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***B**rienen **S**tructural **E**ngineers, P.S.*

PRCTI20240333, Rev.1

These calculations must be on site and made available by the Permittee for all inspections.

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City of Puyallup
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CENTERIS VOLTAGE PARK
1023 39th Avenue South East
Puyallup, WA 98374

173 Battery Room Expansion
Structural Calculations

PAUL J. BRIENEN
STATE OF WASHINGTON
32114
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Project Number 25212
October 10, 2025

Phone: (206) 397-0000 1316 Central Avenue South, Suite 200, Kent, WA 98032 www.bse-ps.com

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INFILL STUD WALLS
DESIGN CRITERIA

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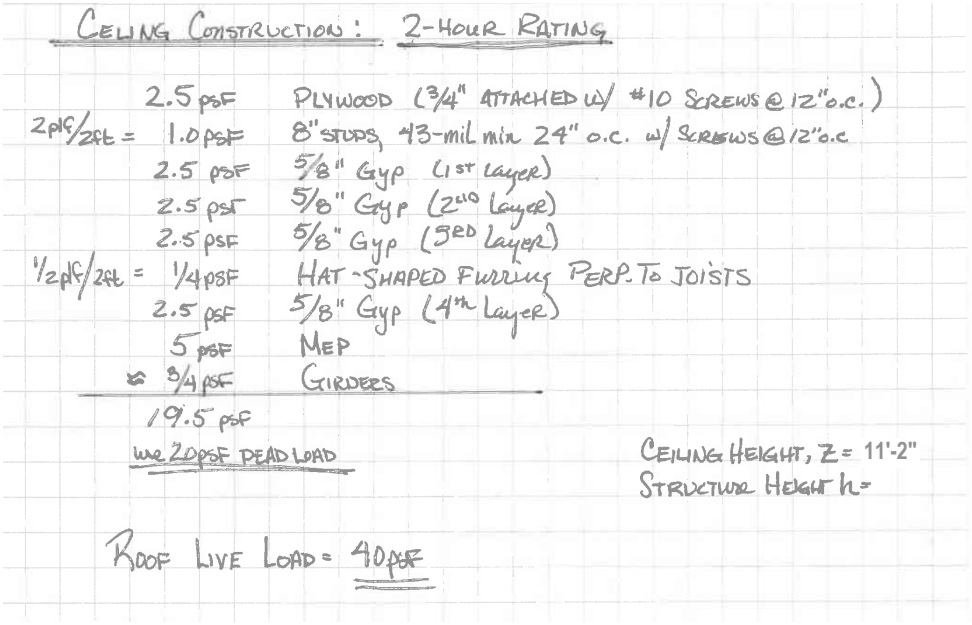
Design Codes

Design Codes: International Building Code, 2021
ASCE 7-16
AISI Standards
AISI S100-16(2020) w/ S2-20
AISI S202-20
AISI S220-20
AISI S240-20
AISI S400-20

Vertical Loads on Ceiling Framing

Dead Load = 20 psf total
(includes weight of (4) layers of Gyp for 2-hour fire rating,
CFS joist weight, plywood wearing surface, and 5psf for MEP)
Live Load = 40 psf
(Access similar to Catwalks or Maintenance spaces)



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Seismic Parameters

Site Class = D (Assumed)

S_{DS} = 1.006

Values per ASCE Hazards Report (See following pages)

Seismic Coefficients from Table 13.5-1 (ASCE 7-16)

Table 13.5-1 Coefficients for Architectural Components

Architectural Component	a_p[a]	R_p	Ω_0[b]
Interior nonstructural walls and partitions[c]			
Plain (unreinforced) masonry walls	1	1½	1½
All other walls and partitions	1	2½	2
Cantilever elements (unbraced or braced to structural frame below its center of mass)			
Parapets and cantilever interior nonstructural walls	2½	2½	2
Chimneys where laterally braced or supported by the structural frame	2½	2½	2
Cantilever elements (braced to structural frame above its center of mass)			
Parapets	1	2½	2
Chimneys	1	2½	2
Exterior nonstructural walls[c]	1[b]	2½	2
Exterior nonstructural wall elements and connections[b]			
Wall element	1	2½	NA
Body of wall panel connections	1	2½	NA
Fasteners of the connecting system	1¼	1	1
Veneer			
Limited deformability elements and attachments	1	2½	2
Low-deformability elements and attachments	1	1½	2
Penthouses (except where framed by an extension of the building frame)	2½	3½	2
Ceilings			
All	1	2½	2
Cabinets			

[a]A lower value for a_p shall not be used unless justified by detailed dynamic analysis. The value for a_p shall not be less than 1. The value of $a_p = 1$ is for rigid components and rigidly attached components. The value of $a_p = 2½$ is for flexible components and flexibly attached components.
[b]Overstrength where required for nonductile anchorage to concrete and masonry. See Section 12.4.3 for seismic load effects including overstrength.
[c]Where flexible diaphragms provide lateral support for concrete or masonry walls and partitions, the design forces for anchorage to the diaphragm shall be as specified in Section 12.11.2.

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Wall Design Criteria

Ceiling height = 12'-0"
Internal Pressure = 5 psf (ASD)
Maximum Deflection = L/240 (Flexible Finishes)

Bearing Walls have Flexural and Axial Bracing
at 96" OC max

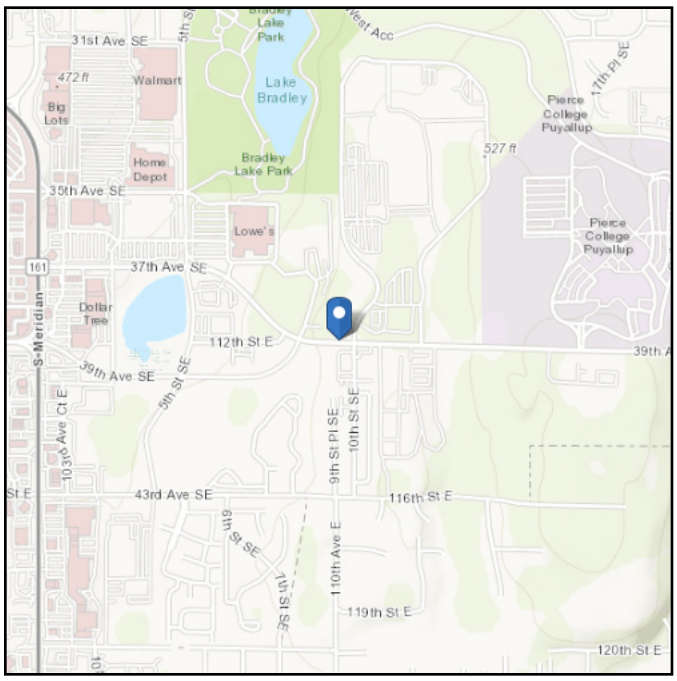
Joist and Girder Design Criteria

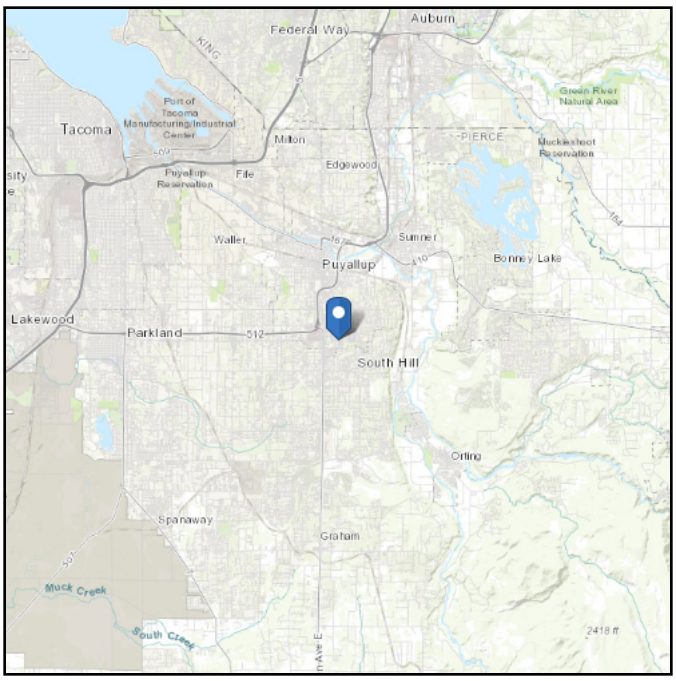
See earlier page of Design Criteria for Loading
Maximum Live Load Deflection = L/360
Maximum Total Deflection = L/240

ASCE Hazards Report

Address:
1023 39th Ave SE
Puyallup, Washington
98374

Standard:	ASCE/SEI 7-16	**Latitude:**	47.154865
Risk Category:	II	**Longitude:**	-122.282255
Soil Class:	D - Default (see Section 11.4.3)	**Elevation:**	485.5468985460304 ft (NAVD 88)





Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	1.257	S_{D1} :	N/A
S_1 :	0.434	T_L :	6
F_a :	1.2	PGA :	0.5
F_v :	N/A	PGA_M :	0.6
S_{MS} :	1.508	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.006	C_v :	1.351

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Thu Oct 02 2025

Date Source: USGS Seismic Design Maps

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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Seismic Forces

Wall Type: Bearing Wall

Wall Seismic Weight, W

	PSF
• Metal Stud Framing	1.5
• (4) Layers 5/8" Gypsum Wall Board (Multiply weight by actual layers of GWB.)	10
• Acoustic Insulation	2
Total =	14 PSF

Wall & Fastener Seismic Force

a_p =	1	R_p =	2.5		
S_{DS} =	1.006	I_p =	1	z/h =	0.24

$$F_d = \frac{0.4 a_p S_{DS} W I_p}{R_p}\left(1 + 2\frac{z}{h}\right)$$

F_d = 0.302W (LRFD) ***(Code MIN)***

$E_{ASD} = 0.7F_d$ = 0.211W (ASD)

ASD Force =	2.9 PSF

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ANCHOR AND CONNECTOR DESIGN INFORMATION

