	5,150	0.29	5,200	0.30	5,150	0.29	5,200	0.30
		6,000	5,150	0.29	5,182	0.29	5,150	0.29	5,200	0.30	5,150	0.29	5,200	0.30
		8,000	5,150	0.29	4,935	0.28	5,150	0.29	5,200	0.30	5,150	0.29	5,200	0.30
8'	TJSB 12x8	4,500	905	0.38	995	0.52	905	0.38	995	0.52	905	0.38	995	0.52
	TJSB 18x8	0	2,215	0.37	2,293	0.41	2,215	0.37	2,435	0.44	2,215	0.37	2,435	0.44
		2,000	2,215	0.37	2,137	0.39	2,215	0.37	2,435	0.44	2,215	0.37	2,435	0.44
		4,000	2,215	0.37	1,981	0.36	2,215	0.37	2,435	0.44	2,215	0.37	2,338	0.42
		6,000	2,152	0.36	1,825	0.33	2,215	0.37	2,296	0.41	2,215	0.37	2,182	0.39
		8,000	1,996	0.33	1,669	0.30	2,215	0.37	2,147	0.39	2,215	0.37	2,025	0.37
	TJSB 24x8	0	4,435	0.37	4,880	0.42	4,435	0.37	4,880	0.42	4,435	0.37	4,880	0.42
		2,000	4,435	0.37	4,749	0.41	4,435	0.37	4,880	0.42	4,435	0.37	4,880	0.42
		4,000	4,435	0.37	4,542	0.39	4,435	0.37	4,880	0.42	4,435	0.37	4,880	0.42
		6,000	4,435	0.37	4,335	0.37	4,435	0.37	4,823	0.41	4,435	0.37	4,880	0.42
		8,000	4,435	0.37	4,128	0.35	4,435	0.37	4,621	0.39	4,435	0.37	4,880	0.42
9'	TJSB 12x9	4,500	790	0.43	890	0.59	790	0.43	890	0.59	790	0.43	890	0.59
	TJSB 18x9	0	1,905	0.43	2,032	0.50	1,905	0.43	2,090	0.51	1,905	0.43	2,090	0.51
		1,000	1,905	0.43	1,963	0.48	1,905	0.43	2,090	0.51	1,905	0.43	2,090	0.51
		2,000	1,905	0.43	1,893	0.46	1,905	0.43	2,090	0.51	1,905	0.43	2,090	0.51
		4,000	1,905	0.43	1,755	0.43	1,905	0.43	2,090	0.51	1,905	0.43	2,071	0.51
		6,000	1,905	0.43	1,617	0.39	1,905	0.43	2,034	0.50	1,905	0.43	1,933	0.47
		8,000	1,769	0.40	1,478	0.36	1,905	0.43	1,902	0.46	1,905	0.43	1,794	0.44
	TJSB 24x9	0	3,905	0.42	4,295	0.47	3,905	0.42	4,295	0.47	3,905	0.42	4,295	0.47
		2,000	3,905	0.42	4,208	0.46	3,905	0.42	4,295	0.47	3,905	0.42	4,295	0.47
		4,000	3,905	0.42	4,024	0.44	3,905	0.42	4,295	0.47	3,905	0.42	4,295	0.47
		6,000	3,905	0.42	3,841	0.42	3,905	0.42	4,273	0.47	3,905	0.42	4,295	0.47
		8,000	3,905	0.42	3,657	0.40	3,905	0.42	4,094	0.45	3,905	0.42	4,295	0.47
10'	TJSB 12x10	4,500	605	0.49	665	0.54	605	0.49	665	0.54	605	0.49	665	0.54
	TJSB 18x10	0	1,725	0.48	1,824	0.55	1,725	0.48	1,895	0.57	1,725	0.48	1,895	0.57
		1,000	1,725	0.48	1,762	0.53	1,725	0.48	1,895	0.57	1,725	0.48	1,895	0.57
		2,000	1,725	0.48	1,700	0.51	1,725	0.48	1,895	0.57	1,725	0.48	1,895	0.57
		4,000	1,725	0.48	1,575	0.47	1,725	0.48	1,895	0.57	1,725	0.48	1,859	0.56
		6,000	1,712	0.48	1,451	0.44	1,725	0.48	1,826	0.55	1,725	0.48	1,735	0.52
		8,000	1,588	0.44	1,327	0.40	1,725	0.48	1,707	0.51	1,725	0.48	1,611	0.48
	TJSB 24x10	0	3,325	0.47	3,660	0.53	3,325	0.47	3,660	0.53	3,325	0.47	3,660	0.53
		2,000	3,325	0.47	3,660	0.53	3,325	0.47	3,660	0.53	3,325	0.47	3,660	0.53
		4,000	3,325	0.47	3,612	0.52	3,325	0.47	3,660	0.53	3,325	0.47	3,660	0.53
		6,000	3,325	0.47	3,448	0.50	3,325	0.47	3,660	0.53	3,325	0.47	3,660	0.53
		8,000	3,325	0.47	3,283	0.48	3,325	0.47	3,660	0.53	3,325	0.47	3,660	0.53

(1) For exact brace heights, see **Available TJ® Shear Braces** on page 2.
(2) Minimum bearing plate sizes: 3/8" x 3½" x 4½" for 12" and 18" wide braces; 3/8" x 3½" x 6½" for 24" wide braces.
(3) For concrete strength of 3,500 psi or greater, refer to ICC-ES ESR 2652, Table 1, for allowable shear loads and associated drifts.
(4) See note 12 in **General Assumptions** on page 5.
(5) 24x7 TJ® Shear Brace is trimmed from a 93¼" tall brace.
(6) 14', 16', and 18' tall braces are trimmed from a 20' brace.

*Also see **General Notes** on page 7.*

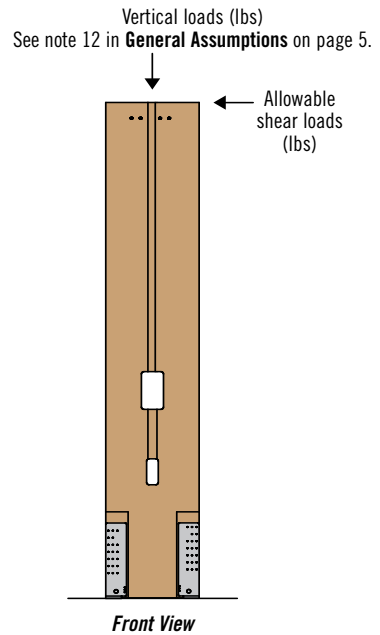
Allowable Design Loads—Stand-Alone Brace on Concrete Foundation *continued*

Nominal Brace Height[1]	TJ® Shear Brace	Total Vertical Load[4] (lbs)	2,500 PSI Concrete Strength				2,500 PSI Concrete Strength with Bearing Plate[2]				3,000 PSI Concrete Strength[3]			
			Seismic (SDC C-E)		Wind (SDC A-B)		Seismic (SDC C-E)		Wind (SDC A-B)		Seismic (SDC C-E)		Wind (SDC A-B)	
			Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)
11'	TJSB 12x11	4,500	545	0.54	600	0.60	545	0.54	600	0.60	545	0.54	600	0.60
	TJSB 18x11	0	1,530	0.53	1,654	0.63	1,530	0.53	1,685	0.64	1,530	0.53	1,685	0.64
		1,000	1,530	0.53	1,598	0.61	1,530	0.53	1,685	0.64	1,530	0.53	1,685	0.64
		2,000	1,530	0.53	1,542	0.59	1,530	0.53	1,685	0.64	1,530	0.53	1,685	0.64
		4,000	1,530	0.53	1,429	0.54	1,530	0.53	1,685	0.64	1,530	0.53	1,685	0.64
		6,000	1,530	0.53	1,316	0.50	1,530	0.53	1,657	0.63	1,530	0.53	1,574	0.60
		8,000	1,440	0.50	1,204	0.46	1,530	0.53	1,549	0.59	1,530	0.53	1,461	0.56
	TJSB 24x11	2,000	3,010	0.52	3,315	0.59	3,010	0.52	3,315	0.59	3,010	0.52	3,315	0.59
		4,000	3,010	0.52	3,277	0.58	3,010	0.52	3,315	0.59	3,010	0.52	3,315	0.59
		6,000	3,010	0.52	3,127	0.55	3,010	0.52	3,315	0.59	3,010	0.52	3,315	0.59
		8,000	3,010	0.52	2,978	0.53	3,010	0.52	3,315	0.59	3,010	0.52	3,315	0.59
12'	TJSB 12x12	4,500	485	0.59	535	0.65	485	0.59	535	0.65	485	0.59	535	0.65
	TJSB 18x12	0	1,340	0.59	1,475	0.70	1,340	0.59	1,475	0.70	1,340	0.59	1,475	0.70
		2,000	1,340	0.59	1,411	0.67	1,340	0.59	1,475	0.70	1,340	0.59	1,475	0.70
		4,000	1,340	0.59	1,308	0.62	1,340	0.59	1,475	0.70	1,340	0.59	1,475	0.70
		6,000	1,340	0.59	1,205	0.57	1,340	0.59	1,475	0.70	1,340	0.59	1,440	0.68
		8,000	1,318	0.58	1,102	0.52	1,340	0.59	1,417	0.67	1,340	0.59	1,337	0.63
	TJSB 24x12	4,000	2,695	0.57	2,965	0.64	2,695	0.57	2,965	0.64	2,695	0.57	2,965	0.64
		6,000	2,695	0.57	2,862	0.62	2,695	0.57	2,965	0.64	2,695	0.57	2,965	0.64
		8,000	2,695	0.57	2,725	0.59	2,695	0.57	2,965	0.64	2,695	0.57	2,965	0.64
13'	TJSB 18x13	1,000	1,200	0.64	1,320	0.74	1,200	0.64	1,320	0.74	1,200	0.64	1,320	0.74
		2,000	1,200	0.64	1,300	0.73	1,200	0.64	1,320	0.74	1,200	0.64	1,320	0.74
		3,010	1,200	0.64	1,252	0.70	1,200	0.64	1,320	0.74	1,200	0.64	1,320	0.74
	TJSB 24x13	2,000	2,440	0.63	2,685	0.70	2,440	0.63	2,685	0.70	2,440	0.63	2,685	0.70
		4,000	2,440	0.63	2,685	0.70	2,440	0.63	2,685	0.70	2,440	0.63	2,685	0.70
		4,850	2,440	0.63	2,685	0.70	2,440	0.63	2,685	0.70	2,440	0.63	2,685	0.70
14'	TJSB 18x14[6]	3,010	1,030	0.69	1,130	0.78	1,030	0.69	1,130	0.78	1,030	0.69	1,130	0.78
	TJSB 24x14[6]	4,850	2,130	0.69	2,340	0.77	2,130	0.69	2,340	0.77	2,130	0.69	2,340	0.77
16'	TJSB 18x16[6]	3,010	770	0.77	845	0.86	770	0.77	845	0.86	770	0.77	845	0.86
	TJSB 24x16[6]	4,850	1,650	0.80	1,815	0.89	1,650	0.80	1,815	0.89	1,650	0.80	1,815	0.89
18'	TJSB 18x18[6]	3,010	660	0.87	725	0.97	660	0.87	725	0.97	660	0.87	725	0.97
	TJSB 24x18[6]	4,850	1,400	0.90	1,540	1.00	1,400	0.90	1,540	1.00	1,400	0.90	1,540	1.00
20'	TJSB 18x20	3,010	550	0.97	605	1.08	550	0.97	605	1.08	550	0.97	605	1.08
	TJSB 24x20	4,850	1,150	1.00	1,265	1.11	1,150	1.00	1,265	1.11	1,150	1.00	1,265	1.11

▪ See page 6 for footnotes.

General Notes

- Tables are based on:
  - ASTM A449 or ASTM A193 B7 threaded rod for anchorage: 1" diameter for 24" braces, ⅞" for all others. See page 20 for anchorage options.
  - Vertical loads and shear loads acting in combination.
  - Anchorage details shown on pages 20–23. See **General Assumptions** on page 5 for uplift calculations and anchorage design.
- No further increases for duration of load are permitted.
- All braces taller than 18' require a 2x6, minimum, full-length stud attached to each 3½" side. Attach using 10d (0.131" x 3") nails at 16" on-center. See detail SB17 on page 18.
- Interpolation is allowed using the values for the two closest heights, or use the allowable loads of the taller brace. For braces less than 93¼" tall, use the values for a 93¼" tall brace.
- 12" braces (105¼" tall or less) and 18" and 24" braces (141¼" tall or less) are allowed in prescriptive applications as a braced wall alternate.



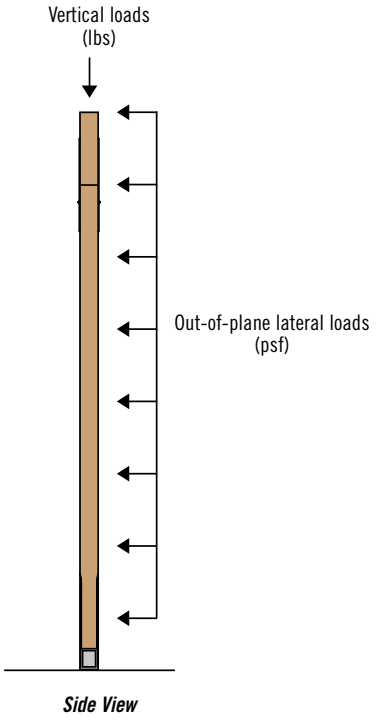
Front View

ALLOWABLE OUT-OF-PLANE LATERAL LOADS—ALL BRACES

Allowable Out-of-Plane Lateral Loads (PSF)

Nominal Brace Height	Stand-Alone Brace on Concrete Foundation[1]						Portal on Concrete Foundation[2]		
	Attached to Double Top Plate			Attached to Header[3][4]			Attached to Header[3][4]		
	Shear Brace Width			Shear Brace Width			Shear Brace Width		
	12"	18"	24"	12"	18"	24"	12"	18"	24"
7'							275	185	140
7½'							255	170	125
8'	305	300	300	230	155	115	230	155	115
9'	210	210	210	205	135	105	205	135	105
10'	150	150	150	150	125	90	150	125	90
11'	110	110	110	110	110	85	110	110	85
12'	85	85	85	85	85	75	85	85	75
13'		65	65						
14'		50	50						
16'		35	35						
18'		25	25						
20'		15	15						

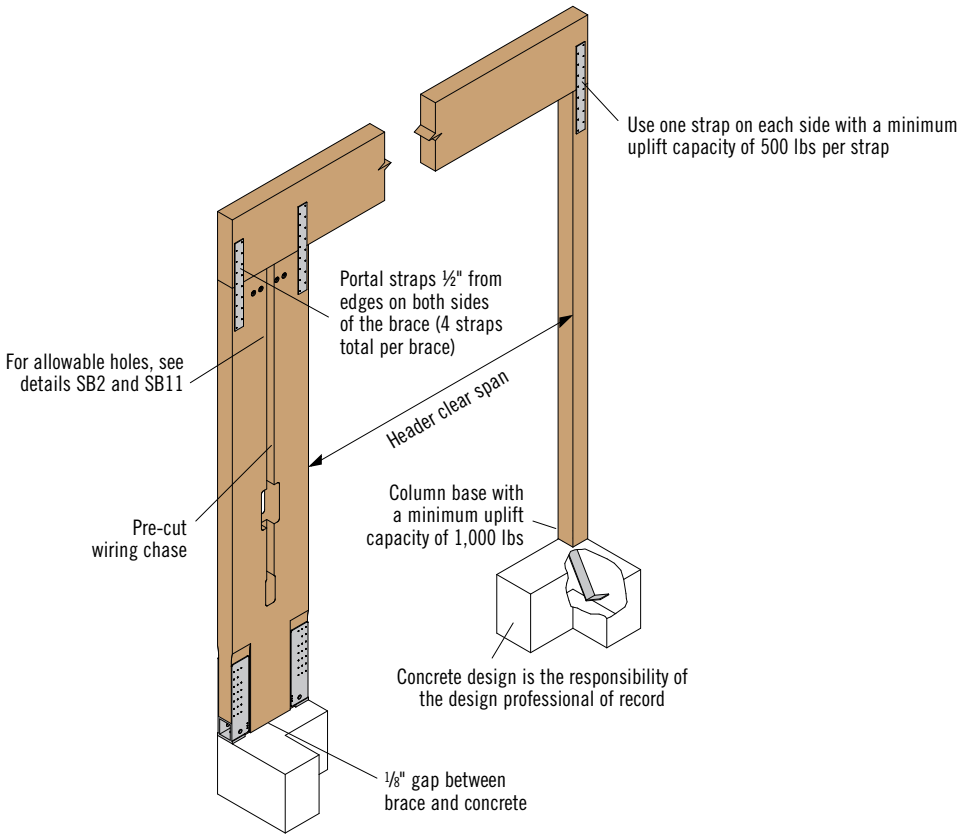
(1) Braces used in stand-alone applications (no portals) and installed according to the details in this guide.
(2) Braces used in a portal application and installed according to the details in this guide.
(3) Table values based on using Trus Joist® Portal Kit to resist header overturning.
(4) Use a load reduction factor of 0.88 for 16" deep headers; 0.78 for 18" deep headers.