Track Connection Distances - Based on Connector Capacities

For 5.0 psf (Live Load)

Max Considered Height

12.00 ft	Track Demand =	(Ht)/2*5psf =	30.0	plf				
Connecting Material	Concrete	MIN SHOTPIN CAPACITY v =	120	lbs/anchor	spacing ≤	36.0	in
	Concrete on Metal Deck	MIN SHOTPIN CAPACITY v =	215	lbs/anchor	spacing ≤	36.0	in
	20 Gauge Steel	MIN SCREW CAPACITY v =	164	lbs/anchor	spacing ≤	36.0	in
	Steel (3/16" Min)	MIN SHOTPIN CAPACITY v =	230	lbs/anchor	spacing ≤	36.0	in

For 2.9 psf (Seismic)

Max Considered Height

12.00 ft	Track Demand =	(Ht)/2*5psf =	17.4	plf				
Connecting Material	Concrete	MIN SHOTPIN CAPACITY v =	90	lbs/anchor	spacing ≤	36.0	in
	Concrete on Metal Deck	MIN SHOTPIN CAPACITY v =	90	lbs/anchor	spacing ≤	36.0	in
	20 Gauge Steel	MIN SCREW CAPACITY v =	164	lbs/anchor	spacing ≤	36.0	in
	Steel (3/16" Min)	MIN SHOTPIN CAPACITY v =	230	lbs/anchor	spacing ≤	36.0	in

TABLE 2—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO STEEL[1,2,3,4]

FASTENER	SHANK DIAMETER (INCH)	ALLOWABLE LOADS (lbf)											
Steel Thickness (inch):		$^1/_8$		$^3/_{16}$		$^1/_4$		$^3/_8$		$^1/_2$		$^3/_4$	
Load Direction:		**Tension**	**Shear**	**Tension**	**Shear**	**Tension**	**Shear**	**Tension**	**Shear**	**Tension**	**Shear**	**Tension**	**Shear**
X-S13 THP	0.145	140[10]	300	300[10]	450	300[10]	450	300[10]	450	--	--	--	--
X-S16P8TH	0.145	--	--	225[10]	420	225[10]	430	225[10]	430	225[10]	430	--	--
X-EGN14 X-S 14 B3 X-S 14 G3	0.118	140	230	220	245	225	290	280[6]	330[6]	280[6]	330[6]	280[6]	330[6]
X-EGN14[5] X-S 14 B3[5] X-S 14 G3[5]	0.118	--	--	220	295	260	355	280[6]	385[6]	280[6]	385[6]	280[6]	385[6]
X-GHP## X-P ## G3 X-P ## B3	0.118	125[10]	230	170[10]	245	200[10]	230	250[10]	255	--	--	--	--
X-P 17 G2[7] X-P 20 G2[7]	0.118	--	--	140[10]	220	180[8]	200[8]	225[6]	220[6]	--	--	--	--
X-P 14 G2[7]	0.118	--	--	--	--	215[8]	290[8]	150[9]	195[9]	130[9]	150[9]	130[9]	150[9]

X-GHP/X-P B3 EMBED CAPACITY TO STEEL

For **SI:** 1 inch = 25.4 mm, 1 ksi = 6.89 MPa, 1 lbf = 4.4 N.

[1]Unless otherwise noted, fasteners must be driven to where the full length of the point of the fastener penetrates through the steel base material.
[2]Unless otherwise noted, steel base material must have minimum yield and tensile strengths (F_y and F_u) equal to 36 ksi and 58 ksi, respectively.
[3]Unless otherwise noted, allowable loads are applicable to static loads and seismic loads in accordance with Section 4.1.
[4]Fastener spacing must be a minimum of 1.0 inch and edge distance must be a minimum of 0.50 inch.
[5]Steel base material must have minimum yield and tensile strengths (F_y and F_u) equal to 50 ksi and 65 ksi, respectively.
[6]Fastener point penetration through the steel is not necessary, provided a minimum embedment of 0.320 inch is achieved.
[7]Tabulated loads for this fastener apply to static load conditions only. For seismic loading, allowable loads must be limited in accordance with Section 4.1.5, Item 3.
[8]Full fastener point penetration through the steel is not necessary, provided a minimum point penetration of 0.08 inch is achieved.
[9]Fastener point penetration through the steel is not necessary, provided a minimum embedment of 0.25 inch is achieved.
[10]For steel-to-steel connections designed in accordance with Section 4.1.4, the tabulated allowable load may be increased by a factor of 1.25, and the design strength may be taken as the tabulated allowable load multiplied by a factor of 2.0.

TABLE 3—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO NORMALWEIGHT CONCRETE[1,2,3]

FASTENER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	ALLOWABLE LOADS (lbf)					
Concrete Compressive Strength:			**2,000 psi**		**4,000 psi**		**6,000 psi**	
Load Direction:			**Tension**	**Shear**	**Tension**	**Shear**	**Tension**	**Shear**
X-C ## (Black Collated Strip or Guidance Washer)	0.138	3/4	45	75	65	105	95	195
		1	85	150	160	200	105	270
		1 1/4	130	210	270	290	165	325
		1 1/2	175	260	270	360	--	--
X-C ## (White Collated Strip or Guidance Washer)	0.138	3/4	45	75	60	105	--	--
		1	85	150	90	200	--	--
		1 1/4	130	210	130	290	--	--
X-C22 P8TH (Black Collated Strip or Guidance Washer)	0.138	3/4	55	130	90	170	100	200
X-C22 P8TH (White Collated Strip or Guidance Washer)	0.138	3/4	55	130	90	170	--	--
X-GN (except for X-GN 39)	0.118	3/4	95	120	95	120	--	--
		1	115	220	115	220	--	--
X-GN39 X-C 39 G2 X-C 39 G3	0.101	5/8	50	80	50	80	--	--
		1	60	100	60	100	--	--
X-GHP## X-P 17 G2, X-P 20 G2 X-P ## G3 X-P ## B3	0.118	5/8	--	--	50	120	50	90
		3/4	80	120	--	--	--	--
X-C ## G2 (except for X-C 39 G2) X-C 36 B3	0.108	3/4	110	190	110	190	110	190
X-C ## G3 (except for X-C 39 G3) X-C ## B3 (except for X-C 36 B3)	0.118	3/4	110	190	110	190	110	190

For **SI:** 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.4 N.

[1]Fasteners must not be driven until the concrete has reached the designated minimum compressive strength, or the minimum compressive strength specified in the applicable code, whichever is greater.

[2]Concrete thickness must be a minimum of 3 times the embedment depth of the fastener. Fastener spacing must be a minimum of 4 inches and edge distance must be a minimum of 3 inches.

[3]The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.5, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.5, Items 2 and 4, as applicable.

3(5/8") = 1 7/8" < 2 1/2" OK

X-GHP/X-P B3 EMBED CAPACITY TO CONCRETE

TABLE 1—FASTENER DESCRIPTION AND APPLICATIONS

FASTENER[1]	FASTENER DESCRIPTION	SHANK TYPE	SHANK DIAMETER [inch (mm)]	HEAD DIAMETER [inch (mm)]	MAXIMUM POINT LENGTH [inch (mm)]	MINIMUM EFFECTIVE SHANK LENGTH [inch (mm)]	FASTENER COATING	APPLICABLE BASE MATERIAL	APPLICABLE LOAD TABLES
X-U ##	Universal Powder Actuated Fastener	Knurled, straight	0.157 (4.0)	0.323 (8.2)	0.433 (11.0)	See Footnote 2	ASTM B633, SC1, Type III	Steel	2, 7
								Concrete	3, 4
								Conc.-filled deck	5
								CMU	6
X-U 15	Powder Actuated Fastener	Knurled, stepped	0.145 (3.7)	0.323 (8.2)	0.413 (10.5)	0.61 (15.5)	ASTM B633, SC1, Type III	Steel	2
X-P ##	Powder Actuated Fastener	Smooth straight	0.157 (4.0)	0.323 (8.2)	0.524 (13.3)	See Footnote 3	ASTM B633, SC1, Type III	Concrete	3
								Conc.-filled deck	5
								CMU	6

For **SI:** 1 inch = 25.4 mm.

[1]## denotes numbers used in fastener designation to represent nominal fastener length in mm, e.g. X-U 27 has a nominal shank length of 27 mm.
[2]For fastener length of 16 mm, the minimum effective shank length is 14.8 mm (0.58 inch). For longer fasteners, the minimum effective shank length can be calculated in terms of the designated length as (##-0.5) in mm and (##-0.5)/25.4 in inches.
[3]The minimum effective shank length can be calculated in terms of the designated length as (##-1) in mm and (##-1)/25.4 in inches.

TABLE 2—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO STEEL[1,2,6]

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (inch)	ALLOWABLE LOADS (lbf)									
Steel Thickness (inch):			$^3/_{16}$		$^1/_4$		$^3/_8$		$^1/_2$		$\geq {}^3/_4$	
Load Direction:			Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
Universal Knurled Shank	X-U	0.157	500[7]	720	775[7]	720	935	720	900	720	350[4]	375[4]
											275[3]	350[3]
Universal Knurled Shank	X-U 15	0.145	155	400	230	395	420	450	365[5]	500[5]	365[5]	400[5]

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N; 1 ksi = 6.9 MPa.

[1]Allowable load capacities are based on base steel with a minimum yield strength (F_y) of 36 ksi and a minimum tensile strength (F_u) of 58 ksi.
[2]The fasteners must be driven to where the point of the fastener penetrates through the steel base material, unless otherwise noted.
[3]Based upon a minimum point penetration of $^3/_8$ inch.
[4]Based upon a minimum point penetration of $^1/_2$ inch.
[5]Based upon a minimum point penetration of $^{15}/_{32}$ inch.
[6]Allowable loads are applicable to static and seismic loads in accordance with Section 4.1.
[7]For steel-to-steel connections designed in accordance with Section 4.1.6 for static loads only, the tabulated allowable load may be increased by a factor of 1.25, and the design strength maybe taken as the tabulated allowable load multiplied by a factor of 2.0.

X-U EMBED CAPACITY TO STEEL

TABLE 3—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO NORMAL-WEIGHT CONCRETE[1,2,4]

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	ALLOWABLE LOADS (lbf)							
Concrete Compressive Strength:				2500 psi		4000 psi		6000 psi		8000 psi	
Load Direction:				Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
Universal Knurled Shank	X-U	0.157	3/4	100	125	100	125	105	205	–	–
			1	165	190	170	225	110[3]	280[3]	–	–
			1 1/4	240	310	280	310	180	425	–	–
			1 1/2	275	420	325	420	–	–	–	–
Smooth Shank	X-P	0.157	3/4[5]	100	155	100	175	105	205	135	205
			1[5]	165	220	180	225	150	300	150	215
			1 1/4[5]	240	310	280	310	180	425	–	–
			1 1/2[5]	310	420	–	–	–	–	–	–

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 psi = 6895 Pa.

[1]Unless otherwise noted, values apply to normal weight cast-in-place concrete. Fasteners must not be driven until the concrete has reached the designated minimum compressive strength.

[2]Unless otherwise noted, concrete thickness must be a minimum of 3 times the embedment depth of the fastener.

[3]This allowable load value for the X-U fastener also applies to normal weight hollow core concrete slabs with f'_c of 6600 psi and minimum dimensions shown in Figure 7, when installed in accordance with Section 4.2.4.

[4]The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.6, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.6, Items 2 and 3, as applicable.

[5]Applies to fastening of cold-formed steel up to 54 mil thick using the X-P 22, X-P 27, X-P 34 and X-P 40 fasteners, respectively, for the 3/4, 1, 1 1/4 and 1 1/2 inch embedment depths.

3(3/4") =2 1/4" < 2 1/2" OK

X-U/X-P EMBED CAPACITY TO CONCRETE

TABLE 4—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO NORMAL-WEIGHT CONCRETE USING DX-KWIK[1,2,3,4]

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inches)	ALLOWABLE LOADS (lbf)			
Concrete Compressive Strength:				4,000 psi		6,000 psi	
Load Direction:				Tension	Shear	Tension	Shear
Universal Knurled Shank	X-U 47 P8 w/ DX-KWIK	0.157	1 1/2	395	405	360	570

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 psi = 6895 Pa.

[1]X-U Fastener is installed using the DX-KWIK drilled pilot hole installation procedure described in Section 4.2.5.

[2]Pilot holes must not be drilled until the concrete has reached the designated minimum compressive strength.

[3]Concrete thickness must be a minimum of 3 times the embedment depth of the fastener.

[4]The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.6, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.6, Items 2 and 3, as applicable.

Screw Capacities

Table Notes

1. Capacities based on AISI S100 Section E4.
2. When connecting materials of different steel thicknesses or tensile strengths, use the lowest values. Tabulated values assume two sheets of equal thickness are connected.
3. Capacities are based on Allowable Strength Design (ASD) and include safety factor of 3.0.
4. Where multiple fasteners are used, screws are assumed to have a center-to-center spacing of at least 3 times the nominal diameter (d).
5. Screws are assumed to have a center-of-screw to edge-of-steel dimension of at least 1.5 times the nominal diameter (d) of the screw.
6. Pull-out capacity is based on the lesser of pull-out capacity in sheet closest to screw tip or tension strength of screw.
7. Pull-over capacity is based on the lesser of pull-over capacity for sheet closest to screw header or tension strength of screw.
8. Values are for pure shear or tension loads. See AISI Section E4.5 for combined shear and pull-over.
9. Screw Shear (Pss), tension (Pts), diameter, and head diameter are from CFSEI Tech Note (F701-12).
10. Screw shear strength is the average value, and tension strength is the lowest value listed in CFSEI Tech Note (F701-12).
11. Higher values for screw strength (Pss, Pts), may be obtained by specifying screws from a specific manufacturer.

Allowable Screw Connection Capacity (lbs)

Thickness (Mils)	Design Thickness	Fy Yield (ksi)	Fu Tensile (ksi)	#6 Screw (Pss = 643 lbs, Pts = 419 lbs) 0.138" dia, 0.272" Head			#8 Screw (Pss= 1278 lbs, Pts = 586 lbs) 0.164" dia, 0.272" Head			#10 Screw (Pss= 1644 lbs, Pts = 1158 lbs) 0.190" dia, 0.340" Head			#12 Screw (Pss= 2330 lbs, Pts = 2325 lbs) 0.216" dia, 0.340" Head			¼" Screw (Pss= 3048 lbs, Pts = 3201 lbs) 0.250" dia, 0.409" Head		
				Shear	Pull-Out	Pull-Over	Shear	Pull-Out	Pull-Over	Shear	Pull-Out	Pull-Over	Shear	Pull-Out	Pull-Over	Shear	Pull-Out	Pull-Over
18	0.0188	33	33	44	24	84	48	29	84	52	33	105	55	38	105	60	44	127
27	0.0283	33	33	82	37	127	89	43	127	96	50	159	102	57	159	110	66	191
30	0.0312	33	33	95	40	140	103	48	140	111	55	175	118	63	175	127	73	211
33	0.0346	33	45	151	61	140	164	72	195	177	84	265	188	95	265	203	110	318
43	0.0451	33	45	214	79	140	244	94	195	263	109	345	280	124	345	302	144	415
54	0.0566	33	45	214	100	140	344	118	195	370	137	386	394	156	433	424	180	521
68	0.0713	33	45	214	125	140	426	149	195	523	173	386	557	196	545	600	227	656
97	0.1017	33	45	214	140	140	426	195	195	548	246	386	777	280	775	1,016	324	936
118	0.1242	33	45	214	140	140	426	195	195	548	301	386	777	342	775	1,016	396	1,067
54	0.0566	50	65	214	140	140	426	171	195	534	198	386	569	225	625	613	261	752
68	0.0713	50	65	214	140	140	426	195	195	548	249	386	777	284	775	866	328	948
97	0.1017	50	65	214	140	140	426	195	195	548	356	386	777	405	775	1,016	468	1,067
118	0.1242	50	65	214	140	140	426	195	195	548	386	386	777	494	775	1,016	572	1,067

SHEET METAL SCREW (SMS) ALLOWABLE STRENGTHS (CONTINUED)

TABLE 3 – NON-PRYING CONDITION

SHEET METAL SCREW ALLOWABLE STRENGTHS FOR STEEL TO STEEL CONNECTIONS WITH TWO LAYERS OF 5/8" GYP BOARD BETWEEN STEEL SURFACES.

F_y (KSI)	MIL (STEEL GA)	FASTENER SIZE									
		NO. 14 0.250 IN		NO. 12 0.216 IN		NO. 10 0.190 IN		NO. 8 0.164 IN		NO. 6 0.138 IN	
		SHEAR (LB)	TENSION (LB)	SHEAR (LB)	TENSION (LB)	SHEAR (LB)	TENSION (LB)	SHEAR (LB)	TENSION (LB)	SHEAR (LB)	TENSION (LB)
50	97 (12)	166	275	130	205						
	68 (14)	166	275	130	205	100	159				
	54 (16)	166	261	130	205	100	159	80	118		
33	43 (18)	166	144	130	124	100	109	80	94	50	79
	33 (20)					70	84	50	72	40	61

NOTES:

1. SEE GENERAL NOTES ON ST1.06 FOR MORE INFORMATION.
2. ALLOWABLE STRENGTH VALUES DO NOT ACCOUNT FOR EFFECTS FROM PRYING. RDP IN RESPONSIBLE CHARGE TO PROVIDE ADEQUATE BLOCKING/RESTRAINT TO PREVENT PRYING ACTION. WHERE PRYING OCCURS, THE VALUES AND CONSTRAINTS OF TABLE 4 SHALL BE USED.

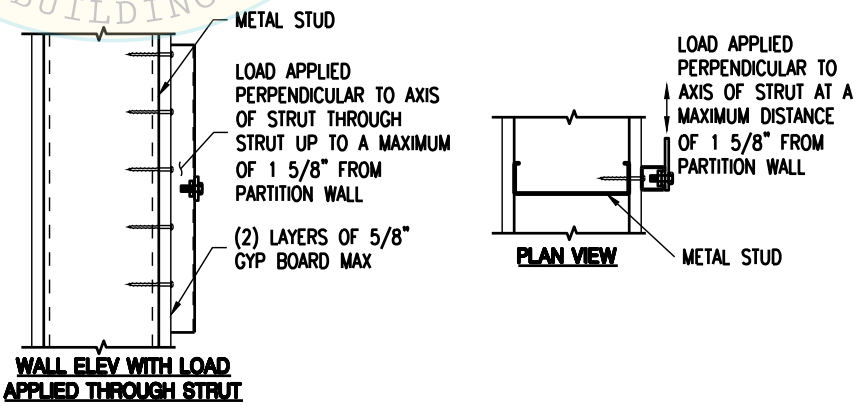
TABLE 4 – PRYING CONDITION (SEE DETAILS BELOW – STRUT CAN BE HORIZONTAL OR VERTICAL)

SHEET METAL SCREW ALLOWABLE STRENGTHS FOR STEEL TO STEEL CONNECTIONS WITH ONE OR TWO LAYERS OF 5/8" GYP BOARD BETWEEN STEEL SURFACES AND MAXIMUM PRYING MOMENT ARM OF 1 5/8".