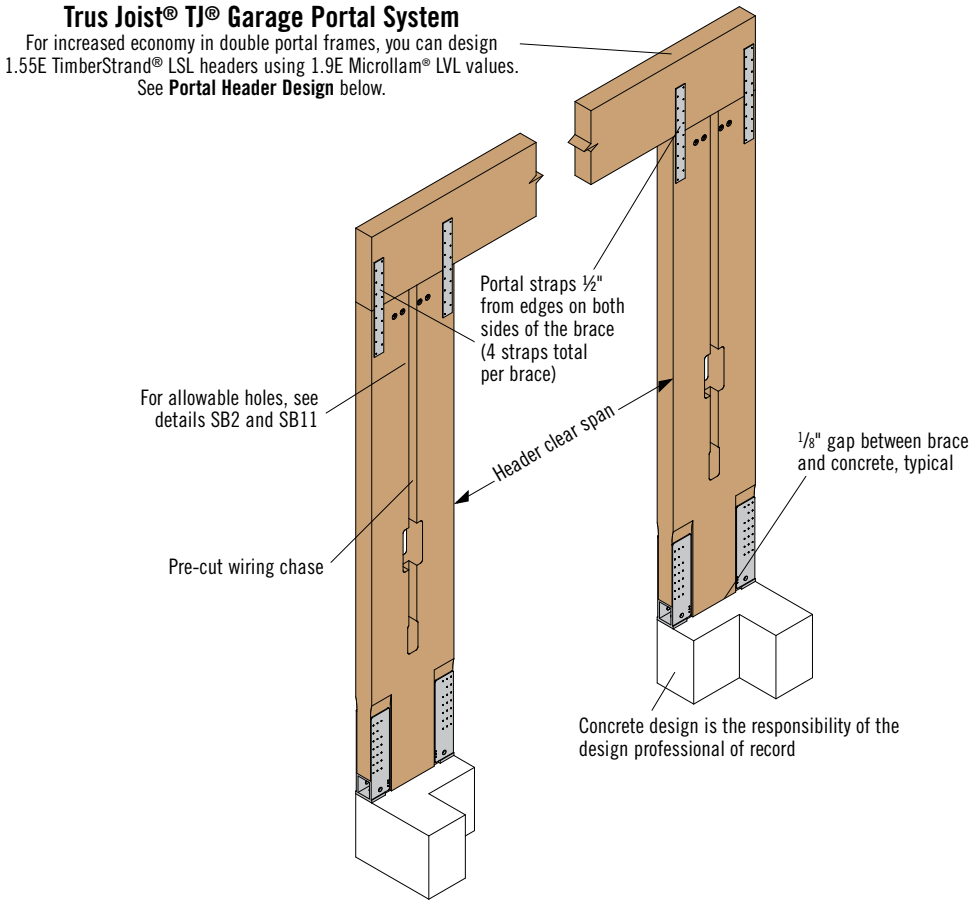
General Notes

- Table is based on:
  - Wall deflection of L/240.
  - Header depth (where applicable) of 14".
- No further increases for duration of load are permitted.
- Out-of-plane lateral loads consider the total vertical load.

SINGLE PORTAL DESIGN



DOUBLE PORTAL DESIGN



PORTAL DESIGN INFORMATION

Using Shear Braces in Portal Frame Assemblies

The portal shear braces listed in the tables under **Allowable Loads—Portal Frame** on pages 10 and 11 require the brace-to-header connection details shown throughout this guide. Increased shear capacity due to the portal acting as a system has been accounted for in the **Allowable Shear** values, where applicable.

- For portal installation details, see pages 16–18.
- For drilling and trimming information, see page 14.

Induced Forces

A portal frame under lateral loads causes the portal header to experience internal stresses in addition to those created by the primary loads (like gravity and wind). These additional stresses are called induced forces and must be considered when designing portal headers.

For headers with typical residential uniform loads, the induced moment and shear forces from a portal frame system do not control the design. This is due to the 160% duration of load (DOL) factor used in design and the location of the induced stresses. See ICC ES ESR-2652 for more information.

Portal Header Design

Both lateral and vertical allowable design loads shown in this guide for portal frames assume that the header size falls within the portal frame parameters listed below, and that the header and braces are connected per detail SB3, SB5, or SB12. When sizing a portal frame header for vertical load, refer to the **Minimum Portal Header Size** table on page 27 or the *Trus Joist® Beam, Header and Column Specifier's Guide* (reorder TJ-9000).

The TJ® Garage Portal system is a double portal frame consisting of two TJ® Shear Braces and a 1.55E TimberStrand® LSL header. When used in this system, a 1.55E TimberStrand® LSL header may be sized using 1.9E Microllam® LVL values only **if** it falls within the parameters below and meets the connection criteria stated above.

Portal-Header Allowable Design Parameters

Header Parameter	1.55E TimberStrand® LSL in TJ® Garage Portal System (Double Portal)	All Other Headers and Applications
Width	3½"(1)	3⅛"– 5½"
Depth	9¼"–16"	9¼"–18"
Clear Span	9'–18'-6"	9'–18'-6"
K(2)	≤ 265 lb/in.	90–4,000 lb/in.
F_b	2,600(3) psi	per TJ-9000

(1) 3½" wide headers can be one-piece members or two 1¾" plies.

(2) $K = Ebd^3/12L^3$, where E is modulus of elasticity (psi), and b, d, and L are the header width (in.), depth (in.), and clear span (in.), respectively.

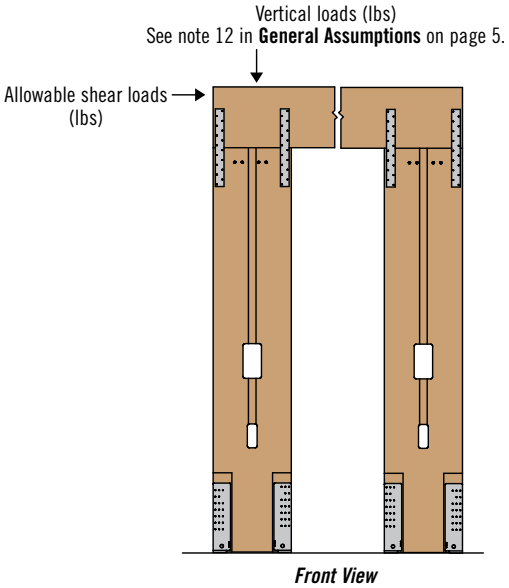
(3) For 12" depths. For other depths, multiply by $(12/d)^{0.136}$. F_b may be adjusted for duration of load not to exceed a maximum value of $[3{,}720(12/d)^{0.136}]$ psi.

Allowable Design Loads—Double Portals on Concrete Foundation

Nominal Brace Height[1]	TJ® Shear Brace	Total Vertical Load[2] (lbs)	2,500 psi Concrete Strength				2,500 psi Concrete Strength with Bearing Plate[3]				3,000 psi Concrete Strength			
			Seismic (SDC C-E)		Wind (SDC A-B)		Seismic (SDC C-E)		Wind (SDC A-B)		Seismic (SDC C-E)		Wind (SDC A-B)	
			Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)
7'	TJSB 12x7	6,000	2730	0.29	3,000	0.31	2,730	0.29	3,000	0.31	2,730	0.29	3,000	0.31
		8,000	2730	0.29	2,975	0.31	2,730	0.29	3,000	0.31	2,730	0.29	3,000	0.31
	TJSB 18x7	0	5,600	0.30	6,092	0.33	5,600	0.30	6,160	0.33	5,600	0.30	6,160	0.33
		2,000	5,600	0.30	5,677	0.30	5,600	0.30	6,160	0.33	5,600	0.30	6,160	0.33
		4,000	5,600	0.30	5,263	0.28	5,600	0.30	6,160	0.33	5,600	0.30	6,160	0.33
		6,000	5,600	0.30	4,848	0.26	5,600	0.30	6,101	0.33	5,600	0.30	5,796	0.31
		8,000	5,303	0.28	4,433	0.24	5,600	0.30	5,703	0.31	5,600	0.30	5,381	0.29
	TJSB 24x7[4]	8,000	10,300	0.29	10,400	0.30	10,300	0.29	10,400	0.30	10,300	0.29	10,400	0.30
7½'	TJSB 12x7.5	6,000	2,520	0.32	2,770	0.35	2,520	0.32	2,770	0.35	2,520	0.32	2,770	0.35
		8,000	2,520	0.32	2,714	0.34	2,520	0.32	2,770	0.35	2,520	0.32	2,770	0.35
	TJSB 18x7.5	0	5,380	0.34	5,558	0.35	5,380	0.34	5,910	0.37	5,380	0.34	5,910	0.37
		2,000	5,380	0.34	5,179	0.32	5,380	0.34	5,910	0.37	5,380	0.34	5,910	0.37
		4,000	5,380	0.34	4,801	0.30	5,380	0.34	5,910	0.37	5,380	0.34	5,666	0.35
		6,000	5,217	0.33	4,422	0.28	5,380	0.34	5,565	0.35	5,380	0.34	5,287	0.33
		8,000	4,838	0.31	4,044	0.25	5,380	0.34	5,203	0.33	5,380	0.34	4,909	0.31
8'	TJSB 12x8	6,000	2,310	0.35	2,540	0.39	2,310	0.35	2,540	0.39	2,310	0.35	2,540	0.39
		8,000	2,310	0.35	2,489	0.38	2,310	0.35	2,540	0.39	2,310	0.35	2,540	0.39
	TJSB 18x8	0	5,150	0.37	5,096	0.36	5,150	0.37	5,665	0.40	5,150	0.37	5,665	0.40
		2,000	5,150	0.37	4,749	0.34	5,150	0.37	5,665	0.40	5,150	0.37	5,542	0.39
		4,000	5,130	0.37	4,402	0.31	5,150	0.37	5,435	0.38	5,150	0.37	5,195	0.37
		6,000	4,783	0.34	4,055	0.29	5,150	0.37	5,103	0.36	5,150	0.37	4,848	0.34
		8,000	4,436	0.32	3,708	0.26	5,150	0.37	4,771	0.34	5,150	0.37	4,501	0.32
	TJSB 24x8	2,000	8,870	0.37	9,760	0.42	8,870	0.37	9,760	0.42	8,870	0.37	9,760	0.42
		4,000	8,870	0.37	9,672	0.42	8,870	0.37	9,760	0.42	8,870	0.37	9,760	0.42
		6,000	8,870	0.37	9,231	0.40	8,870	0.37	9,760	0.42	8,870	0.37	9,760	0.42
		8,000	8,870	0.37	8,790	0.38	8,870	0.37	9,760	0.42	8,870	0.37	9,760	0.42
9'	TJSB 12x9[5]	6,000	1,580	0.43	1,780	0.59	1,580	0.43	1,780	0.59	1,580	0.43	1,780	0.59
		8,000	1,580	0.43	1,764	0.58	1,580	0.43	1,780	0.59	1,580	0.43	1,780	0.59
	TJSB 18x9[5]	0	3,810	0.43	4,064	0.50	3,810	0.43	4,180	0.51	3,810	0.43	4,180	0.51
		2,000	3,810	0.43	3,787	0.46	3,810	0.43	4,180	0.51	3,810	0.43	4,180	0.51
		4,000	3,810	0.43	3,510	0.43	3,810	0.43	4,180	0.51	3,810	0.43	4,142	0.51
		6,000	3,810	0.43	3,233	0.39	3,810	0.43	4,069	0.50	3,810	0.43	3,866	0.47
		8,000	3,537	0.40	2,957	0.36	3,810	0.43	3,804	0.46	3,810	0.43	3,589	0.44
	TJSB 24x9[5]	2,000	7,810	0.42	8,590	0.47	7,810	0.42	8,590	0.47	7,810	0.42	8,590	0.47
		4,000	7,810	0.42	8,569	0.47	7,810	0.42	8,590	0.47	7,810	0.42	8,590	0.47
		6,000	7,810	0.42	8,178	0.45	7,810	0.42	8,590	0.47	7,810	0.42	8,590	0.47
		8,000	7,810	0.42	7,788	0.43	7,810	0.42	8,590	0.47	7,810	0.42	8,590	0.47

(1) For exact brace heights, see **Available TJ® Shear Braces** on page 2.
(2) See note 12 in **General Assumptions** on page 5.
(3) Minimum bearing plate sizes: ⅜" x 3½" x 4½" for 12" and 18" wide braces; ⅜" x 3½" x 6½" for 24" wide braces.
(4) 24x7 TJ® Shear Brace is trimmed from a 93¼" tall brace.
(5) The portal kit must be ordered separately when specifying braces over 100" tall.

*Also see **General Notes** on page 11.*



Front View

ALLOWABLE LOADS—PORTAL FRAME

Allowable Design Loads—Single Portals on Concrete Foundation

Nominal Brace Height[1]	TJ® Shear Brace	Total Vertical Load[2] (lbs)	2,500 psi Concrete Strength				2,500 psi Concrete Strength with Bearing Plate[3]				3,000 psi Concrete Strength			
			Seismic (SDC C-E)		Wind (SDC A-B)		Seismic (SDC C-E)		Wind (SDC A-B)		Seismic (SDC C-E)		Wind (SDC A-B)	
			Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)	Allowable Shear (lbs)	Drift at Allowable Shear (in.)
7'	TJSB 12x7	8,000	1,300	0.27	1,430	0.33	1,300	0.27	1,430	0.33	1,300	0.27	1,430	0.33
	TJSB 18x7	0	2,800	0.31	3,046	0.36	2,800	0.31	3,080	0.36	2,800	0.31	3,080	0.36
		2,000	2,800	0.31	2,839	0.33	2,800	0.31	3,080	0.36	2,800	0.31	3,080	0.36
		4,000	2,800	0.31	2,631	0.31	2,800	0.31	3,080	0.36	2,800	0.31	3,080	0.36
		6,000	2,800	0.31	2,424	0.28	2,800	0.31	3,050	0.36	2,800	0.31	2,898	0.34
		8,000	2,652	0.29	2,216	0.26	2,800	0.31	2,852	0.33	2,800	0.31	2,690	0.31
	TJSB 24x7[4]	4,000	5,150	0.29	5,200	0.30	5,150	0.29	5,200	0.30	5,150	0.29	5,200	0.30
		6,000	5,150	0.29	5,182	0.30	5,150	0.29	5,200	0.30	5,150	0.29	5,200	0.30
		8,000	5,150	0.29	4,935	0.28	5,150	0.29	5,200	0.30	5,150	0.29	5,200	0.30
7½'	TJSB 12x7.5	8,000	1,200	0.31	1,320	0.38	1,200	0.31	1,320	0.38	1,200	0.31	1,320	0.38
	TJSB 18x7.5	0	2,625	0.33	2,779	0.39	2,625	0.33	2,885	0.40	2,625	0.33	2,885	0.40
		2,000	2,625	0.33	2,590	0.36	2,625	0.33	2,885	0.40	2,625	0.33	2,885	0.40
		4,000	2,625	0.33	2,400	0.33	2,625	0.33	2,885	0.40	2,625	0.33	2,833	0.39
		6,000	2,608	0.33	2,211	0.31	2,625	0.33	2,783	0.39	2,625	0.33	2,644	0.37
		8,000	2,419	0.30	2,022	0.28	2,625	0.33	2,602	0.36	2,625	0.33	2,454	0.34
8'	TJSB 12x8	8,000	1,100	0.35	1,210	0.42	1,100	0.35	1,210	0.42	1,100	0.35	1,210	0.42
	TJSB 18x8	0	2,450	0.36	2,548	0.41	2,450	0.36	2,695	0.43	2,450	0.36	2,695	0.43
		2,000	2,450	0.36	2,375	0.38	2,450	0.36	2,695	0.43	2,450	0.36	2,695	0.43
		4,000	2,450	0.36	2,201	0.35	2,450	0.36	2,695	0.43	2,450	0.36	2,597	0.41
		6,000	2,392	0.35	2,027	0.32	2,450	0.36	2,551	0.41	2,450	0.36	2,424	0.39
		8,000	2,218	0.33	1,854	0.30	2,450	0.36	2,385	0.38	2,450	0.36	2,250	0.36
	TJSB 24x8	0	4,435	0.37	4,880	0.42	4,435	0.37	4,880	0.42	4,435	0.37	4,880	0.42
		2,000	4,435	0.37	4,749	0.41	4,435	0.37	4,880	0.42	4,435	0.37	4,880	0.42
		4,000	4,435	0.37	4,542	0.39	4,435	0.37	4,880	0.42	4,435	0.37	4,880	0.42
		6,000	4,435	0.37	4,335	0.37	4,435	0.37	4,823	0.42	4,435	0.37	4,880	0.42
		8,000	4,435	0.37	4,128	0.36	4,435	0.37	4,621	0.40	4,435	0.37	4,880	0.42
9'	TJSB 12x9[5]	8,000	790	0.43	882	0.58	790	0.43	890	0.59	790	0.43	890	0.59
	TJSB 18x9[5]	0	1,905	0.43	2,032	0.50	1,905	0.43	2,090	0.51	1,905	0.43	2,090	0.51
		2,000	1,905	0.43	1,893	0.46	1,905	0.43	2,090	0.51	1,905	0.43	2,090	0.51
		4,000	1,905	0.43	1,755	0.43	1,905	0.43	2,090	0.51	1,905	0.43	2,071	0.51
		6,000	1,905	0.43	1,617	0.39	1,905	0.43	2,034	0.50	1,905	0.43	1,933	0.47
		8,000	1,769	0.40	1,478	0.36	1,905	0.43	1,902	0.46	1,905	0.43	1,794	0.44
	TJSB 24x9[5]	0	3,905	0.42	4,295	0.47	3,905	0.42	4,295	0.47	3,905	0.42	4,295	0.47
		2,000	3,905	0.42	4,208	0.46	3,905	0.42	4,295	0.47	3,905	0.42	4,295	0.47
		4,000	3,905	0.42	4,024	0.44	3,905	0.42	4,295	0.47	3,905	0.42	4,295	0.47
		6,000	3,905	0.42	3,841	0.42	3,905	0.42	4,273	0.47	3,905	0.42	4,295	0.47
		8,000	3,905	0.42	3,657	0.40	3,905	0.42	4,094	0.45	3,905	0.42	4,295	0.47

▪ See page 10 for footnotes.

General Notes

- Tables are based on:
  - ASTM A449 or ASTM A193-B7 threaded rod for anchorage; 1" diameter for 24" wide braces, ⅞" for all others. See page 20 for anchorage options.
  - Portal header clear spans of 9' (minimum) to 18'-6" (maximum).
  - Vertical loads and shear loads acting in combination.
  - Anchorage details shown on pages 20–23. See **General Assumptions** on page 5 for uplift calculations and anchorage design.
- **Allowable Shear** and **Drift at Allowable Shear** are for the entire portal assembly.
- No further increases for duration of load are permitted.
- Interpolation is allowed; use the values for the two closest heights, or use the allowable loads of the taller brace. For braces less than 78" tall, use the values for a 78" tall brace.
- Portal frame assemblies must be connected directly to a concrete foundation or footing.
- Braces may be trimmed to a minimum height of 74½ inches.
- For shimming and furring requirements, see details on pages 16–18.
- Portal braces may be used in 2x4 or 2x6 wall framing. See details SB5 and SB12 for header framing options.
- 12" braces (105¼" tall or less) and 18" and 24" braces (141¼" tall or less) are allowed in prescriptive applications as a braced wall alternate.

ALLOWABLE LOADS—STACKED SHEAR BRACES

Allowable Design Loads for Brace in Second Floor, Stacked Application

TJ® Shear Brace	Width	Height	Total Vertical Load (1) (lbs)	Seismic Design		Wind Design	
				Allowable Shear(2) (lbs)	Drift at Allowable Shear(2) (in.)	Allowable Shear(2) (lbs)	Drift at Allowable Shear(2) (in.)
TJSB 12x9(3)	12"	105¼"	2,000	500	0.44	550	0.50
TJSB 18x9	18"	105¼"	2,000	1,225	0.42	1,345	0.48
TJSB 24x9	24"	105¼"	2,000	2,165	0.41	2,380	0.46
TJSB 18x10	18"	117¼"	2,000	1,125	0.47	1,235	0.53
TJSB 24x10	24"	117¼"	2,000	1,990	0.46	2,190	0.52
TJSB 18x11	18"	129¼"	2,000	1,020	0.52	1,120	0.59
TJSB 24x11	24"	129¼"	2,000	1,815	0.51	1,995	0.59
TJSB 18x12	18"	141¼"	2,000	920	0.57	1,010	0.64
TJSB 24x12	24"	141¼"	2,000	1,640	0.57	1,805	0.65

(1) See note 12 in **General Assumptions** on page 5.

(2) Interpolation of **Allowable Shear** and **Drift at Allowable Shear** values is allowed; use the values for the two closest heights. Minimum brace height of 105¼" required.

(3) 12x9 brace does not qualify as a prescriptive braced unit in a second floor application.

Allowable Design Loads for Brace in First Floor, Stacked Application

TJ® Shear Brace	Width	Height	Total Vertical Load(1)(2) (lbs)	Kx10⁹ (lb-in²)	Seismic Design	Wind Design
					Allowable Shear(3)(4) (lbs)	Allowable Shear(3)(4) (lbs)
TJSB 18x8	18"	93¼"	4,000	9.7	2,215	2,435
TJSB 24x8	24"	93¼"	4,000	19.4	4,435	4,880
TJSB 18x9	18"	105¼"	4,000	10.3	1,905	2,090
TJSB 24x9	24"	105¼"	4,000	21.5	3,905	4,295
TJSB 18x10	18"	117¼"	4,000	11.6	1,725	1,895
TJSB 24x10	24"	117¼"	4,000	22.6	3,325	3,660
TJSB 18x11	18"	129¼"	4,000	12.5	1,530	1,685
TJSB 24x11	24"	129¼"	4,000	24.8	3,010	3,315
TJSB 18x12	18"	141¼"	4,000	12.8	1,340	1,475
TJSB 24x12	24"	141¼"	4,000	26.5	2,695	2,965

(1) See note 12 in **General Assumptions** on page 5.

(2) Maximum vertical load = second floor axial load (2,000 lbs) + first floor axial load (4,000 lbs) = 6,000 lbs.

(3) Interpolation of **Allowable Shear** values is allowed; use the values for the two closest heights. Minimum brace height of 93¼" required.

(4) Drift of first floor brace must comply with code drift limits. Calculate drift using the equation shown at right.

General Notes

- No further increases for duration of load are permitted.
- The maximum reactions for footings shown on this page are based on the information on page 20–23.
- In a stacked application, use a TJ® Shear Brace on the first floor that will extend the height of the wall and the floor system. See detail SB9.
- The second story brace must be the same width or narrower than the first floor brace.
- When specifying the height of second floor braces, add the total floor height, including sheathing, to the wall height, then subtract 2"; see h_3 at right. Maximum height for second floor braces is 141¼".
- See page 17 for installation details.
- See page 13 for design procedures and for allowable brace combinations for stacked shear braces in prescriptive applications.
- Axial loads and shear loads are assumed to act in combination.

Maximum Allowable Base Overturning Moment(1) (in-lbs)

First Floor Brace Width	Total Vertical Load(2) (lbs)	Concrete Strength					
		2,500 psi		2,500 psi with Bearing Plate(3)		3,000 psi	
		Seismic SDC C-E	Wind SDC A-B	Seismic SDC C-E	Wind SDC A-B	Seismic SDC C-E	Wind SDC A-B
18"	0	216,115	213,845	216,115	237,740	216,115	237,740
	2,000	216,115	199,280	216,115	237,740	216,115	232,555
	4,000	215,270	184,715	216,115	228,065	216,115	217,995
	6,000	200,705	170,155	216,115	214,130	216,115	203,430
24"	0	413,590	455,015	413,590	455,015	413,590	455,015
	2,000	413,590	442,845	413,590	455,015	413,590	455,015
	4,000	413,590	423,535	413,590	455,015	413,590	455,015
	6,000	413,590	404,220	413,590	449,745	413,590	455,015

(1) Values in this table may not be interpolated.

(2) See note 12 in **General Assumptions** on page 5.

(3) Minimum bearing plate sizes: ⅜" x 3½" x 4¼" for 18" wide braces and ⅜" x 3½" x 6½" for 24" wide braces.

Drift Equation for First Floor Braces

$$\Delta = \frac{h_1^2}{K}(3V_2h_3 + 2V_{base}h_1)$$

Δ .....deflection at the top of the first floor brace (in.)

h_1 .....first floor brace height: Top of concrete to the bottom of the second floor top plates (in.)

h_2 .....total assembly height: Top of concrete to the bottom of the second floor top plates (in.)

h_3 .....second floor brace height (h_4 minus 2"): Top of the LSL bearing block to the bottom of the second floor top plates (in.)

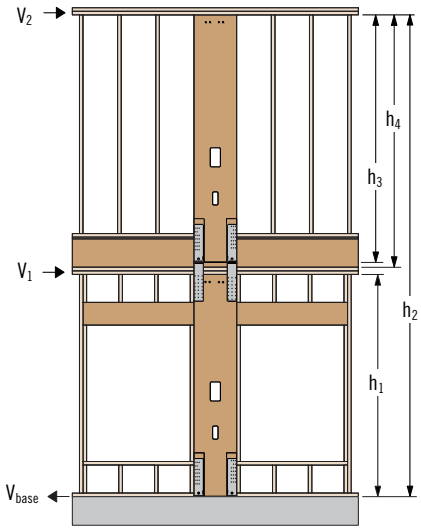
h_4 .....top of first floor top plates to the bottom of the second floor top plates (in.)

V_1 .....applied shear load on first floor brace (lbs)

V_2 .....applied shear load on second floor brace (lbs)

V_{base}.....$V_1 + V_2$ (lbs)

K .....from table (lb-in²)



Shear capacities shown are for individual braces only. To resist forces at both upper and lower floors in a two-story application, check the shear at each floor against the maximum capacity for EACH brace. Check the overturning moment (OM) against the maximum capacity for the system. See page 13 for an example.

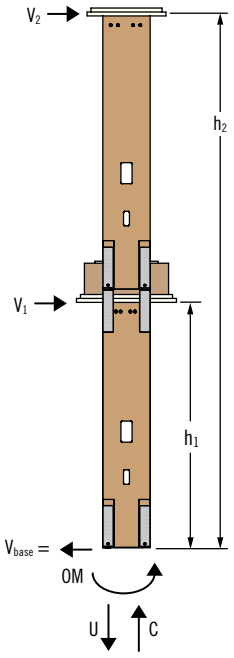
OM = (V_2h_2) + (V_1h_1)

OVERTURNING FORCES—STACKED SHEAR BRACES

Allowed Combinations for Stacked TJ® Shear Braces in Wind- or Seismic-Controlled Prescriptive Applications

Bottom TJ® Shear Brace	Top TJ® Shear Brace							
	TJSB 18x9	TJSB 18x10	TJSB 18x11	TJSB 18x12	TJSB 24x9	TJSB 24x10	TJSB 24x11	TJSB 24x12
TJSB 18x8	W	W/S	W	W	–	–	–	–
TJSB 18x9	W	W	W	W	–	–	–	–
TJSB 18x10	W	W	W	–	–	–	–	–
TJSB 18x11	–	–	–	–	–	–	–	–
TJSB 18x12	–	–	–	–	–	–	–	–
TJSB 24x8	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S
TJSB 24x9	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S
TJSB 24x10	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S
TJSB 24x11	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S
TJSB 24x12	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S

- W indicates allowed brace combination for SDC A-B; S indicates allowed combinations for SDC C-D_2.
- See page 29 for prescriptive anchorage requirements.
- Maximum vertical load of 2,000 lbs.
- Bearing plates required, see page 4 for dimensions.



Elevation of stacked braces, and the structural forces developed during lateral events.

Designing for Overturning Forces

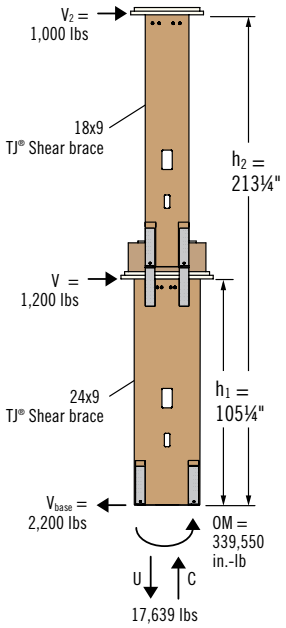
When specifying stacked shear brace applications, it is important to consider overturning forces. Analysis should be performed by following these steps:

1. Analyze the structure to determine the shear forces at each floor. The detail at right illustrates the forces developed in a stacked shear brace.
2. Select a TJ® Shear Brace for each floor, and verify that the shear capacity of the brace meets or exceeds what is required. See below for more information.
3. Calculate the system's overturning moment and shear.
4. Compare the required forces to the TJ® Shear Brace capacity.

Calculating the Overturning Resistance of a Stacked Shear Brace

The maximum overturning resistance provided by a TJ® Shear Brace depends on the footing capacity, the anchor bolt capacity, and the brace capacity. For all TJ® Shear Braces, the anchorage capacity controls. See page 12 for **Maximum Allowable Base Overturning Moment**. For definitions of the variables used on this page, see **Drift Equation for First Floor Braces** on page 12.

Design Example



Given

- 2,500 psi, uncracked concrete
- SDC D; Wind speed = 100 mph (seismic controls)
- First floor wall height = 9'; shear brace choice = TJSB 24x9
- Second floor wall height = 8'; joist height = 11⅞"; shear brace choice = TJSB 18x9
- Second floor brace shear, V_2 = 1,000 lbs
  First floor brace shear, V_1 = 1,200 lbs
  Shear at footing, V_{base} = 2,200 lbs

Solution

1. From the **Maximum Allowable Base Overturning Moment** table on page 12, the maximum base overturning moment (OM_{max}) is: 413,590 in.-lb.
2. Compare the shear at each brace to the maximum allowable shear for each brace shown in the tables on page 12.

   Second floor brace: Allowable shear for an TJSB 18x9 = 1,225 lbs > 1,000 lbs required. OK.

   First floor brace: Allowable shear for an TJSB 24x9 = 3,905 lbs > 2,200 lbs (1,200 + 1,000 lbs) required. OK.
3. Calculate the required overturning moment (OM) using the shear at each floor and the floor heights:

   $OM = (V_2h_2) + (V_1h_1)$
   $OM = (1{,}000 \times 213.25) + (1{,}200 \times 105.25) = 339{,}550$ in.-lb.
4. Compare the allowed maximum base overturning moment (from step 1) to the required overturning moment. If the capacity is exceeded, consider adding an additional brace to the first floor.

   413,590 in.-lb > 339,550 in.-lb required. OK.

   The stacked TJSB 18x9 and TJSB 24x9 are adequate to resist the overturning and shear forces in this example.
5. Verify the vertical load limits for each brace as shown in the tables on page 12.
6. Verify the footing requirements for the stacked shear braces. Using tables on page 20, a 40" footing and an ℓ_e of 13" for uncracked concrete is required.
7. Verify the drift requirements for the first floor brace. Calculate the drift from the equation on page 12, and compare it to the maximum allowable seismic drift limit.