F_y (KSI)	MIL (STEEL GA)	FASTENER SIZE									
		NO. 14 0.250 IN		NO. 12 0.216 IN		NO. 10 0.190 IN		NO. 8 0.164 IN		NO. 6 0.138 IN	
		SHEAR (LB)	TENSION (LB)	SHEAR (LB)	TENSION (LB)	SHEAR (LB)	TENSION (LB)	SHEAR (LB)	TENSION (LB)	SHEAR (LB)	TENSION (LB)
50	97 (12)	40	275	30	205						
	68 (14)	40	275	30	205	25	159				
	54 (16)	40	261	30	205	25	159	20	118		
33	43 (18)	40	144	30	124	25	109	20	94	10	79
	33 (20)					15	84	15	72	10	61

NOTES:

1. SEE GENERAL NOTES ON ST1.06 FOR MORE INFORMATION.
2. THE ALLOWABLE STRENGTH VALUES LISTED IN TABLE 4 ARE BASED UPON A LIMITED TEST ASSEMBLY WHERE THE ORIGIN AND DIRECTION OF THE LOAD RESULTS IN PRYING UPON THE FASTENER. THE MAGNITUDE OF THIS PRYING EFFECT SHALL BE LIMITED TO A MOMENT ARM OF 1 5/8" FROM THE FASTENER.



SECTION TITLE:
STANDARD PARTITION WALL DETAILS

SHEET TITLE:
SHEET METAL SCREW ALLOWABLE STRENGTHS (CONTINUED)

OPD NO.:
ST1.08

c) The metal-critical joint may fail in one of two ways. Failure occurs when the resistance of the screw head to embedment is greater than the resistance of the metal to lateral and/or withdrawal load, and the screw tears away from the metal framing. Failure also occurs when thin metal in a metal-to-plywood joint crushes or tears away from the screw.

Tables 1 and 2 present ultimate lateral loads for wood- and sheet-metal-screw connections in plywood-and-metal joints. Loaded end distance in these tests was one inch. Plywood face grain was parallel to the load since this direction yields the lowest lateral loads when the joint is plywood-critical. All wood-screw specimens were tested with a 3/16-in.-thick steel side plate, and values should be modified if thinner steel is used.

DIVIDE BY 5 SAFETY FACTOR FOR ALLOWABLE LOADS

TABLE 1

SCREWS: METAL-TO-PLYWOOD CONNECTIONS[a]

Depth of Threaded Penetration (in.)	Ultimate Lateral Load (lbf)[b]					
	Wood Screws			Sheet Metal Screws		
	#8	#10	#12	#8	#10	#12
1/2	415	(500)	590	465	(565)	670
5/8	–	–	–	500	(600)	705
3/4	–	–	–	590	(655)	715

(a) Plywood was C-D grade with exterior glue (all plies Group 1), face grain parallel to load. Side plate was 3/16"-thick steel.

(b) Values in parentheses are estimates based on other tests.

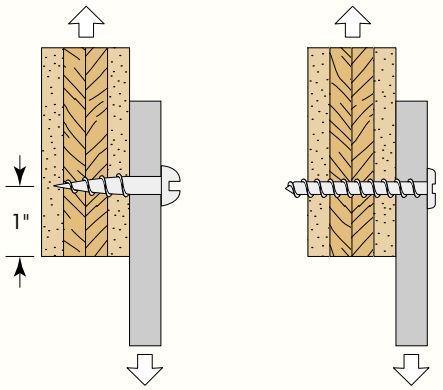


TABLE 2

SHEET METAL SCREWS: PLYWOOD-TO-METAL CONNECTIONS[a]

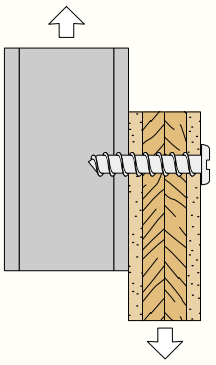
Framing	Plywood Thickness (in.)	Ultimate Lateral Load (lbf)[b]				
		Screw Size				1/4"-20 Self Tapping Screw
		#8	#10	#12	#14	
0.080-in. Aluminum	1/4	330	360	390	410	590
	1/2	630	850*	860	920	970
	3/4	910*	930*	1250	1330	1440
0.078-in. Galvanized Steel (14 gage)	1/4	360	380	400	410	650
	1/2	700*	890*	900	920	970
	3/4	700*	950*	1300*	1390*	1500

(a) Plywood was A-C EXT (all plies Group 1), face grain parallel to load.

(b) Loads denoted by an asterisk(*) were limited by screw-to-framing strength; others were limited by plywood strength.

IF ALLOWABLE IS A FOS = 5, THEN

#8	#10	#12	
140	190	260	LBS



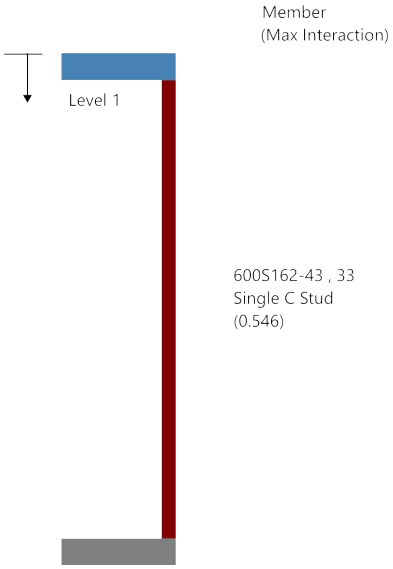
BSE
Brienen ***S***tructural ***E***ngineers, P.S.

BEARING CFS WALL DESIGNS

Project Name: Centeris
Model: 6" BRG WALL
Code: AISI S100-16w/S2-20

BEARING WALL
6" STUDS

Date: 10/08/2025
Simpson Strong-Tie® CFS Designer™ 5.2.8.0



Load Inputs

Top Level is a Roof?	False
Axial Loads Redistributed?	True
Live Load Reduction Applied?	False
Roof Snow Load	0 psf
Roof Wind Uplift	0 psf
Wind Load Defl Modifier	1.0

Stacked Wall Summary Report

Model Inputs

Level	Wall Height (ft)	Stud Spacing (in)	Supported Member Tributary Length (ft)	Gravity Load Ecc. (in)	Flexural Bracing (in)	Axial KyLy (in)	Axial KtLt (in)	K-Phi Flexure (lb-in/in)	Dist. K-Phi Axial (lb-in/in)	Lm (in)
1	12	24	4	Stud Depth/2	96	96	96	0	0	None

Level	Wall D (psf)	Roof or Floor D (psf)	Floor or Roof L or Lr (psf)	L Reduction Factor	MWFRS Windward W (psf)	MWFRS Leeward W (psf)	C&C Windward W (psf)	C&C Leeward W (psf)	Seismic Coefficient Eh/D	Seismic Coefficient Ev/D
1	14	20	40	1	5	5	5	5	0.3	0.14

Load Combinations

LC Number	D	L	Max Roof (Lr or S)	S	MWFRS Windward (W)	MWFRS Leeward (W)	C&C Windward (W)	C&C Leeward (W)	Roof Uplift (W)	Seismic (Eh or Ev)
1	1	1	0	0	0	0	0	0	0	0

Load Combinations

LC Number	D	L	Max Roof (Lr or S)	S	MWFRS Windward (W)	MWFRS Leeward (W)	C&C Windward (W)	C&C Leeward (W)	Roof Uplift (W)	Seismic (Eh or Ev)
2	1	0	1	0	0	0	0	0	0	0
3	1	0.75	0.75	0	0.75	0	0	0	0	0
4	1	0.75	0.75	0	0	0.75	0	0	0	0
5	1	0	0	0	0	0	1	0	0	0
6	1	0	0	0	0	0	0	1	0	0
7	1	0	0	0	0	0	0	0	0	1
8	1	0.75	0	0.75	0	0	0	0	0	0.75
9	0.6	0	0	0	0	0	0	0	1	0
10	0.6	0	0	0	0	0	0	0	1	0

Member Selection

Level	Section	Fy (ksi)	Configuration	Ma-Fy (ft-lb)	Ma-Dist (ft-lb)	Ma-Brc (ft-lb)	Axial Pa (lb)	Axial Pa-Dist (lb)
1	600S162-43	33	Single	1271	1088	666	1567.9	4787

	Bending and Axial Interactions				Shear and Web Crippling					
Level	Control LC	M(LC) (ft-lb)	P(LC) (lb)	Max Intr	Rmax (lb)	Control LC	Va (lb)	Rmax/Va	Pa (lb)	Stiffener Req'd
1	4	190	400	**0.546**	63	6	1416	0.045	259	No

Deflection

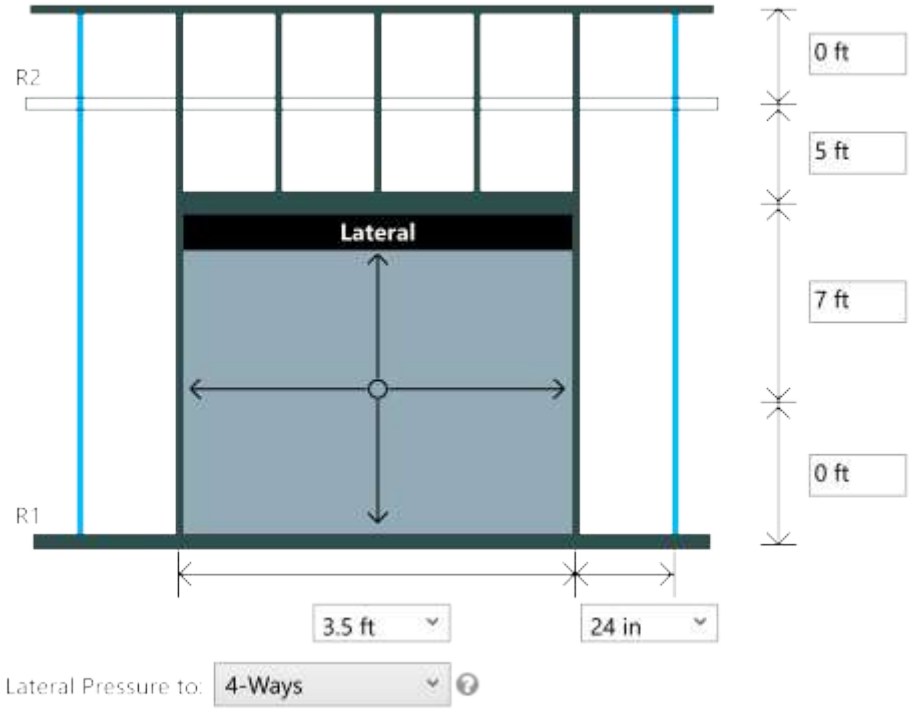
Deflection Multiplier for C&C Wind Load : 1.0