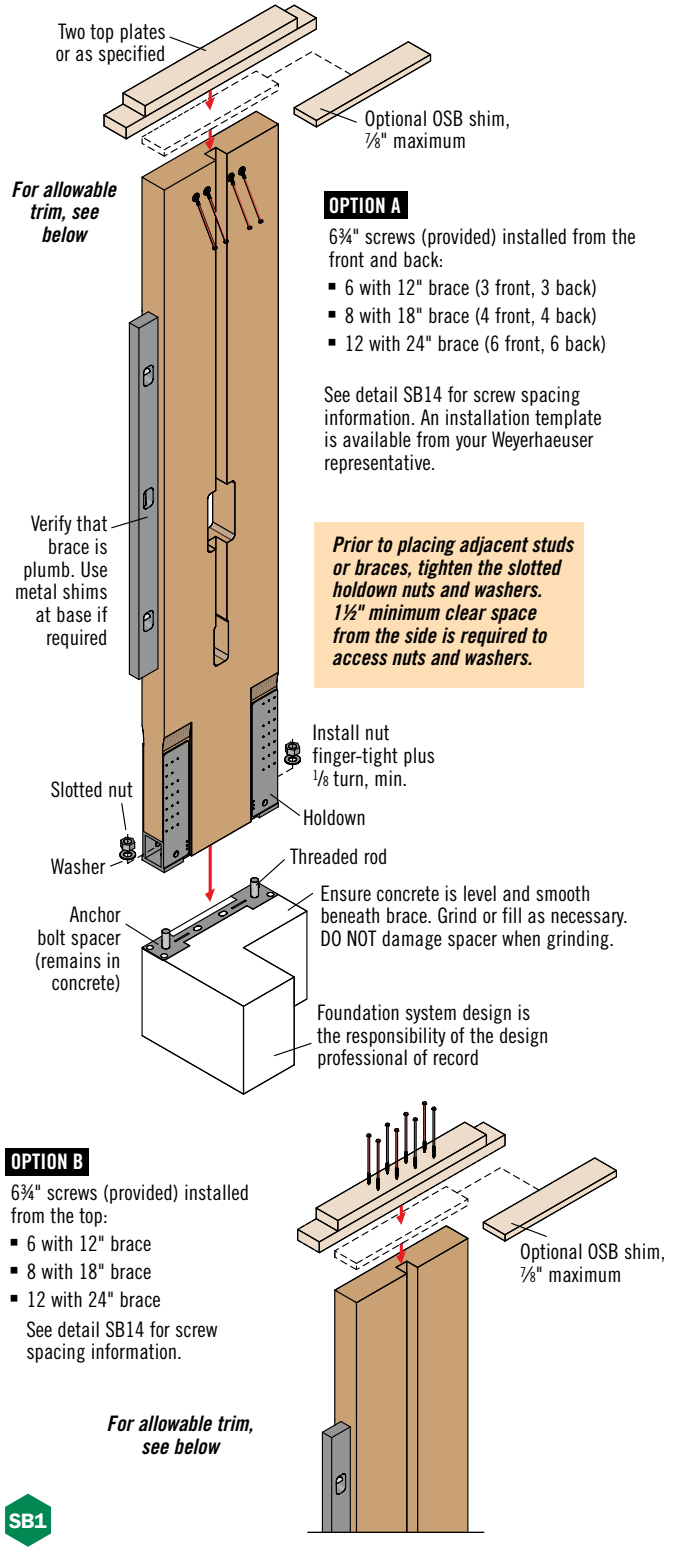
   $$\text{Maximum allowable drift} = \frac{105.25" \times 2.5\%}{4 \times 1.4} = 0.47"$$

   $$\Delta = \frac{(105.25")^2}{21.5 \times 10^9}\ [3(1{,}000 \times 105.25") + 2(2{,}200 \times 105.25")]$$

   $\Delta = 0.41" < 0.47"$ OK

INSTALLATION DETAILS, TRIM ZONES, AND ALLOWABLE HOLES

Stand-Alone TJ® Shear Brace Installation



OPTION A

6¾" screws (provided) installed from the front and back:

- 6 with 12" brace (3 front, 3 back)
- 8 with 18" brace (4 front, 4 back)
- 12 with 24" brace (6 front, 6 back)

See detail SB14 for screw spacing information. An installation template is available from your Weyerhaeuser representative.

Prior to placing adjacent studs or braces, tighten the slotted holdown nuts and washers. 1½" minimum clear space from the side is required to access nuts and washers.

OPTION B

6¾" screws (provided) installed from the top:

- 6 with 12" brace
- 8 with 18" brace
- 12 with 24" brace

See detail SB14 for screw spacing information.

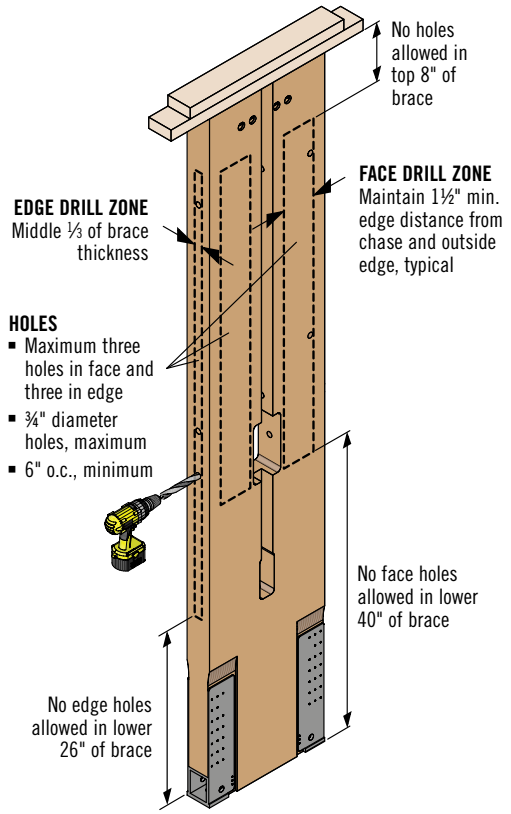
SB1

Allowable Trim

- Trim height from the top of the brace only. Do not trim the sides or bottom.
- **Braces may be trimmed down to a minimum height of 74½".**

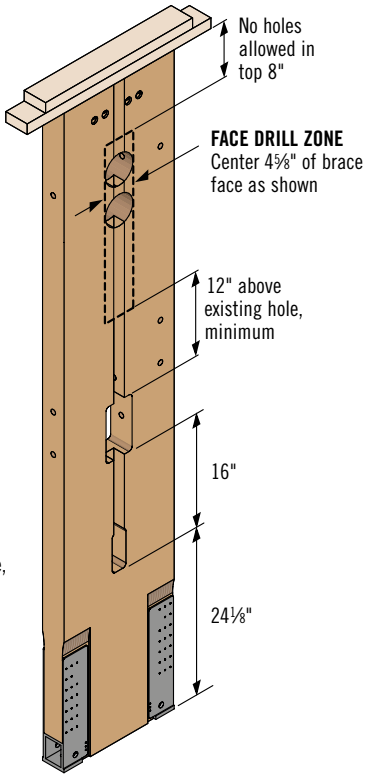
WARNING: Drilling, sawing, sanding or machining wood products generates wood dust, a substance known to the State of California to cause cancer. For more information on Proposition 65, visit wy.com/inform.

Allowable Small Holes—All Braces



SB2

Allowable Large Holes—All Braces
(in addition to allowable small holes above)



HOLES

- 4⅝" diameter holes, maximum
- Maximum two 4⅝" holes or one 4¼" x 12" hole
- No minimum on-center spacing required

HOLES for 24x7 BRACE ONLY

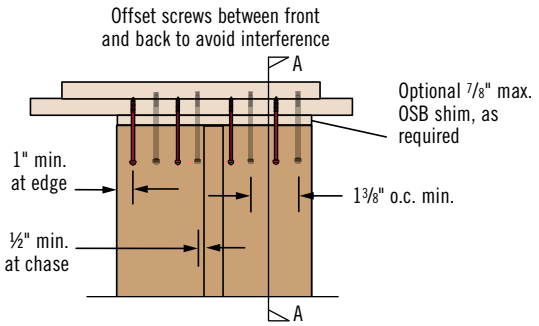
- Maximum one 4⅝" x 6" diameter hole
- 8" from top of brace, minimum

SB 11

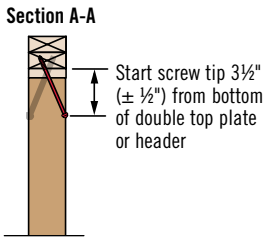
Visit woodbywy.com/walls/w_shear-brace.aspx for complete CAD details

SCREW SPACING OPTIONS FOR INSTALLATION DETAILS

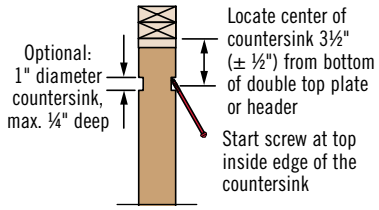
Stand-Alone Brace—Screw Option A



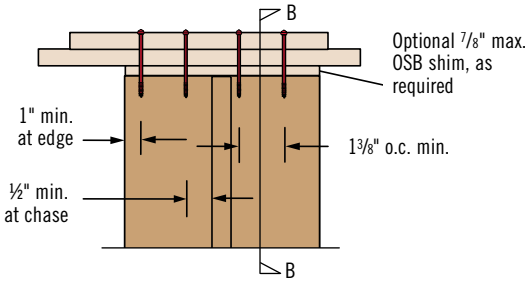
DO NOT install screws in center electrical chase



Install at an angle that prevents screws from exiting sides of top plates or header

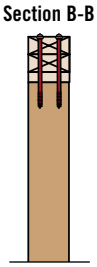


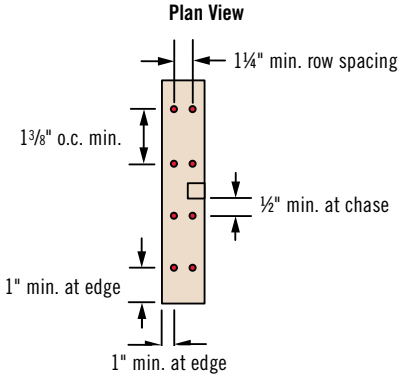
Stand-Alone Brace—Screw Option B



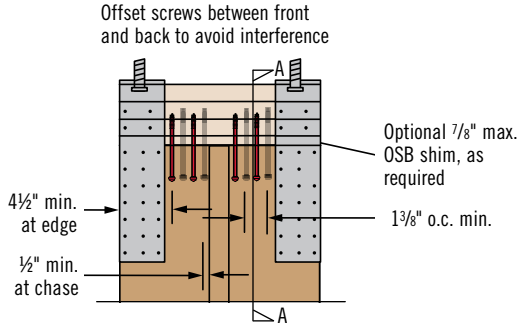
SB 14

DO NOT install screws in center electrical chase

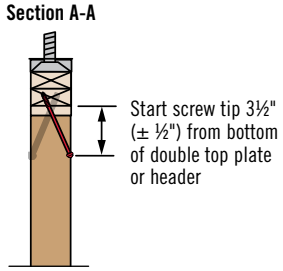




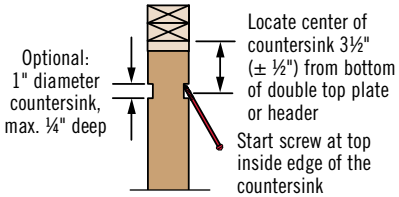
Multistory Brace—Screw Option A



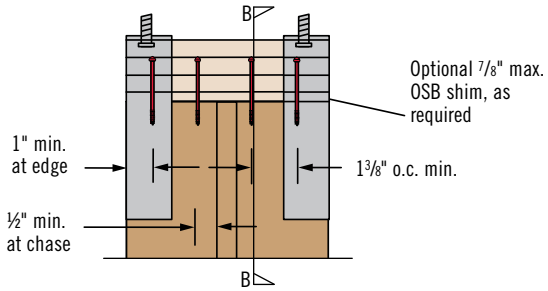
DO NOT install screws in center electrical chase



Install at an angle that prevents screws from exiting sides of top plates or header

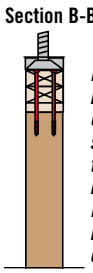


Multistory Brace—Screw Option B

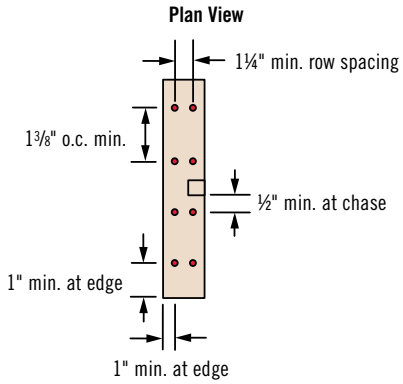


SB 15

DO NOT install screws in center electrical chase. If a code inspection is required for the connection, have it performed prior to installing the bearing block on top.

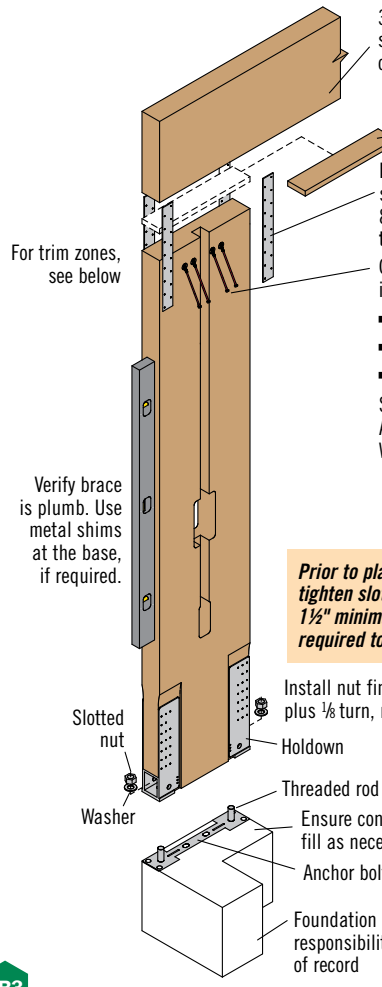


Install screws before installing bearing block. Countersink (½" max.) screw heads into the top plate to allow bearing block to sit flat. If a code inspection is required for the connection, have it performed prior to installing the bearing block on top.



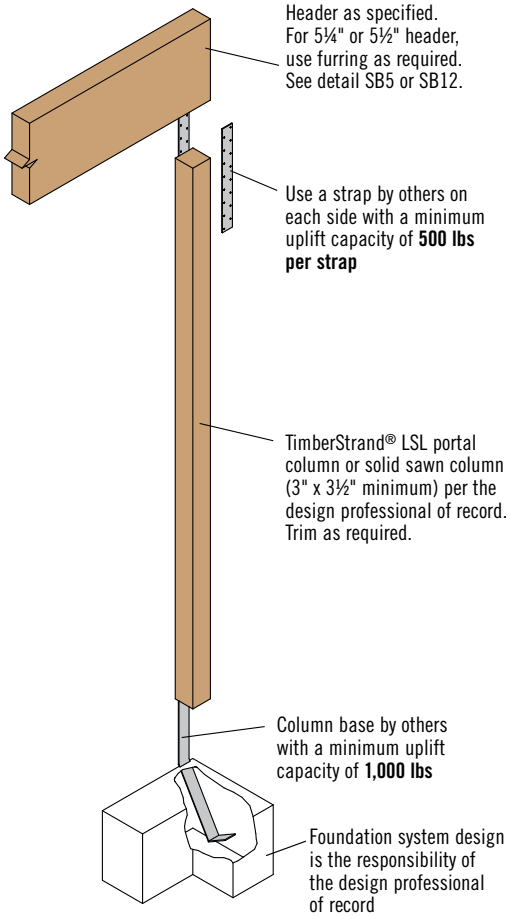
PORTAL INSTALLATION DETAILS

Portal Frame Shear Brace



SB3

Portal Frame Column



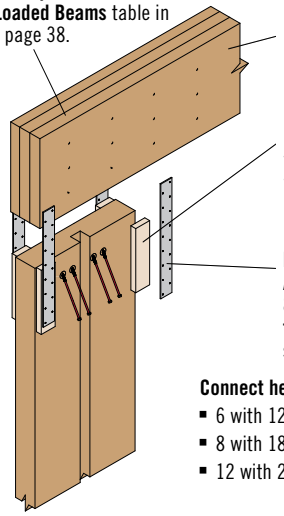
SB4

Portal Allowable Trim

- Trim height from the top of the brace only. Do not trim the sides or bottom.
- Braces may be trimmed down to a minimum height of 74½".

Concentric Header Connection

For multiple ply headers, connect plies using the **Multiple-Member Connections for Side-Loaded Beams** table in #TJ-9000, page 38.



(3⅛"–5½") wide x (9¼"–18") deep header as specified. **Center over brace width.**

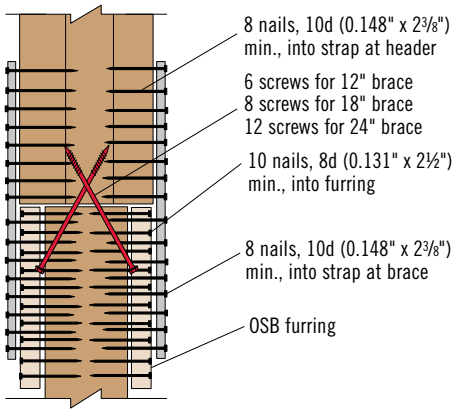
For 5¼" or 5½" wide headers, use a minimum 2½" x 10" furring of ⅞" thick OSB. Attach furring to each side of brace with ten 8d (0.131" x 2½") nails. With 3⅛" wide headers, attach ¼" thick furring to one side of header.