Level	D(Unif) (in)	L/	Control LC	D(Total) (in)	L/	Control LC
1	0.068	L/2109	6	0.078	L/1855	6

Project Name: Centeris
Model: 6" BRG WALL HDR @ 3'-6" OPNG
Code: AISI S100-16w/S2-20

6" STUD WALL
OPENING WIDTH = 3'-6"
DESIGN HT = 12'-0"
LATERAL LOAD = 5 PSF
DEFLECTION = L/240

Date: 10/08/2025
mpson Strong-Tie® CFS Designer™ 5.2.8.0



Design Loads

Wall Lateral Pressure :	**5 psf**
Parapet Lateral Pressure :	
RO Lateral Pressure :	**4-Ways**
Lateral element force multiplier	
Strength :	**1.0**
Deflection :	**1**
Header:	**Box (lateral combined)**
Gravity Load at Header:	**14 psf**
Additional Jamb Axial Load :	**420 lbs**

FROM HEADER CALCULATION, SEE FOLLOWING PAGES

Brace Settings

Component(s)	Members(s)	Flexural Bracing	Axial KyLy	Axial KtLt	Distortional K-Phi(lb-in/in)	Distortional Lm	Interconnection Spacing
Jamb Studs	600S162-43(33), Single	Full	Head/Sill	Head/Sill	0	None	N/A
Vertical Header	400S125-43(33), Boxed	Full	N/A	N/A	0	None	N/A
Lateral Header	600T125-33(33), Boxed	Full	N/A	N/A	0	None	N/A

Analysis Results

Component(s)	Members(s)	Axial Load (lb)	Max KL/r	Max. Moment (ft-lb)	Max. Shear (lb)	Bottom Reaction (lb)	Top or End Reaction (lb)
Jamb Studs	600S162-43(33), Single	808.5	146	243.5	74.8	82.5	60.6
Vertical Header	400S125-43(33), Boxed	N/A	N/A	107.2	122.5	N/A	122.5
Lateral Header	600T125-33(33), Boxed	N/A	N/A	28.1	29.5	N/A	29.5

Design Results

Component(s)	Members(s)	Deflection Span	Deflection Parapet	A + M Interaction	V + M Interaction	Web Stiffners	Design OK
Jamb Studs	600S162-43(33), Single	L/1603	L/0	0.65	0.19	No	Yes
Vertical Header	400S125-43(33), Boxed	L/7126	NA	0.11	0.11	No	Yes
Lateral Header	600T125-33(33), Boxed	L/50994	NA	0.03	0.03	No	Yes

Simpson Strong-Tie® Connectors @ Jambs

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie® Connector	Connector Interaction	Anchor Interaction
R2	60.63	0.00	By Others & Anchorage Designed by Engineer	NA	NA
R1	82.50	808.50	600T125-33 (33) & (1) .157", 3/4" embed SST PDPA/PDPAT to 4000 nw concrete	40.24 %	61.11 %

* Reference catalog for connector and anchor requirement notes as well as screw placements requirement

Simpson Strong-Tie® Wall Stud Bridging Connectors @ Jambs

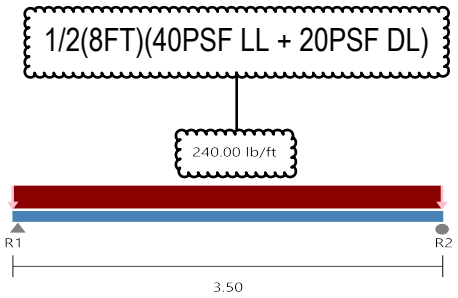
Span/Parapet	Bracing Length(in.)	Design Number of Braces	Pn(lb.)	LSUBH (Min)[1]	LSUBH (Max)[1]	SUBH (Min)[1]	SUBH (Max)[1]	MSUBH (Min)[1]	MSUBH (Max)[1]
Span	Varies	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

1) Values in parentheses are stress ratios.
2) Bridging connectors are not designed for back-back, box, or built-up sections.
3) Reference www.strongtie.com for latest load data, important information, and general notes.
4) CFS Designer will not select bridging connectors unless all flexural and axial bracing settings are the same.
5) If the bracing length is larger than the span length, bridging connectors are not designed.

Project Name: Centeris
Model: 3.5ft BRG HDR
Code: AISI S100-16w/S2-20

Date: 10/08/2025
Simpson Strong-Tie® CFS Designer™ 5.2.8.0



Section: (2) 400S125-43 (33 ksi) Boxed C Stud (punched)
Maxo = 992.6 ft-lb **Va =** 3478.2 lb **I =** 1.36 in^4

Loads have not been modified for strength checks
Loads have not been modified for deflection calculations

Bridging Connectors - Design Method =AISI S100

Span	Axial KyLy, KtLt	Flexual, Distortional	Connector	Stress Ratio
Span	NA	None, N/A	N/A	-

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
R1*	420.00	2.00	606.1	0.0	0.36	NO
R2*	420.00	2.00	606.1	0.0	0.36	NO

"*" after support means punched near support

	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	0.0(t)	-	0%	KΦ=0.00 lb-in/in Max KL/r = N/A
	Max. Shear, lbs	420.0	1619.1	26%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	367.5	992.6	37%	
	Moment Stability, ft-lbs	367.5	992.6	37%	
	Shear/Moment	0.37	1.00	37%	Shear 0.0, Moment 367.5
	Axial/Moment	0.37	1.00	37%	Axial 0.0(c), Moment 367.5
	Deflection Span, in	0.020	--meets L/2078--		

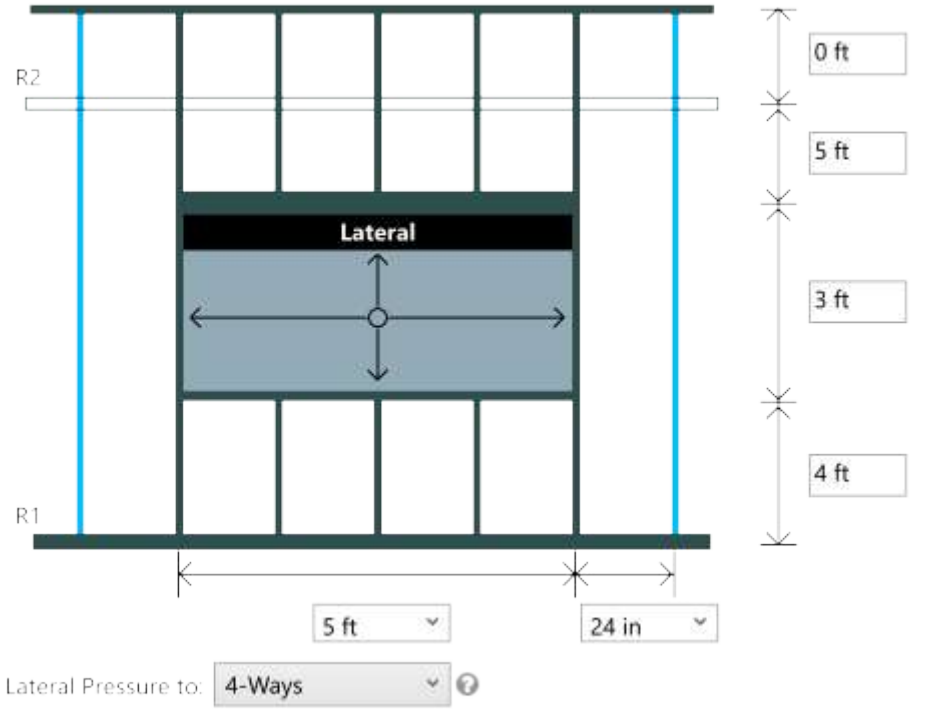
Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R1	0.0	420.0	By Others & Anchorage Designed by Engineer	NA	NA
R2	0.0	420.0	By Others & Anchorage Designed by Engineer	NA	NA

* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

Project Name: Centeris
Model: 6" BRG WALL HDR @ 5'-0" OPNG
Code: AISI S100-16w/S2-20

6" STUD WALL
OPENING WIDTH = 5'-0"
DESIGN HT = 12'-0"
LATERAL LOAD = 5 PSF
DEFLECTION = L/240

Date: 10/08/2025
mpson Strong-Tie® CFS Designer™ 5.2.8.0



Design Loads

Wall Lateral Pressure :	**5 psf**
Parapet Lateral Pressure :	
RO Lateral Pressure :	**4-Ways**
Lateral element force multiplier	
Strength :	**1.0**
Deflection :	**1**
Header:	**Box (lateral combined)**
Gravity Load at Header:	**14 psf**
Additional Jamb Axial Load :	**600 lbs**

FROM HEADER CALCULATION, SEE FOLLOWING PAGES

Brace Settings

Component(s)	Members(s)	Flexural Bracing	Axial KyLy	Axial KtLt	Distortional K-Phi(lb-in/in)	Distortional Lm	Interconnection Spacing
Jamb Studs	600S162-43(33), Single	Full	Head/Sill	Head/Sill	0	None	N/A
Vertical Header	400S125-43(33), Boxed	Full	N/A	N/A	0	None	N/A
Lateral Header	600T125-33(33), Boxed	Full	N/A	N/A	0	None	N/A
Sill	600T125-33(33), Single	Full	N/A	N/A	0	None	N/A

Analysis Results

Component(s)	Members(s)	Axial Load (lb)	Max KL/r	Max. Moment (ft-lb)	Max. Shear (lb)	Bottom Reaction (lb)	Top or End Reaction (lb)
Jamb Studs	600S162-43(33), Single	1041.0	83	307.8	80.0	80.0	73.8
Vertical Header	400S125-43(33), Boxed	N/A	N/A	218.8	175.0	N/A	175.0
Lateral Header	600T125-33(33), Boxed	N/A	N/A	59.7	44.4	N/A	44.4
Sill	600T125-33(33), Single	N/A	N/A	51.9	38.1	N/A	38.1

Design Results

Component(s)	Members(s)	Deflection		A + M Interaction	V + M Interaction	Web Stiffners	Design OK
		Span	Parapet				
Jamb Studs	600S162-43(33), Single	L/1280	L/0	0.60	0.24	No	Yes
Vertical Header	400S125-43(33), Boxed	L/2444	NA	0.22	0.22	No	Yes
Lateral Header	600T125-33(33), Boxed	L/16699	NA	0.06	0.06	No	Yes
Sill	600T125-33(33), Single	L/9618	NA	0.11	0.11	No	Yes

Simpson Strong-Tie® Connectors @ Jambs

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie® Connector	Connector Interaction	Anchor Interaction
R2	73.75	0.00	By Others & Anchorage Designed by Engineer	NA	NA

R1	80.00	1041.00	600T125-33 (33) & (2) .157", 3/4" embed SST PDPA/PDPAT to 4000 nw concrete	19.51 %	29.63 %

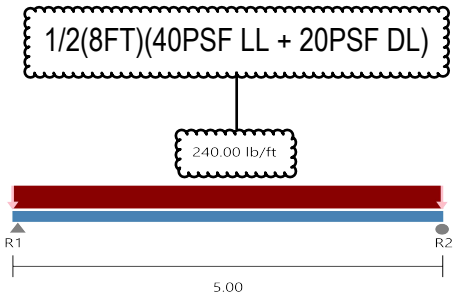
* Reference catalog for connector and anchor requirement notes as well as screw placements requirement

Simpson Strong-Tie® Wall Stud Bridging Connectors @ Jambs

Span/Parapet	Bracing Length(in.)	Design Number of Braces	Pn(lb.)	LSUBH (Min)[1]	LSUBH (Max)[1]	SUBH (Min)[1]	SUBH (Max)[1]	MSUBH (Min)[1]	MSUBH (Max)[1]
Span	Varies	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

1) Values in parentheses are stress ratios.
2) Bridging connectors are not designed for back-back, box, or built-up sections.
3) Reference www.strongtie.com for latest load data, important information, and general notes.
4) CFS Designer will not select bridging connectors unless all flexural and axial bracing settings are the same.
5) If the bracing length is larger than the span length, bridging connectors are not designed.



Section: (2) 400S125-43 (33 ksi) Boxed C Stud (punched)
Maxo = 992.6 ft-lb **Va =** 3478.2 lb **I =** 1.36 in^4

Loads have not been modified for strength checks
Loads have not been modified for deflection calculations

Bridging Connectors - Design Method =AISI S100

Span	Axial KyLy, KtLt	Flexual, Distortional	Connector	Stress Ratio
Span	NA	None, N/A	N/A	-

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
R1*	600.00	2.00	606.1	0.0	0.51	NO
R2*	600.00	2.00	606.1	0.0	0.51	NO

"*" after support means punched near support

	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	0.0(t)	-	0%	KΦ=0.00 lb-in/in Max KL/r = N/A
	Max. Shear, lbs	600.0	1619.1	37%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	750.0	992.6	76%	
	Moment Stability, ft-lbs	750.0	992.6	76%	
	Shear/Moment	0.76	1.00	76%	Shear 0.0, Moment 750.0
	Axial/Moment	0.76	1.00	76%	Axial 0.0(c), Moment 750.0
	Deflection Span, in	0.084	--meets L/713--		

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R1	0.0	600.0	By Others & Anchorage Designed by Engineer	NA	NA
R2	0.0	600.0	By Others & Anchorage Designed by Engineer	NA	NA

* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

2021/2018/2015
IBC and IRC
Code Compliant
ICC-ESR 4934

Expanding Your Solutions

CT Shaft Wall Stud System

CEMCO's Solution for Fire-Rated Shaft Walls, Stairwells, and Horizontal Ceilings

Effective 07/08/2022

Table of Contents

Introduction

CT Shaft Wall Stud System

CEMCO's new CT Shaft Wall Product is manufactured from hot-dipped galvanized steel in web depths of 2-1/2", 4" and 6" in 20 ga. (33 mil), and in 18 ga. (43 mil) thicknesses with corresponding J-Tracks. The CT Shaft Wall System is the industry's most flexible in that many gypsum board and gypsum Shaftliner manufacturers are approved in several UL fire-rated assemblies for both 1 and 2-hour ratings.

ASTM & Code Standards

- ICC-ESR 4934
- ASTM A653/653M – Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- ASTM A924/924M – Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process.
- ASTM A1003/1003M – Specification for Steel Sheet, Carbon, Metallic and Nonmetallic-Coated for Cold-Formed Framing Members.
- ASTM C645 – Standard Specification for Nonstructural Steel Framing Members.
- IBC: 2012, 2015, 2018, 2021
- CBC: 2013, 2016, 2019
- AISI: S100

Technical Support and Resources

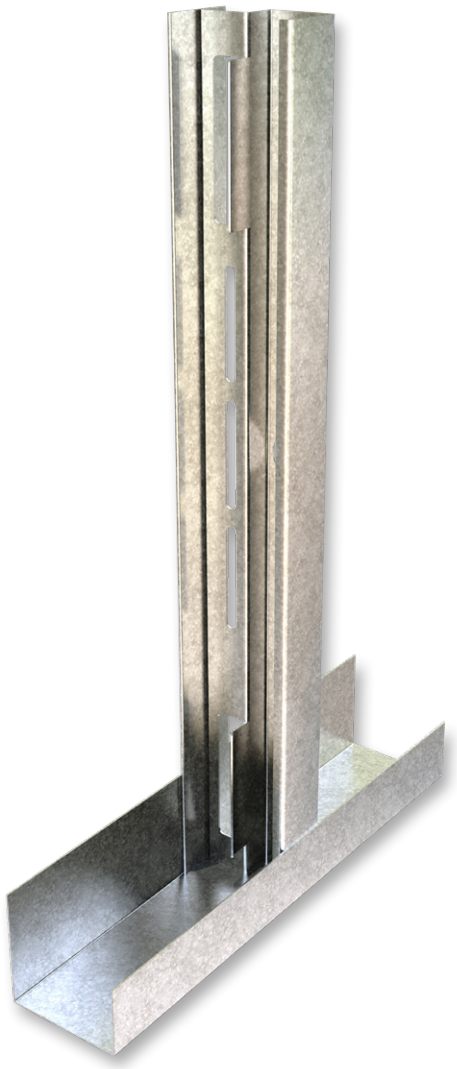
- Contact CEMCO's Technical Services Department at 800-775-2362 or email at technicalservices@cemcosteel.com.
- Visit www.cemcosteel.com for all catalogs, specification sheets, typical details, and acoustical/UL reports.

LEED v4 for Building & Design Construction

- MR Prerequisite: Construction and Demolition Waste Management Planning.
- MR Credit: Construction and Demolition Waste Management.
- MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials, Option 2.
- MR Credit: Building Product Disclosure and Optimization – Material Ingredients, Option 1.
- MR Credit: Building Life-Cycle Impact Reduction, Option 4.

MR Credit 4.1/4.2 – Recycled Content

- Total Recycled Content: 36.9%
- Post-Consumer: 19.8%
- Pre-Consumer: 14.4%



California's Proposition 65 Warning

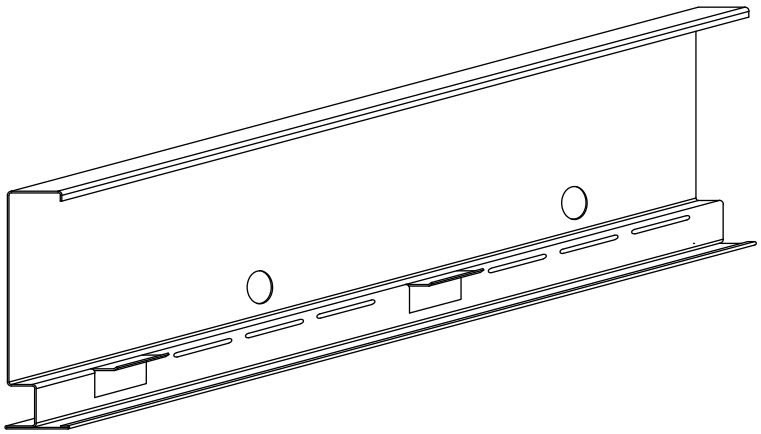
California's Safe Drinking Water and Toxic Enforcement Act of 1986 – commonly referred to as Proposition 65 ("Prop 65") (27 Cal. Code Reg. § 25600, et seq.) – has recently changed, requiring manufacturers to provide a warning based on its knowledge about the presence of one or more of the almost 900 listed chemicals which are known to the State of California to cause cancer and birth defects, or other reproductive harm. With a few exceptions, manufacturers operating in the state of California as well as those entities who distribute, import, package, and/or supply products into the State of California are now required provide a "clear and reasonable" warning to consumers that their products may contain one or more of these listed chemicals or compounds. The complete list is available at **www.P65Warnings.ca.gov.**

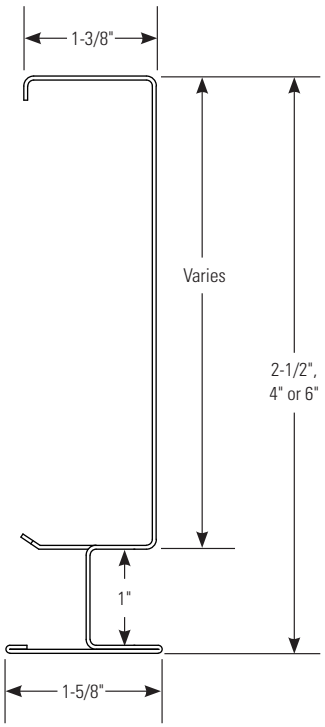
In compliance with the new requirements, we are notifying each of our customers that CEMCO products contain Nickel (metallic) and/or other chemicals listed which are known to the State of California to cause cancer and birth defects or other reproductive harm. Safety data sheets from our major suppliers are available from CEMCO on our website at **www.cemcosteel.com.**