Portal straps: Maintain ½" edge distance. Attach with sixteen nails, 10d (0.148" x 2⅜") min., 8 into header and 8 into brace. **Straps are provided for braces under 100" tall. For taller braces, order straps separately.**

Connect header to brace with 6¾" screws (provided):

- 6 with 12" brace (3 front, 3 back)
- 8 with 18" brace (4 front, 4 back)
- 12 with 24" brace (6 front, 6 back)

SB5

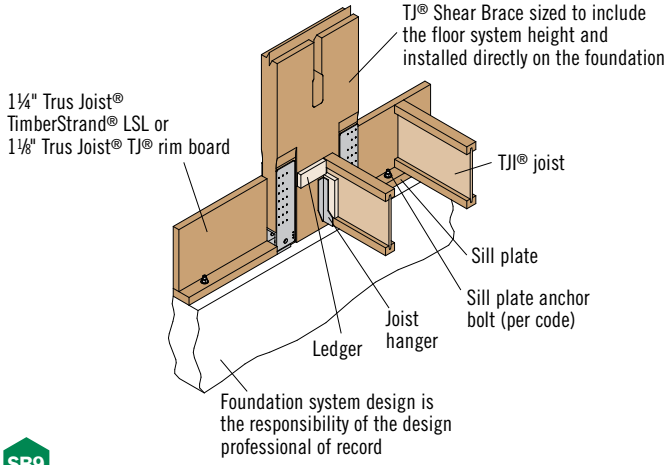


Furring strips may also be attached as shown in detail SB12.

INSTALLATION DETAILS

In-Line Shear Brace

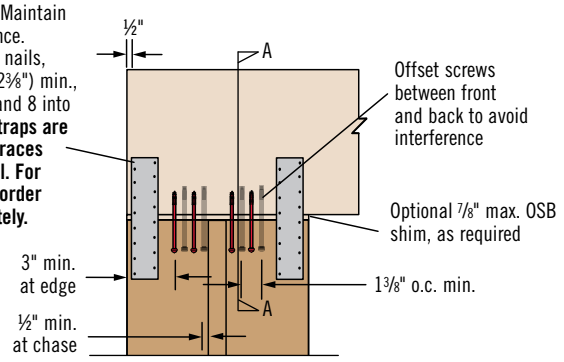
Specify brace height from the top of the foundation to the bottom of the top plate or beam. See dimension h_1 on page 12.



SB9

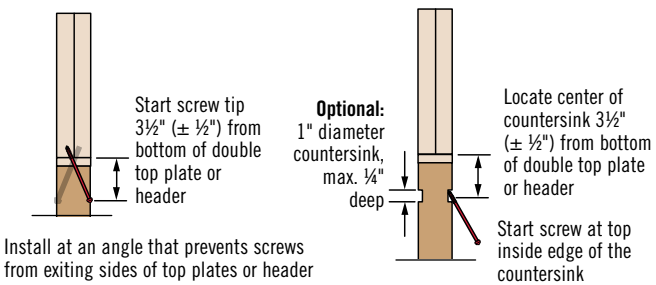
Portal Screw Detail

Portal straps: Maintain ½" edge distance. Attach with 16 nails, 10d (0.148" x 2⅜") min., 8 into header and 8 into shear brace. **Straps are provided for braces under 100" tall. For taller braces, order straps separately.**



DO NOT install screws in center electrical chase

Section A-A

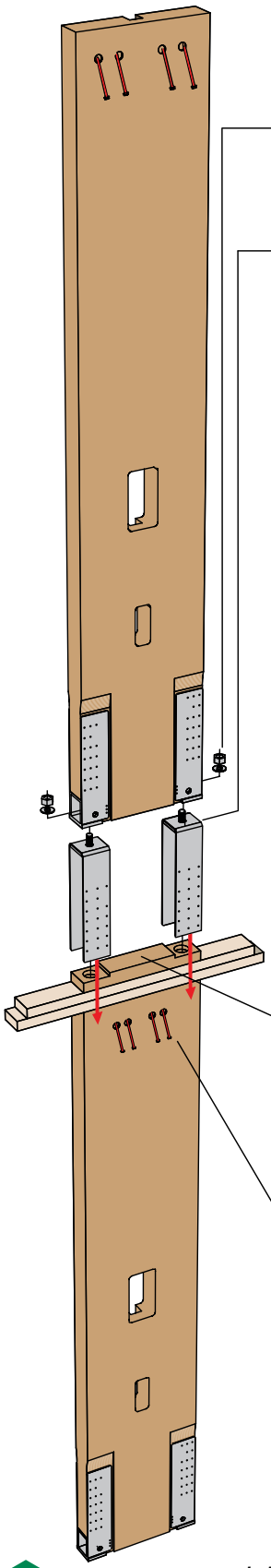


SB16

DO NOT use Option B screw installation with portal applications

Stacked Brace Installation

Second floor brace height includes wall height plus total floor height; see General Notes on page 12.

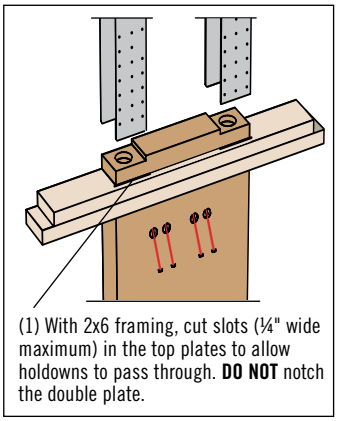


4 Install second story brace using the nuts and washers provided in the multistory kit.

3 Install holdowns over the bearing block and slide down the face of the TJ® Shear Brace(1). To ensure easy installation of second story brace, verify the following center-to-center bolt spacings:

- 8⅛" for 12" braces
- 14" for 18" braces
- 20" for 24" braces

Nail holdowns to the first story brace using 10d nails, (0.148" x 2½"). Fill all visible holes.



(1) With 2x6 framing, cut slots (¼" wide maximum) in the top plates to allow holdowns to pass through. **DO NOT** notch the double plate.

2 Align 2" tall bearing block (provided) over first story brace. To help secure the block while installing the holdowns, attach block to plates with one nail in each recessed hole.

1 Install first story brace and framing per detail SB15.

If using **Option B**, countersink (½" maximum) screws into the top plate to avoid interference with the bearing block. **DO NOT modify the bearing block.** If a code inspection is required for the connection, have it performed prior to installing the bearing block on top.

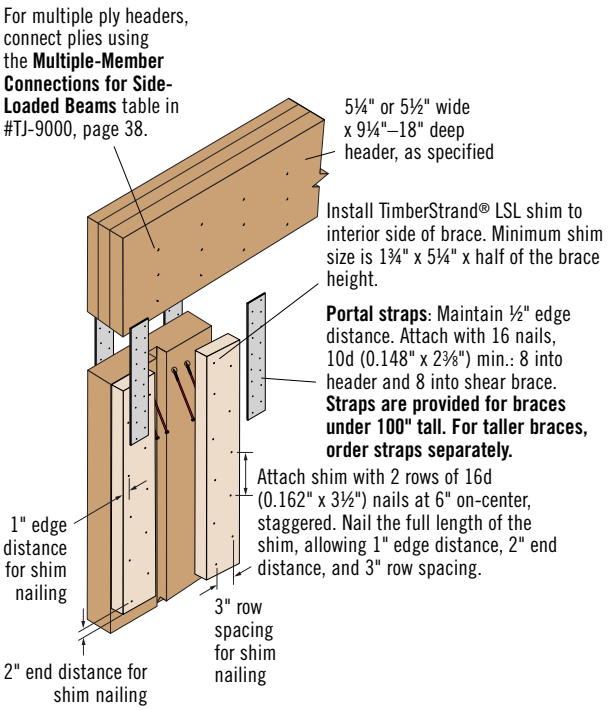
SB10

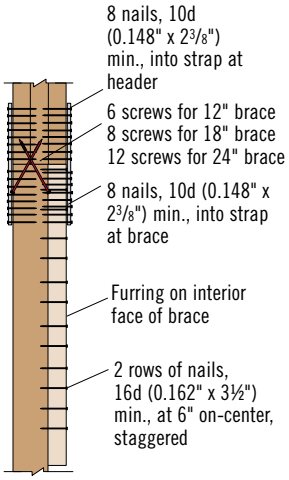
Ledgers and joist hangers may be attached directly to the brace. See detail SB9.

Visit woodbywy.com/walls/w_shear-brace.aspx for complete CAD details

INSTALLATION DETAILS

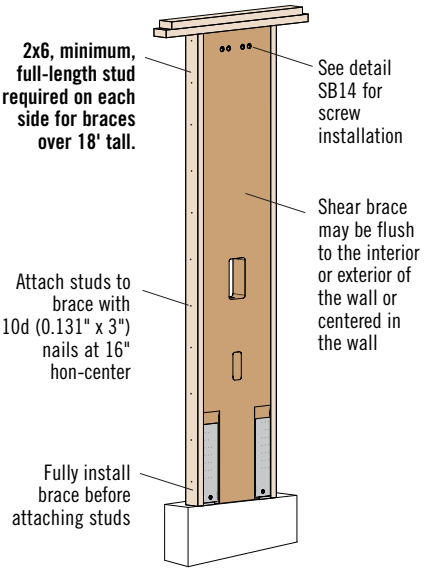
Offset Header





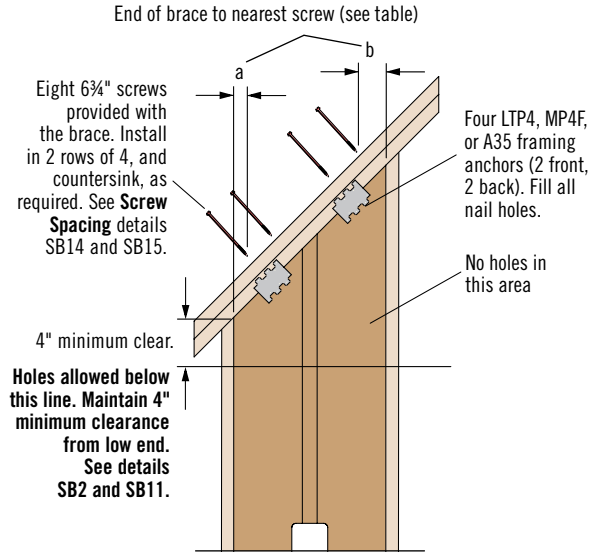
SB 12

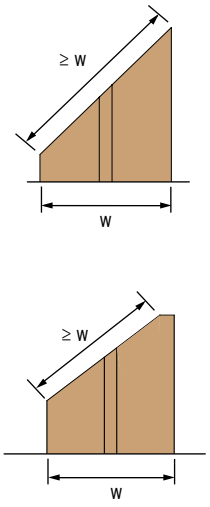
Tall Brace Framing
(braces over 18' tall)



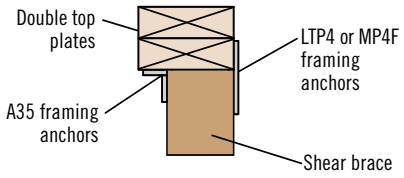
SB 17

Rake Wall





Section View for 2x6 or Wider Wall



End Distance for Screws

Slope	Distance a	Distance b
0:12 – 4:12	2"	3"
5:12 – 8:12	1½"	4½"
9:12 – 12:12	½"	5½"

- Maintain end distances to prevent screws from penetrating through the outer edges.
- Install screws perpendicular to the top plate.
- End distances assume double top plate.

General Notes

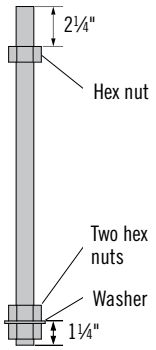
- Actual cut length must be greater than or equal to the brace's width (w).
- For slopes up to 12:12.
- Walls taller than 12' must be designed for the application.

SB 13

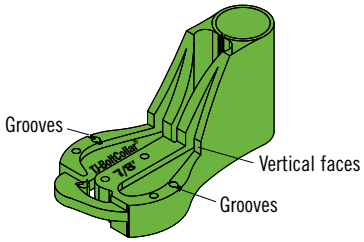
Anchor Bolt Installation

- See page 20 for anchor bolt imbedment depths.
- On the bottom end of each rod create a double nut and washer assembly by installing a washer between two hex nuts, leaving two threads showing at the bottom.
- On the top end of each rod, install a hex nut roughly 2¼" from the top. Set the anchor bolt spacer on the hex nuts.
- Slide the TJ-BoltCollar® anchor bolt holder over the threads, flush with the end of the threaded rod, and snap it shut (invert the anchor bolt holder depending on concrete form layout).
- Hand-tighten the hex nut to the underside of the anchor bolt spacer.
- Nail the anchor bolt assembly to the form edge using three nails (alignment depends on brace placement in the wall).
- **To better secure the assembly during concrete placement, tie the threaded rods to footing reinforcement.**

Threaded Rod Assembly

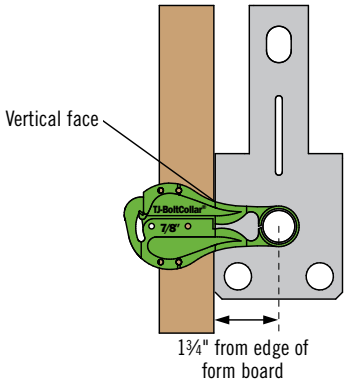


TJ-BoltCollar® Anchor Bolt Holder



Bolt Placement 1¾" from Concrete Edge

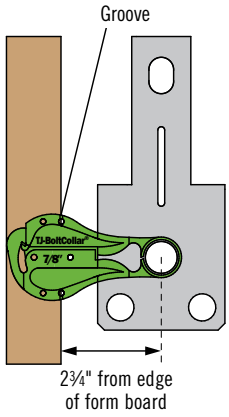
(for use with 4x portal headers, or when centering in 2x4 walls or placing flush to the outside of wider walls)



To install shear brace flush to the outside face of wall, align bolt holder's vertical faces with inside face of formwork

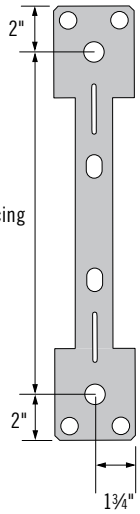
Bolt Placement 2¾" from Concrete Edge

(for use when centering in 2x6 walls)



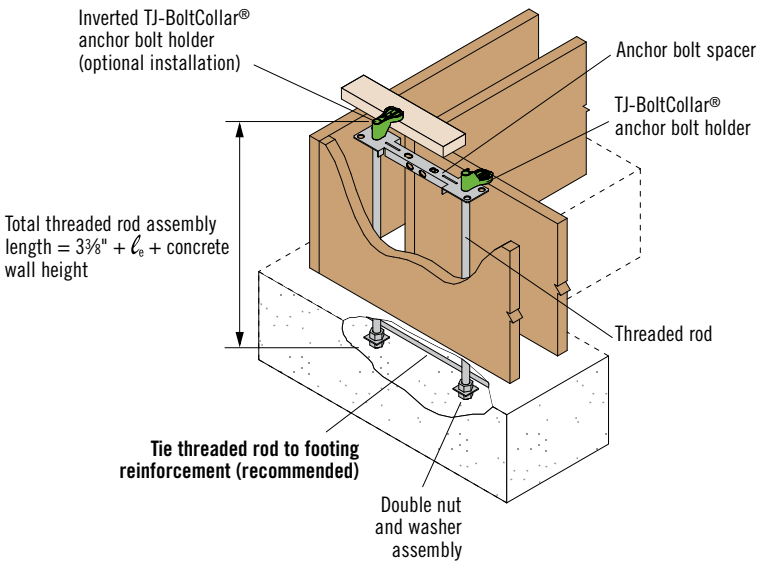
To install shear brace centered under 5½" header or beam, align bolt holder's grooves with inside face of formwork

Anchor Bolt Spacer



TJ® Shear Brace	Bolt Spacing
TJSB 12x	8⅛"
TJSB 18x	14"
TJSB 24x	20"

Bolt and Form-Work Installation



ANCHORAGE EMBEDMENT DEPTHS

Foundation systems are the responsibility of the design professional of record. Visit woodbywy.com/walls/w_shear-brace.aspx for complete CAD details

Anchorage Embedment Depths and Footing Dimensions for Uncracked Concrete Footings

Concrete Strength	TJ® Shear Brace	Anchor Bolt Diameter	Seismic (SDC C-E) Minimum Embedment and Footing Dimensions(1)					Wind (SDC A-B) Minimum Embedment and Footing Dimensions(1)				
			Embedment Depth, ℓ_e	Footing Width	C_1	C_2	C_3	Embedment Depth, ℓ_e	Footing Width	C_1	C_2	C_3
2,500 psi	TJSB 12x_	7/8"	8"	24"	10"	14"	10"	6"	19"	8"	11"	8"
	TJSB 18x_	7/8"	12"	36"	16"	20"	16"	8"	25"	11"	14"	11"
	TJSB 24x_	1"	13"	40"	18"	22"	18"	11"	33"	14"	19"	14"
3,000 psi	TJSB 12x_	7/8"	7"	22"	10"	12"	10"	6"	18"	7"	11"	7"
	TJSB 18x_	7/8"	11"	33"	15"	18"	15"	8"	24"	10"	14"	10"
	TJSB 24x_	1"	13"	38"	18"	20"	18"	10"	30"	14"	16"	14"

(1) C_1 and C_2 are measured from the edge of the widest section on the anchor bolt spacer. C_3 is measured from the end of the anchor bolt spacer. See detail below.