Physical Properties							Section Properties			
"CT" Stud Designation	Web	Gauge	Mil	Yield Strength (ksi)	Design Thickness (in)	Coating	Weight (lb/ft)	Area (in^2)	Ix (in^4)	Sx (in^3)
20CT212	2-1/2	20	33	40	0.0346	G40	0.840	0.247	0.240	0.167
20CT4	4	20	33	40	0.0346	G40	1.016	0.299	0.708	0.307
20CT6	6	20	33	40	0.0346	G40	1.252	0.368	1.858	0.545
18CT212	2-1/2	18	43	40	0.0451	G60	1.090	0.320	0.307	0.214
18CT4	4	18	43	40	0.0451	G60	1.319	0.388	0.909	0.395
18CT6	6	18	43	40	0.0451	G60	1.625	0.478	2.393	0.703

Notes:
1. Uncoated steel thickness. Thickness is for carbon sheet steel.
2. Ix = Moment of Inertia
3. Sx = Section Modulus

PROPERTIES ARE EQUIVALENT TO A 600S162-43 STUD

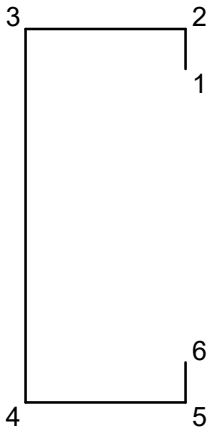




SECTION DESIGNATION: 600S162-43 [33] Single

Section Dimensions:

Web Height =	6.000 in
Top Flange =	1.625 in
Bottom Flange =	1.625 in
Stiffening Lip =	0.500 in
Inside Corner Radius =	0.0712 in
Punchout Width =	1.500 in
Punchout Length =	4.000 in
Design Thickness =	0.0451 in



Steel Properties:

Fy =	33.000 ksi
Fu =	45.000 ksi
Fya =	36.303 ksi

Gross Properties

A(gross)	Weight	A(net)	Sxx	Ixx	Rx	Iyy	Ry
(in^2)	(lb/ft)	(in^2)	(in^3)	(in^4)	(in)	(in^4)	(in)
0.4469	1.5206	0.3792	0.7719	2.3158	2.2764	0.1484	0.5762

Effective Properties

Ixx(defl)	Sxx	Ma-xx	Ma-x(dist)	Vag	Vanet	Syy	Ma-y
(in^4)	(in^3)	(Ft-Lb)	(Ft-Lb)	(lb)	(lb)	(in^3)	(Ft-Lb)
2.3158	0.7673	1390.0	1205.1	1416	1240	0.1080	177.9

K-phi for Distortional Buckling = 0.00 lb*in/in

Torsional Properties

Jx1000	Cw	Xo	m	Ro	Beta
(in^4)	(in^6)	(in)	(in)	(in)	
0.3030	1.0952	-1.062	0.670	2.577	0.830

Warping Torsional Properties

a	Sxx(lip)	Wn(1)	Wn(2)	Wn(3)	Wn(4)	Wn(5)	Wn(6)
(in^3)	(in^3)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)
97.1	0.9203	3.7825	2.7081	-1.9960	1.9960	-2.7081	-3.7825

Web Crippling - Allowable Loads, Pa (lb)

End Bearing Length = 1.00 (in)
Interior Bearing Length = 3.50 (in)

Cond. 1 (E1F)	Cond. 2 (I1F)	Cond. 3 (E2F)	Cond. 4 (I2F)
259	745	185	743

Punchout Reduction Factor Cond. 1, Rc(E1F) = 0.925 + 0.083x/h <= 1.0
Punchout Reduction Factor Cond. 2, Rc(I1F) = 0.888 + 0.053x/h <= 1.0

Limiting Heights									
Stud Depth	**Model Number**	**Gauge**	**Design Thickness** (in)	**Yield** (ksi)	**Deflection**	**5 psf**	**7.5 psf**	**10 psf**	**15 psf**
1-Hour Shaft Wall System									
2-1/2"	20CT212	20	0.0346	40	L/120	16' 0"	13' 11"	12' 8"	6' 10"
					L/180	14' 1"	12' 4"	11' 2"	6' 10"
					L/240	12' 10"	11' 2"	10' 2"	6' 10"
					L/360	11' 2"	9' 8"	8' 7"	0' 0"
	18CT212	18	0.0451	40	L/120	16' 2"	14' 2"	12' 11"	6' 7"
					L/180	13' 11"	12' 2"	11' 1"	6' 7"
					L/240	12' 5"	10' 10"	9' 10"	6' 7"
					L/360	10' 5"	9' 1"	8' 4"	0' 0"
4"	20CT4	20	0.0346	40	L/120	20' 10"	18' 2"	16' 6"	7' 2"
					L/180	18' 5"	16' 1"	14' 7"	7' 2"
					L/240	16' 10"	14' 8"	13' 4"	7' 2"
					L/360	14' 8"	12' 10"	11' 8"	7' 2"
	18CT4	18	0.0451	40	L/120	23' 7"	20' 7"	17' 7"	6' 7"
					L/180	20' 10"	18' 1"	16' 6"	6' 7"
					L/240	18' 11"	16' 6"	15' 0"	6' 7"
					L/360	16' 7"	14' 6"	13' 0"	6' 7"
6"	20CT6	20	0.0346	40	L/120	27' 4"	22' 4"	18' 4"	6' 11"
					L/180	24' 6"	21' 5"	18' 4"	6' 11"
					L/240	22' 4"	19' 6"	17' 8"	6' 11"
					L/360	19' 5"	17' 0"	15' 5"	6' 11"
	18CT6	18	0.0451	40	L/120	30' 1"	23' 6"	17' 7"	6' 7"
					L/180	26' 2"	22' 11"	17' 7"	6' 7"
					L/240	23' 7"	20' 7"	17' 7"	6' 7"
					L/360	20' 6"	17' 11"	16' 4"	6' 7"

Notes:
1. Allowable heights are based on the transverse load test complying with ICC-ES AC86 and AISI S916-15.
2. Studs spaced at 24" O.C. maximum.
3. Standard J-Track is used as both top and bottom track.
4. CT-Shaft Stud limiting heights were tested with 5/8" Type-X gypsum board oriented vertically.

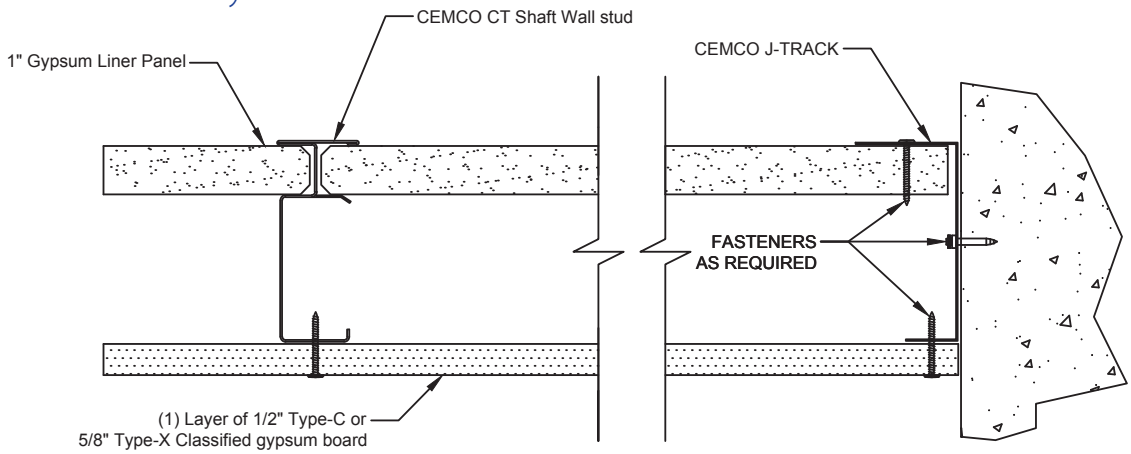
Limiting Heights									
Stud Depth	**Model Number**	**Gauge**	**Design Thickness** (in)	**Yield** (ksi)	**Deflection**	**5 psf**	**7.5 psf**	**10 psf**	**15 psf**
2-Hour Shaft Wall System									
2-1/2"	20CT212	20	0.0346	40	L/120	16' 11"	14' 10"	13' 5"	6' 11"
					L/180	15' 1"	13' 2"	12' 0"	6' 11"
					L/240	13' 11"	12' 2"	11' 1"	6' 11"
					L/360	12' 4"	10' 8"	9' 7"	6' 11"
	18CT212	18	0.0451	40	L/120	17' 0"	14' 11"	13' 6"	6' 7"
					L/120	14' 11"	13' 0"	11' 10"	6' 7"
					L/180	13' 6"	11' 10"	10' 8"	6' 7"
					L/240	11' 6"	10' 10"	9' 1"	0' 0"
4"	20CT4	20	0.0346	40	L/360	21' 8"	19' 0"	17' 2"	6' 11"
					L/180	19' 5"	16' 11"	15' 5"	6' 11"
					L/240	17' 10"	15' 6"	14' 1"	6' 11"
					L/360	15' 8"	13' 8"	12' 5"	6' 11"
	18CT4	18	0.0451	40	L/120	24' 8"	21' 7"	17' 7"	6' 7"
					L/180	21' 10"	19' 1"	17' 4"	6' 7"
					L/240	20' 0"	17' 6"	15' 11"	6' 7"
					L/360	17' 8"	15' 6"	14' 0"	6' 7"
6"	20CT6	20	0.0346	40	L/120	27' 7"	24' 2"	18' 4"	6' 11"
					L/180	25' 4"	22' 1"	18' 4"	6' 11"
					L/240	23' 1"	20' 2"	18' 4"	6' 11"
					L/360	20' 2"	17' 7"	16' 0"	6' 11"
	18CT6	18	0.0451	40	L/120	31' 2"	23' 6"	17' 7"	6' 7"
					L/180	27' 5"	23' 6"	17' 7"	6' 7"
					L/240	24' 11"	21' 10"	17' 7"	6' 7"
					L/360	21' 11"	19' 1"	17' 5"	6' 7"

Notes:
1. Allowable heights are based on the transverse load test complying with ICC-ES AC86 and AISI S916-15.
2. Studs spaced at 24" O.C. maximum.
3. Standard J-Track is used as both top and bottom track.
4. CT-Shaft Stud limiting heights were tested with 5/8" Type-X gypsum board oriented vertically.