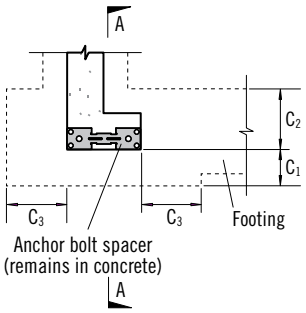
Anchorage Embedment Depths and Footing Dimensions for Cracked Concrete Footings

Concrete Strength	TJ® Shear Brace	Anchor Bolt Diameter	Seismic (SDC C-E) Minimum Embedment and Footing Dimensions(1)					Wind (SDC A-B) Minimum Embedment and Footing Dimensions(1)				
			Embedment Depth, ℓ_e	Footing Width	C_1	C_2	C_3	Embedment Depth, ℓ_e	Footing Width	C_1	C_2	C_3
2,500 psi	TJSB 12x_	7/8"	9"	27"	12"	15"	12"	7"	23"	10"	13"	9"
	TJSB 18x_	7/8"	14"	41"	18"	23"	18"	10"	30"	14"	16"	13"
	TJSB 24x_	1"	15"	46"	21"	25"	21"	12"	37"	17"	20"	17"
3,000 psi	TJSB 12x_	7/8"	9"	26"	12"	14"	12"	7"	21"	9"	12"	9"
	TJSB 18x_	7/8"	13"	39"	18"	21"	18"	9"	28"	12"	16"	12"
	TJSB 24x_	1"	14"	43"	20"	23"	20"	12"	36"	16"	20"	15"

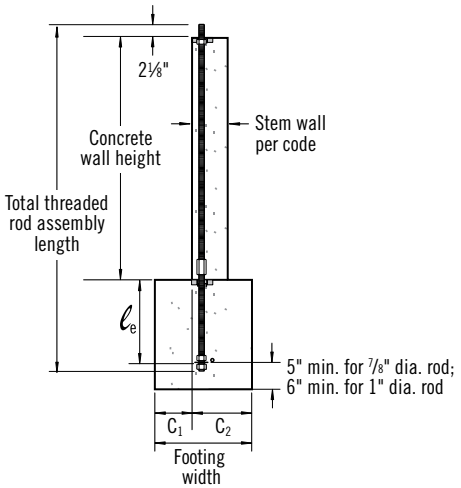
(1) C_1 and C_2 are measured from the edge of the widest section on the anchor bolt spacer. C_3 is measured from the end of the anchor bolt spacer. See detail below.

General Notes for Anchorage

- No increases for duration of load are permitted.
- Appropriate for use in areas governed by IBC or IRC and for all TJ® Shear braces.
- ℓ_e is measured from the top of the washer to the top of the footing.
- Anchorage embedment is based on ACI 318 Appendix D.
- Anchor bolts are ASTM A449 or ASTM A193 B7 threaded rods and are applicable for all braces and applications within this guide.
- ASTM A307 threaded rod may be substituted in all 12" wide brace applications.
- ASTM A307 threaded rod may be substituted in applications where the holdown uplift at allowable design shear for wind is less than:
  13,400 lbs for 7/8" diameter anchor bolts.
  17,575 lbs for 1" diameter anchor bolts.
- For additional information, see ICC ES ESR-2652, RR-25730.



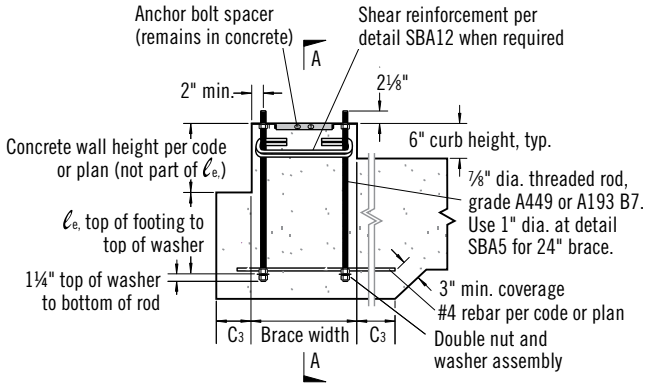
Section A–A

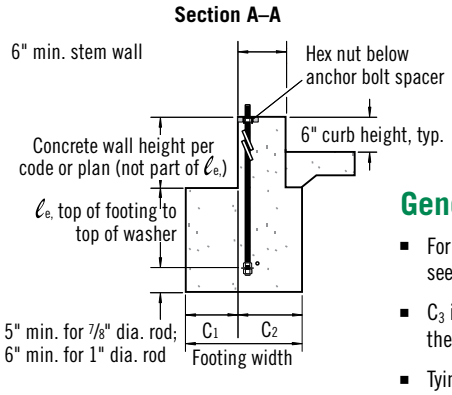


ANCHORAGE DETAILS

Foundation systems are the responsibility of the design professional of record. Visit woodbywy.com/walls/w_shear-brace.aspx for complete CAD details

Portal Anchorage at Garage Curb



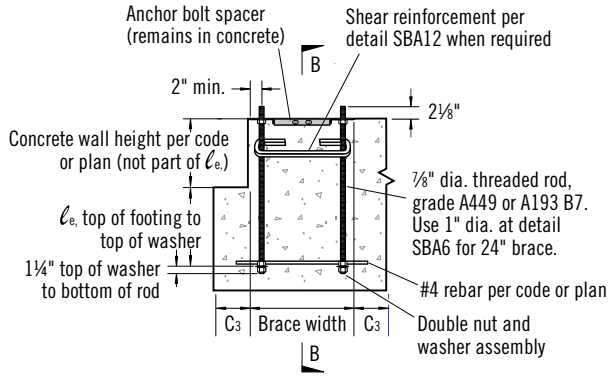


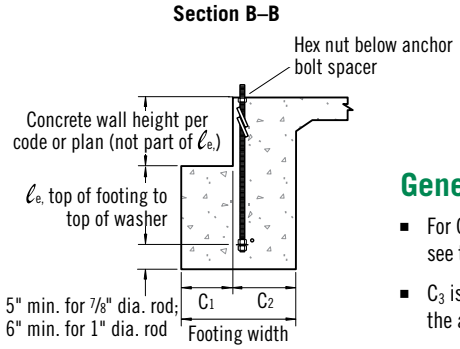
SBA 1 SBA 5

General Notes

- For C_1, C_2, C_3, and ℓ_e lengths, see tables on page 20.
- C_3 is measured from the end of the anchor bolt spacer.
- Tying threaded rods to footing reinforcement is recommended.

Concrete Foundation—Slab on Grade



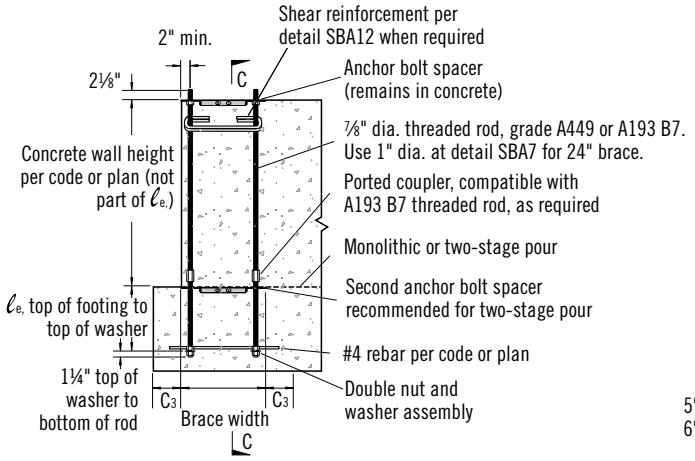


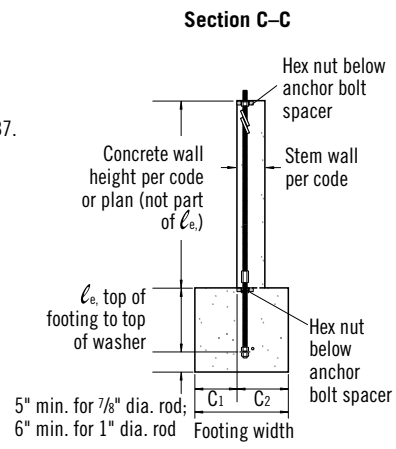
SBA 2 SBA 6

General Notes

- For C_1, C_2, C_3, and ℓ_e lengths, see tables on page 20.
- C_3 is measured from the end of the anchor bolt spacer.
- Tying threaded rods to footing reinforcement is recommended.

Concrete Foundation with Stem Wall or Basement





SBA 3 SBA 7

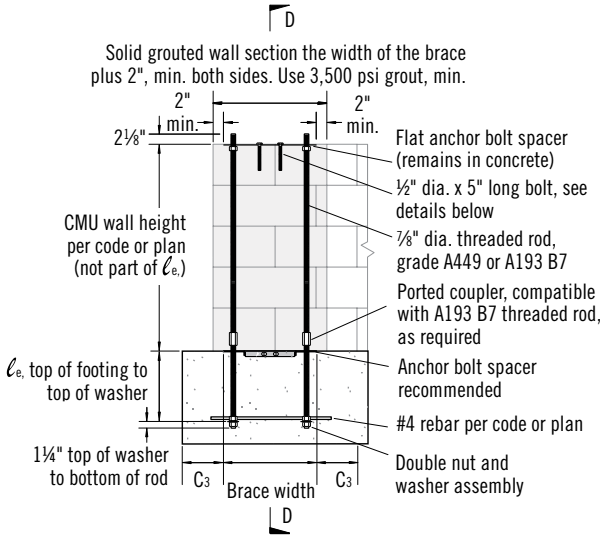
General Notes

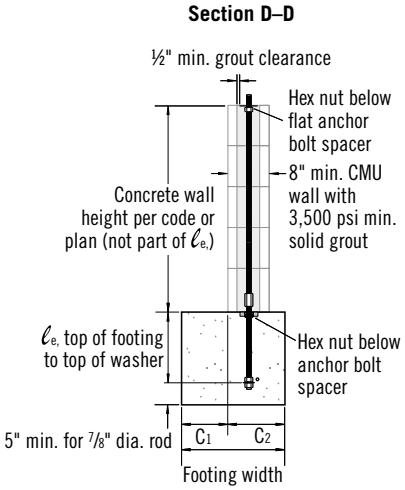
- For C_1, C_2, C_3, and ℓ_e lengths, see tables on page 20.
- For a two-stage pour, a second anchor bolt spacer is recommended. See detail.
- C_3 is measured from the end of the anchor bolt spacer.
- Tying threaded rods to footing reinforcement is recommended.

ANCHORAGE DETAILS

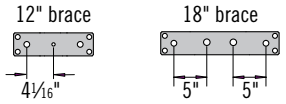
Foundation systems are the responsibility of the design professional of record. Visit woodbywy.com/walls/w_shear-brace.aspx for complete CAD details

Concrete Masonry Wall for Prescriptive Use Only (12" and 18" Braces Only)





Bolt Locations for Flat Anchor-Bolt-Spacer



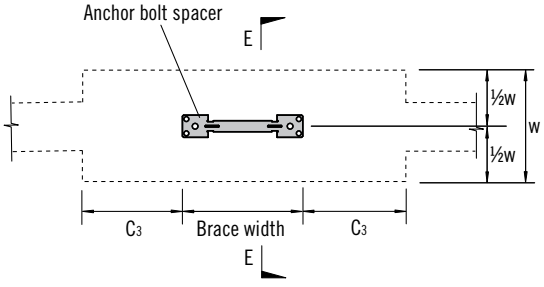
(Use existing holes. Order spacers separately.)

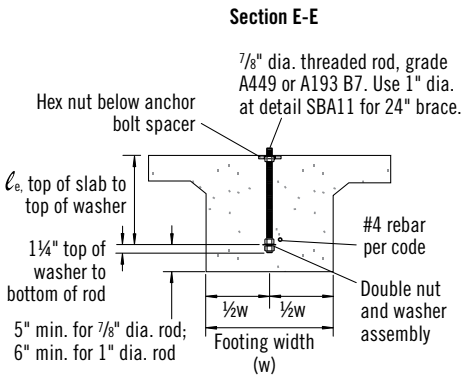
General Notes

- For C_1, C_2, C_3, and ℓ_e lengths, see table on page 29.
- For anchorage into CMU walls, the grout strength must be 3,500 psi, minimum.
- Two anchor bolt spacers are recommended:
  - Order flat anchor bolt spacer for CMU wall anchorage.
  - Use standard anchor bolt spacer for concrete footing.
- Notch bottom of shear brace (¼" x 1" x 1") to accommodate carriage bolts.
- C_3 is measured from the end of the anchor bolt spacer.
- Tying threaded rods to footing reinforcement is recommended.
- CMU wall design is the responsibility of the design professional of record and must be designed per 2009 IBC, Chapter 21.

SBA 4

Concrete Foundation—Interior Slab-on-Grade





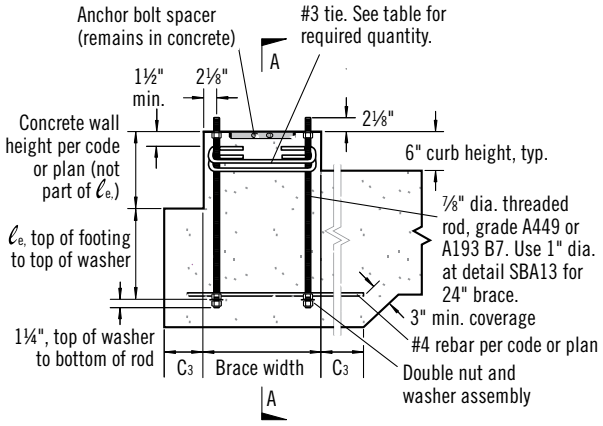
General Notes

- For footing widths, C_3, and ℓ_e lengths, see tables on page 20.
- C_3 is measured from the end of the anchor bolt spacer.
- Tying threaded rods to footing reinforcement is recommended.

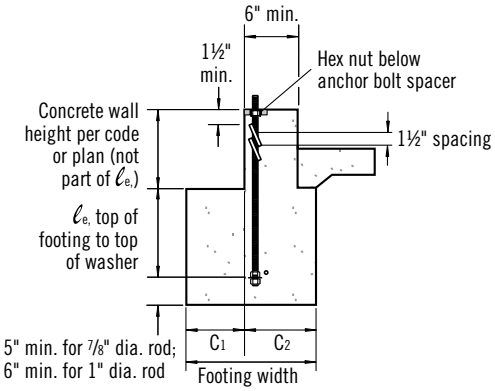
SBA 10 SBA 11

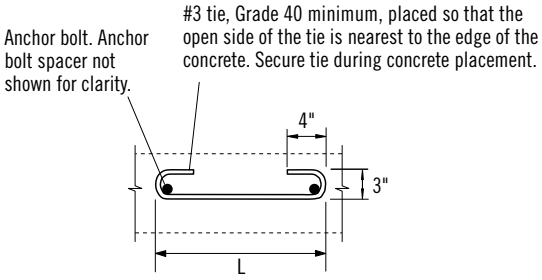
ANCHORAGE DETAILS

Anchorage Shear Reinforcement



Section A–A





TJ® Shear Brace	Seismic (SDC C-E) / Wind Design (SDC A-B)		
	L	Minimum Total Length of Rebar Required	Required Shear Reinforcement(1)
TJSB 12x_	–	–	None
TJSB 18x_	16 1/16"	26 5/16"	One #3 tie
TJSB 24x_	22¼"	32½"	Two #3 ties

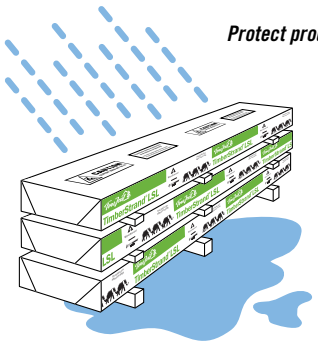
(1) Shear reinforcement in addition to the anchor bolt spacer.

General Notes

- For C_1, C_2, C_3, and ℓ_e lengths, see tables on page 20.
- C_3 is measured from the end of the anchor bolt spacer.
- Tying threaded rods to footing reinforcement is recommended.
- Shear anchorage designs conform to ACI 318-08 and assume a minimum f'_c = 2,500 psi concrete.
- Shear reinforcement is not required for braces in interior foundation applications (braces installed away from the edge of the concrete).
- Minimum curb/stemwall width is 6".

SBA 12 SBA 13

PRODUCT STORAGE



Protect product from sun and water

CAUTION:
Wrap is slippery when wet or icy

Use support blocks at 10' on-center to keep bundles out of mud and water

PRESCRIPTIVE WALL BRACING

What is Wall Bracing?

Wall bracing resists lateral (sideways) movement in a structure, and consists of a system of specially constructed wall segments tied to the roof and floor.

Prescriptive wall bracing requirements are commonly satisfied in one of four ways:

1. Construct 4'-wide wall sections of code-prescribed materials.
2. Construct narrow wall sections (at least 28" wide) of OSB (oriented strand board) or plywood and include tiedowns.
3. Use prefabricated wall sections designed to resist lateral loads.
4. Construct alternate site-built or prefabricated portal frames.

The most common panel materials used for wall bracing are 4' x 8' structural panels (OSB or plywood) or gypsum board. However, TJ® Shear Braces are strong enough that a single brace can replace most 4'-wide, site-built panels. See item 4 below for exceptions. Refer to section IRC R602.10 for specifics on braced wall requirements and construction methods.

Criteria for Prescriptive Design

The following conditions must be met in order to use prescriptive methods:

- Maximum building height of three stories.
- Wind speeds of less than 110 mph or less than 100 mph in hurricane regions. Check local building codes for any exceptions.
- Seismic design category (SDC) of A through D_2.
- Additional restrictions apply based on loads and building geometry. See Weyerhaeuser's *Conventional Construction Guide* (Reorder #1502) or contact your local building official.
- Some jurisdictions require an engineered design for all homes. Check with the local building official to determine if a house plan requires an engineered design or can be prescriptively specified.

Local wind speed and seismic categories can be obtained from your local building official.

How to PRESCRIPTIVELY Specify Braced Panels
(for 2009 IRC)

1. Define the wall line to be braced. All portions of the wall line must be within 4' of the braced wall line. See page 25.
2. Calculate the bracing required for the wall line based on wind(1) and seismic(2) requirements. Use the longer of the two. The total length of bracing required depends on the following conditions:

Wind

- Bracing method
- Number of Stories
- Story location
- Spacing between braced wall lines
- Basic wind speed
- Exposure
- Roof eave-to-ridge height
- Wall height
- Number of braced wall lines
- Presence or absence of attached gypsum board
- Presence or absence of holdown devices

Seismic

- Bracing method
- Number of Stories
- Story location
- Story height
- Braced-wall-line length
- Spacing between braced wall lines
- Seismic design category
- Soil site class
- Wall, roof, and ceiling dead loads

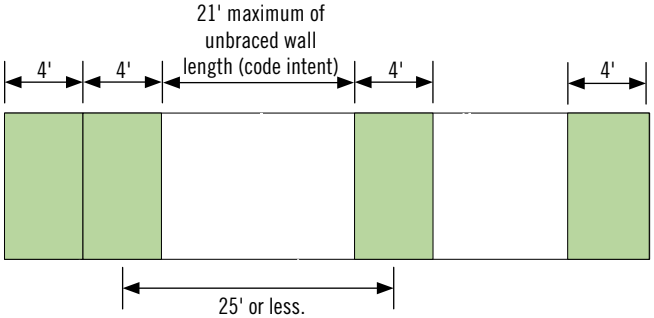
In an intermittent panel design (as opposed to a continuously sheathed design), the code-minimum lengths for each panel must be met.(3)

3. Adjust the panel locations at both ends of the wall line and in between as required to meet code. In general, the following apply for intermittent panels:
   - The maximum distance between the center lines of panels is 25', resulting in a maximum of 21' of unbraced length. **See Figure 1.**
   - The combined distances from the ends of the wall to the nearest edge of a braced wall panel (End distance 1 + End distance 2) cannot be more than 12'-6". **See Figure 2.**
   - For seismic category D_0, D_1, D_2, panels must be placed at the ends of the wall line. Refer to the 2009 IRC, R602.10.1.4.1 for exceptions. Note: A TJ® Shear Brace may be located up to 8' from the end of the braced wall line in seismic category D.
4. Verify that the total length of braced wall panels provided meets or exceeds the requirements developed in step 2 above. If needed, add additional bracing until the result meets or exceeds the requirement. Note that most TJ® Shear Braces count as 4' of wall bracing regardless of their actual width; **however**, braces over certain heights do not qualify. Those conditions are:
   - 12" wide braces taller than 105½", and
   - 18" and 24" wide braces taller than 141½"
5. If a wall line cannot meet the bracing requirements following this procedure, additional analysis may be required or the wall line may need to be modified. Contact your Weyerhaeuser representative for assistance.

Footnotes

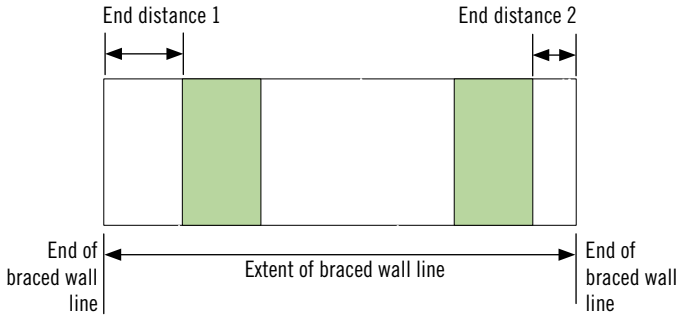
(1) In accordance with the 2009 IRC, Table R602.10.1.2(1) and adjusted by any applicable factors from the footnotes.
(2) In accordance with the 2009 IRC, Table R602.10.1.2(2) and adjusted by any applicable factors in Table R602.10.1.2(3).
(3) In accordance with the 2009 IRC, Table R602.10.3.

Figure 1: Maximum spacing between panels



Braced wall panel spacing is measured from the center of the first 4' panel to the center of the next panel.

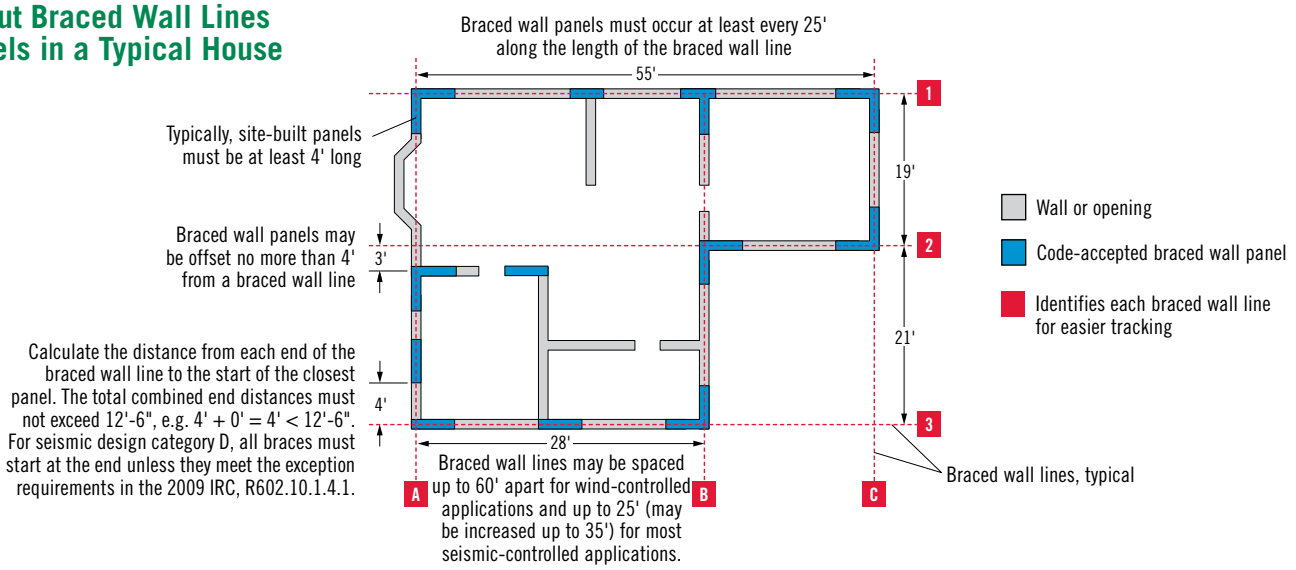
Figure 2: End Distance



End distance 1 plus End distance 2 must not exceed 12'-6". If a panel is located at the end of a braced wall line, the end distance is zero.

PRESCRIPTIVE BRACING REQUIREMENTS

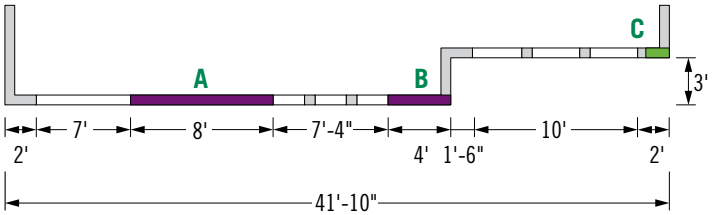
Laying Out Braced Wall Lines and Panels in a Typical House

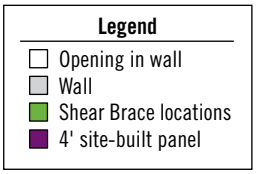


PRESCRIPTIVE BRACE EXAMPLE

Example 1: Wind Controlled

Determine the required bracing for the wall line shown:





Given:

- First story of a two-story, single-family residence.
- Dead loads: Wall = 10psf; roof/ceiling = 12psf
- Wind speed = 100 mph
- Exposure category B; soil site class D
- Seismic category (SDC) A
- Total exterior wall length = 41'-10"
- Eave-to-ridge height = 9'-0"; wall height = 9'-0"
- 3 braced wall lines; spacing = 25'
- Applied interior gypsum
- Bracing method to be wood structural panels (WSP) and TJ® Shear Braces
- **Since this wall line is part of a detached single-family residence located in a SDC A zone, the building is exempt from seismic requirements.**

1. Develop the adjustment factor according to the footnotes in table R602.10.1.2(1), 2009 IRC as follows:

Adjustment Factor Description	Factor Value
Exposure	1.0
Eave-to-ridge height	0.97
Wall height	0.95
Number of braced wall lines	1.3
Gypsum attachment	1.0
Final Adjustment Factor (product of all factors above)	**1.20**

2. Determine the total length of bracing required for a WSP-braced wall using table R602.10.1.2(1), and wind speed of 100 mph. Interpolating between a 20' and 30' braced-wall-line spacing gives a required bracing length of 11'.

3. Multiply the bracing length from step 2 by the final adjustment factor from step 1: 11' x 1.2 = 13.2' of required bracing length.

4. Choose brace types and locations. Since there are no 4' long wall sections available on the right side of the wall line for a WSP, use one 12x9 TJ® Shear Brace (equivalent to 4') in that area (brace C). In the longer wall section, choose WSPs for the 8' and 4' wall sections (braces A and B).

5. Checks:

Sufficient braced wall length(1)	8' + 4' + 4' = 16' > 13.2'	OK
Combined end distance to panels	9' + 0' = 9' < 12'-6"	OK
Unbraced wall length between panels :		
Length from brace A to B = 7'-4"	< 21'	OK
Length from brace B to C = 12'-6"	< 21'	OK

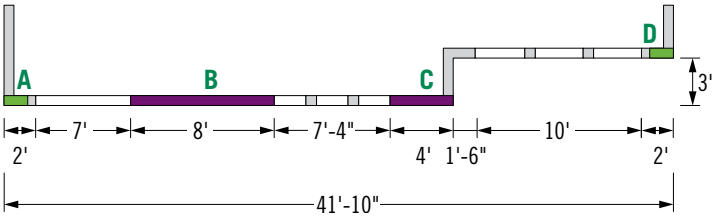
The braced panel layout is complete.

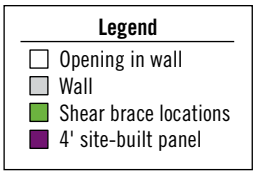
Footnotes

(1) The TJ® Shear Brace is equivalent to 4' of bracing regardless of its actual width.

Example 2 : Seismic Controlled

Determine the required bracing for the wall line shown:





Given:

- First story of a two-story, single-family residence.
- Dead loads: wall = 10psf; roof/ceiling = 12psf
- Wind speed = 90 mph
- Eave-to-ridge height = 9'-0"; wall height = 9'-0"
- Exposure category B; soil site class D
- Seismic category (SDC) D_0
- Total exterior wall length = 41'-10"
- 3 braced wall lines; spacing = 25'
- Applied interior gypsum
- Bracing method to be wood structural panels (WSP) and TJ® Shear Braces
- **Since this wall line is part of a detached single-family residence located in a SDC D_0 zone, the required length of bracing will be the greater of the lengths calculated based on wind or seismic.**

- **Determine the required length of wall bracing based on wind design:**

1. Adjustment factors will be the same as in Example 1, step 1. Final adjustment factor = 1.2.
2. Determine the total length of bracing required for a WSP-braced wall using table R602.10.1.2(1), wind speed 90 mph. Interpolating between a 20' and 30' braced-wall-line spacing gives a bracing length of 9'.
3. Required bracing length for wind is 9' x 1.2 = 10.80'

- **Determine the required length of wall bracing based on seismic design:**

4. Develop the adjustment factor according to the footnotes in table R602.10.1.2(3), 2009 IRC as follows:

Adjustment Factor Description	Factor Value
Story height	1.0
Braced wall line spacing	1.0
Wall dead load	1.0
Roof/ceiling dead load	1.0
Final Adjustment Factor (product of all factors above)	**1.0**

5. Determine the total length of bracing required for a WSP-braced wall using table R602.10.1.2(2). Interpolating between a 40' and 50' braced-wall-line spacing gives a bracing length of 18.83'.
6. Multiply the bracing length from step 5 by the final adjustment factor from step 4: 18.83' x 1.0 = 18.83' of bracing length required.
7. Compare the wind and seismic required bracing lengths and use the largest. 10.80' (wind) < 18.83' (seismic); therefore use 18.83'.
8. Choose brace types and locations. Place one 12x9 brace (equivalent to 4') at each end of the wall line (braces A and D). In the center, choose WSPs for the 8' and 4' wall sections (braces B and C).
9. Checks:

Sufficient braced wall length(1) 4' + 8' + 4' + 4' = 20' > 18.83' OK

Unbraced wall length between panels (2):

Length from brace A to B = 8'-0" < 21' OK

Length from brace B to C = 7'-4" < 21' OK

Length from brace C to D = 12'-6" < 21' OK

The braced panel layout is complete.

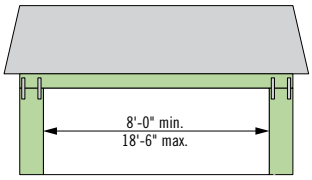
Footnotes

(1) The TJ® Shear Brace is equivalent to 4' of bracing regardless of its actual width.

(2) Since the building is in SDC D_0, a panel must be located at each end of the braced wall line for WSP-braced walls, or a maximum of 8' from the end for a TJ® Shear Brace. In this example the short walls and windows at each end of the wall line would not allow a WSP at each end. This is an ideal application for TJ® Shear Braces.

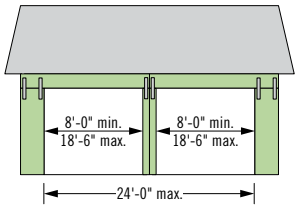
PRESCRIPTIVE PORTALS

One Double Portal



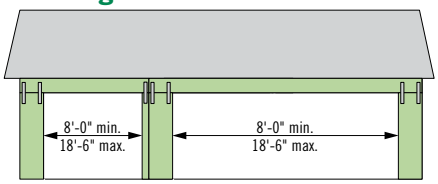
	Quantity	Size
Panels	2	TJSB 12x7, 7.5, or 8
Headers	1	See table below

Two Single Portals



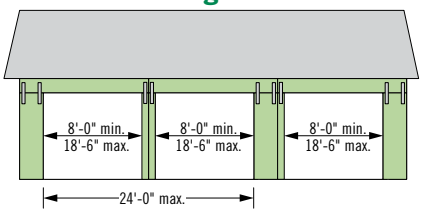
	Quantity	Size
Panels	2	TJSB 12x7, 7.5, or 8
Columns	2	3½" x 3½" x brace height
Headers	2	See table below

One Single and One Double Portal



	Quantity	Size
Panels	3	TJSB 12x7, 7.5, or 8
Columns	1	3½" x 3½" x brace height
Headers	2	See table below

Three Single Portals



	Quantity	Size
Panels	3	TJSB 12x7, 7.5, or 8
Columns	3	3½" x 3½" x brace height
Headers	3	See table below

General Notes

- Header must be single span. Do not run headers continuous over more than one portal.
- A minimum of 1,000 lbs of uplift capacity is required at the top and bottom of a single, portal column.
- To transfer shear across header joints in prescriptive applications, use one LSTA 24 strap, minimum. Place strap across the top with 9½" deep headers. Strap is not required if the header is attached to a continuous double top plate.

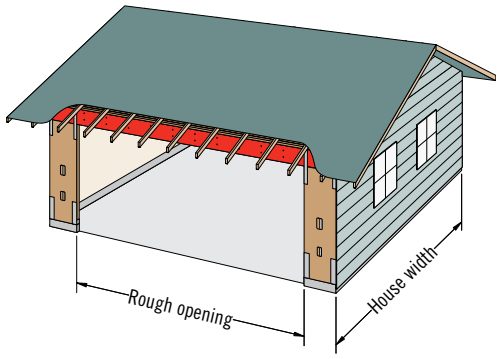
PRESCRIPTIVE PORTAL HEADER SIZING TABLE

Minimum Portal Header Size

Roof Load (PSF)		House Width	Rough Opening 9'-3"				Rough Opening 16'-3"				Rough Opening 18'-3"			
Non-Snow Area 125%	20LL + 15DL	24'	3½" x 9¼"	T	M	P	3½" x 11⅞"	(1)	M	P	3½" x 14"	T	M	P
		30'	3½" x 9¼"	T	M	P	3½" x 14"	T	M	P	3½" x 14"	(1)	M	P
		36'	3½" x 9¼"	T	M	P	3½" x 14"	T	M	P	3½" x 16"	T	M	P
	20LL + 20DL	24'	3½" x 9¼"	T	M	P	3½" x 11⅞"	(1)	M	P	3½" x 14"	(1)	M	P
		30'	3½" x 9¼"	T	M	P	3½" x 14"	T	M	P	3½" x 16"	T	M	P
		36'	3½" x 9¼"	T	M	P	3½" x 14"	(1)	M	P	3½" x 16"	(1)	M	P
Snow Area 115%	25LL + 15DL	24'	3½" x 9¼"	T	M	P	3½" x 11⅞"	(1)	M	P	3½" x 14"	(1)	M	P
		30'	3½" x 9¼"	T	M	P	3½" x 14"	T	M	P	3½" x 16"	T	M	P
		36'	3½" x 9¼"	T	M	P	3½" x 14"	(1)	M	P	3½" x 16"	(1)	M	P
	30LL + 15DL	24'	3½" x 9¼"	T	M	P	3½" x 14"	T	M	P	3½" x 14"	(1)	M	P
		30'	3½" x 9¼"	T	M	P	3½" x 14"	(1)	M	P	3½" x 16"	(1)	M	P
		36'	3½" x 9¼"	T	M	P	3½" x 16"	T	M	P	5¼" x 14"	(1)	M	P
	40LL + 15DL	24'	3½" x 9¼"	T	M	P	3½" x 14"	(1)	M	P	3½" x 16"	(1)	M	P
		30'	3½" x 9¼"	T	M	P	3½" x 16"	(1)	M	P	5¼" x 14"	(1)	M	P
		36'	3½" x 9¼"	(1)	M	P	5¼" x 14"	(1)	M	P	5¼" x 16"	T	M	P

(1) 1.55E TimberStrand® LSL may be substituted for 1.9E Microllam® LVL if the header is used as part of the TJ® Garage Portal system. See page 28 for other requirements.

T 1.55E TimberStrand® LSL **M** 1.9E Microllam® LVL **P** 2.0E Parallam® PSL



How to Use This Table

1. Determine appropriate **Roof Load** and **House Width**.
2. Locate **Rough Opening**.
3. Select header size and material.

TJ® GARAGE PORTAL SYSTEM

What is the TJ® Garage Portal System?

The Trus Joist® TJ® Garage Portal system is a double portal frame consisting of two TJ® Shear Braces and a 1.55E TimberStrand® LSL header. The header and shear braces must be connected according to details SB3, SB5, or SB12 in this guide and meet the parameters in the table below.

Using the TJ® Garage Double Portal system allows the advantage of designing a 1.55E TimberStrand® LSL portal header using 1.9E Microllam® LVL design properties, when installed as specified above. This allowed increase is due to the double portal acting together as a system.

Portal Header Design

Lateral allowable design loads in this guide are applicable to portals with headers that fall within the parameters listed in the table below. Headers and braces must be connected per detail SB3, SB5, or SB12. When sizing a portal frame header vertical load, refer to the **Minimum Portal Header Size** table on page 27 or the *Trus Joist Beams, Headers, and Columns Specifier's Guide* (Reorder #TJ-9000), except for 1.55E TimberStrand® LSL as noted below.

- For **Portal Installation Details**, see pages 16–18.
- For drilling and trimming information, see pages 14.

Portal Header Allowable Design Parameters

Header Parameter	1.55E TimberStrand® LSL in TJ® Garage Portal System (Double Portal)	All Other Headers and Applications
Width	3½"(1)	3⅛"– 5½"
Depth	9¼"–16"	9¼"–18"
Clear Span	9'–18'-6"	9'–18'-6"
K(2)	≤ 265 lb/in.	90–4,000 lb/in.
F_b	2,600(3) psi	per TJ-9000

(1) 3½" wide headers can be one-piece members or two 1¾" plies.

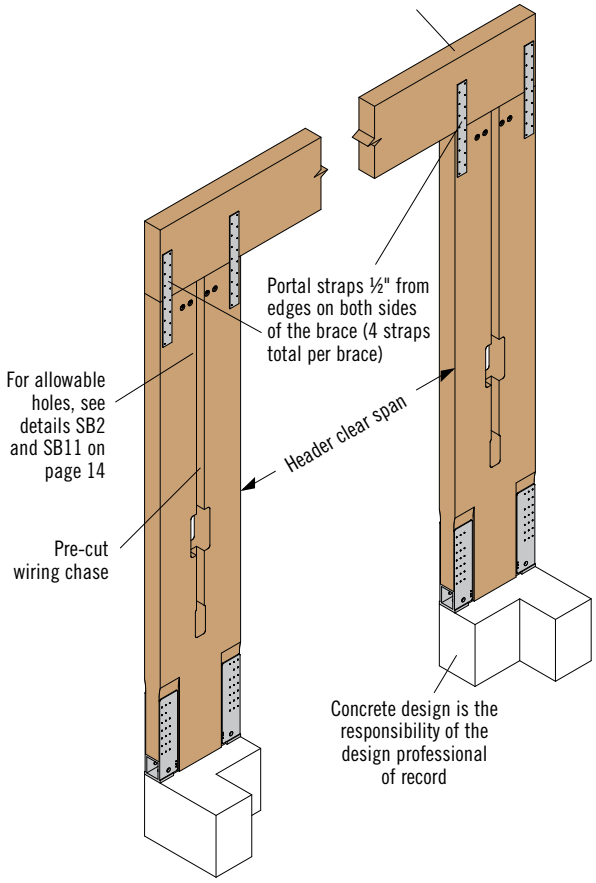
(2) $K = Ebd^3/12L^3$, where E is modulus of elasticity (psi), and b, d, and L are the header width (in.), depth (in.), and clear span (in.), respectively.

(3) For 12" depths. For other depths, multiply by $(12/d)^{0.136}$. F_b may be adjusted for duration of load not to exceed a maximum value of $[3{,}720(12/d)^{0.136}]$ psi.

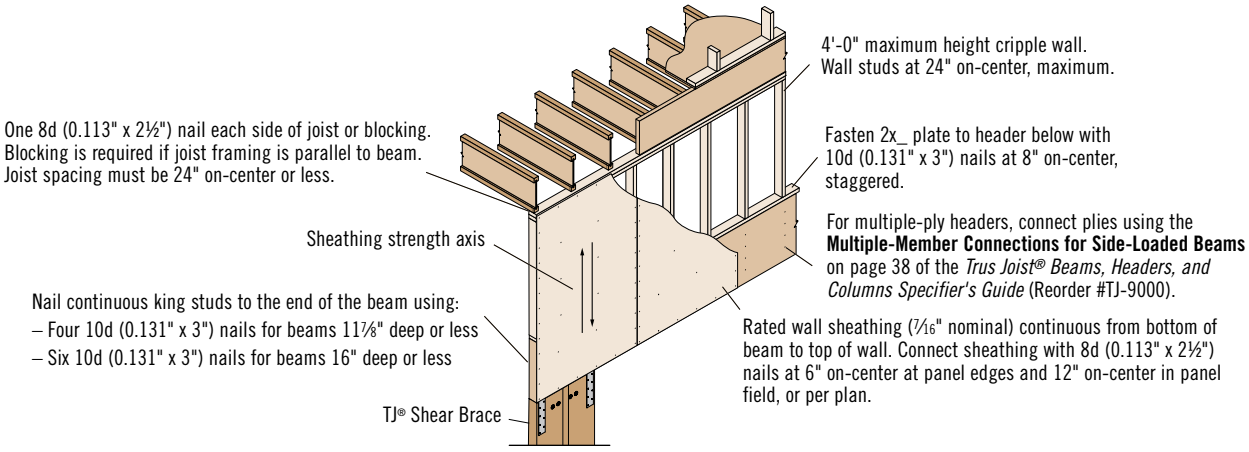
Double Portal

TJ® Garage Portal System

For increased economy in double portal frames, you can now design 1.55E TimberStrand LSL headers using 1.9E Microllam LVL values. See **Portal Header Allowable Design Parameters** table below.



Dropped Header with Acceptable Lateral Bracing



When framed as shown above, the following dropped headers are considered fully braced under uniform-load, simple-span conditions:

Single-ply:

– 3½" wide headers, 16" deep or less, with a maximum span of 18'-6"

Multiple-ply:

– Headers up to three 1¾" plies, 11⅞" deep or less
– Headers up to three 1¾" x 14" plies, with a maximum span of 8'-6"

L 16.1

PRESCRIPTIVE ANCHORAGE

Prescriptive Embedment Depths and Footing Dimensions

	TJ® Shear Brace Application	Minimum Footing Width	Embedment Depth, ℓ_e		Minimum Footing Dimensions		
			Wind SDC A-B	Seismic SDC C-D_2(1)	Minimum C_1	Minimum C_2	Minimum C_3
Uncracked Concrete	Standard or Portal Brace	16"	6"	7"(2)	6"	10"	10"
	Stacked Brace (18" bottom brace)	26"	8"	8"(2)	11"	15"	11"
	Stacked Brace (24" bottom brace)	33"	10"	11"(2)	14"	19"	14"
Cracked Concrete	Standard or Portal Brace	20"	6"	7"	9"	11"	10"
	Stacked Brace (18" bottom brace)	30"	9"	10"	14"	16"	14"
	Stacked Brace (24" bottom brace)	35"	11"	12"	16"	19"	16"

(1) Applications in SDC C-D_2 regions with stone or masonry veneer require special consideration. Contact your Weyerhaeuser representative for assistance.

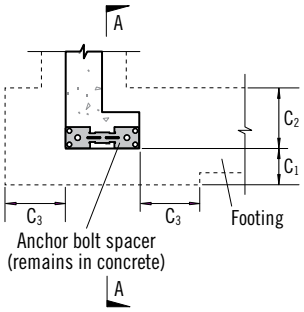
(2) In SDC C-D_2 regions, the ACI 318-08 Appendix D and the 2009 IBC require anchorage to be designed with cracked concrete, unless it can be demonstrated that the concrete remains uncracked.

General Notes

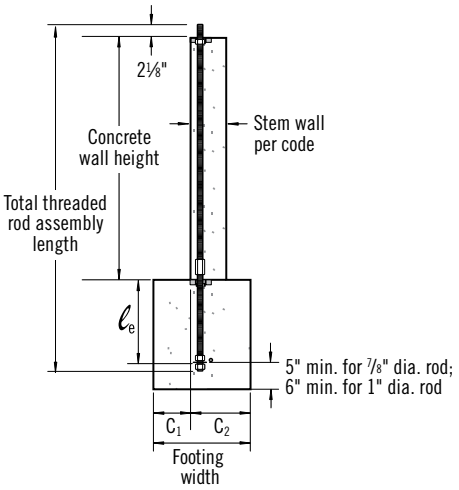
- Minimum concrete f'_c of 2,500 psi.
- Standard anchor bolts are ASTM A449 or ASTM A193-B7 threaded rods; 1" diameter for 24" wide braces and ⅞" diameter for 12" and 18" wide braces.
- For 12" braces, A307-grade threaded rod may be used with the embedment depths shown.
- For 18" braces, A307-grade threaded rod may be used with the embedment depths shown, if the brace is used in an SDC A or B application (SDC C for detached houses) and in a non-stacked application.
- Ties for anchorage shear reinforcement are not required.
- C_3 is measured from the end of the template.

Threaded Rod Installation

- With a two-stage concrete pour, use two anchor bolt spacers (one at the footing and one at the stem wall) to ensure the proper on-center spacing of threaded rods or anchor bolts. See details on page 20.



Section A–A



ALTERNATE PRESCRIPTIVE ANCHORAGE

Alternate Anchorage

For 12"(1) and 18" TJ® Shear Braces

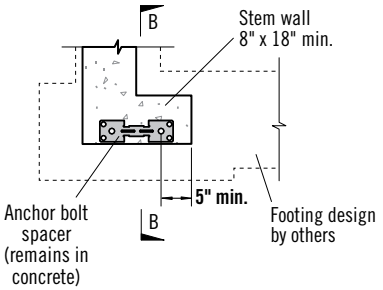
Anchor	Manufacturer	Embedment Depth, ℓ_e	Anchor Bolt Spacer Required
STB28	USP	27¾"	Yes
SSTB28	Simpson	27¾"	Yes

(1) Applicable for 12" braces in portal applications only.

General Notes

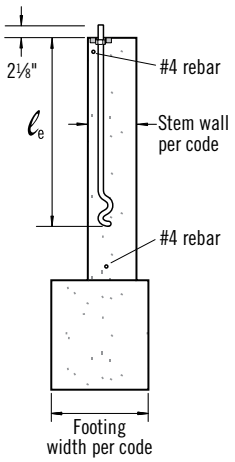
- Check with manufacturer for capacities and installation instructions. **Exception: Leave 2⅛" of anchor bolt above the anchor bolt spacer.**
- Not for use with masonry walls.
- Minimum concrete f'_c of 2,500 psi.
- Place hex nut on anchor bolt 2⅛" from the top of the bolt.
- Not for use in stacked applications.

Top View of Concrete Wall and Footing



Section B–B

Section View of Concrete Wall and Footing



NOTES

NOTES

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Floors and Roofs: Start with the best framing components in the industry: our Trus Joist® TJI® joists; TimberStrand® LSL rim board; and TimberStrand® LSL, Microllam® LVL, and Parallam® PSL headers and beams. Pull them all together with our self-gapping and self-draining Weyerhaeuser Edge Gold™ floor panels and durable Weyerhaeuser roof sheathing.

Walls: Get the best value out of your framing package—use TimberStrand® LSL studs for tall walls, kitchens, and bathrooms, and our traditional, solid-sawn lumber everywhere else. Cut down installation time by using TimberStrand® LSL headers for doors and windows, and Weyerhaeuser wall sheathing with its handy two-way nail lines. Use our TJ® Shear Brace for extra support in walls with large openings or in high wind or seismic areas.

Software Solutions: Whether you are a design professional or lumber dealer, Weyerhaeuser offers an array of software packages to help you specify individual framing members, create cut lists, manage inventories—even help you design a complete structural frame. Contact your Weyerhaeuser representative to find out how to get the software you need.

Technical Support: Need technical help? Weyerhaeuser has one of the largest networks of engineers and sales representatives in the business. Call us for help, and a skilled member from our team of experts will answer your questions and work with you to develop solutions that meet all your structural framing needs.

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