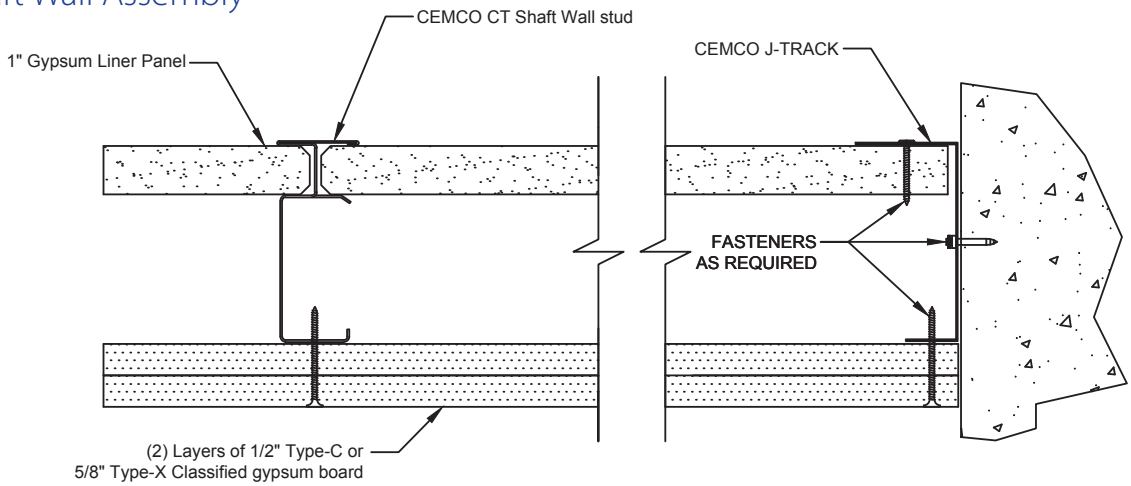
Limiting Heights									
Stud Depth	**Model Number**	**Gauge**	**Design Thickness** (in)	**Yield** (ksi)	**Deflection**	**5 psf**	**7.5 psf**	**10 psf**	**15 psf**
1-Hour Stairwell System									
4"	20CT4	20	0.0346	40	L/120	21' 10"	18' 8"	16' 2"	9' 11"
					L/180	19' 4"	16' 11"	15' 4"	9' 11"
					L/240	17' 8"	15' 6"	14' 1"	9' 11"
					L/360	15' 8"	13' 8"	12' 6"	9' 11"
	18CT4	18	0.0451	40	L/120	24' 2"	21' 1"	19' 2"	10' 5"
					L/180	21' 6"	18' 8"	17' 0"	10' 5"
					L/240	19' 8"	17' 2"	15' 7"	10' 5"
					L/360	17' 4"	15' 2"	13' 8"	10' 5"
6"	20CT6	20	0.0346	40	L/120	28' 11"	23' 7"	18' 4"	10' 10"
					L/180	25' 10"	22' 6"	18' 4"	10' 10"
					L/240	23' 8"	20' 8"	18' 4"	10' 10"
					L/360	20' 11"	18' 2"	16' 7"	10' 10"
	18CT6	18	0.0451	40	L/120	30' 7"	25' 0"	21' 8"	10' 5"
					L/180	27' 5"	23' 11"	21' 8"	10' 5"
					L/240	25' 2"	22' 0"	20' 0"	10' 5"
					L/360	22' 2"	19' 5"	17' 7"	10' 5"

Notes:
1. Allowable heights are based on the transverse load test complying with ICC-ES AC86 and AISI S916-15.
2. Studs spaced at 24" O.C. maximum.
3. Standard J-Track is used as both top and bottom track.
4. CT-Shaft Stud limiting heights were tested with 5/8" Type-X gypsum board oriented vertically.

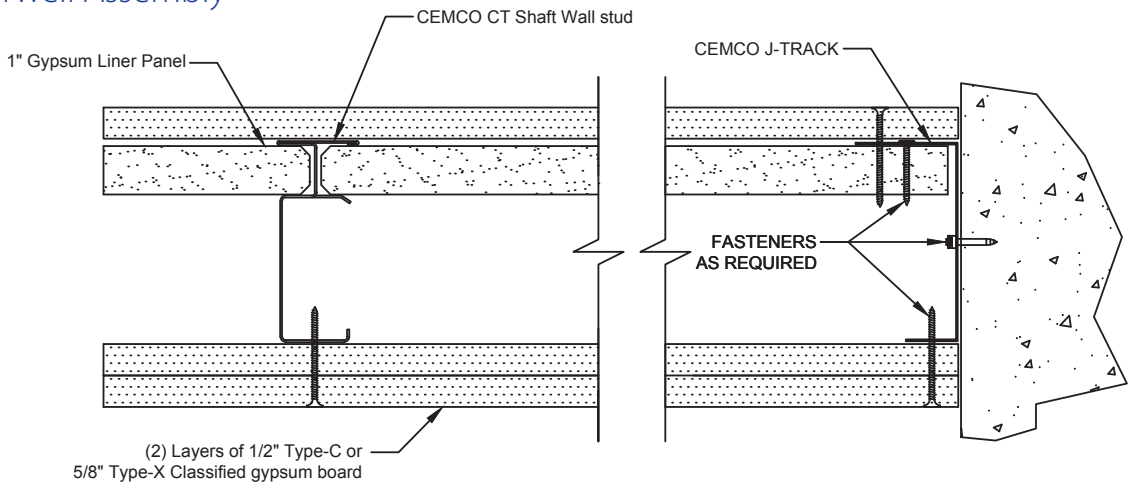
1 Hour Shaft Wall Assembly



2 Hour Shaft Wall Assembly



2 Hour Stairwell Assembly



Horizontal Spans (Dead Load Only)

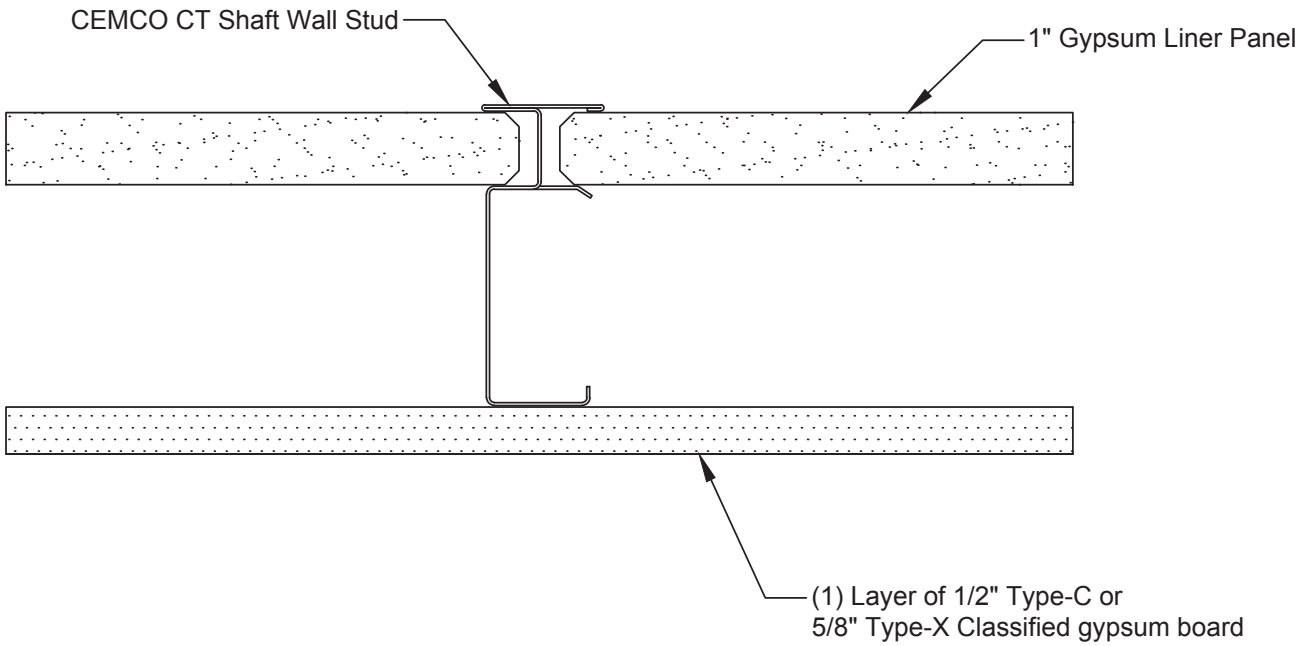
Web Depth	Gauge	Design Thickness (in)	Mil	1 Layer Type "X" 1" Shaft Liner			2 Layer Type "X" 1" Shaft Liner			2 Layers of Type "C" 1" Shaft Liner		
				L/120	L/240	L/360	L/120	L/240	L/360	L/120	L/240	L/360
2-1/2"	20	0.0346	33	13'-3"	10'-6"	9'-2"	12'-0"	9'-6"	8'-4"	12'-2"	9'-8"	8'-5"
4"	20	0.0346	33	18'-11"	15'-0"	13'-1"	17'-2"	13'-8"	11'-11"	17'-6"	13'-10"	12'-1"
6"	20	0.0346	33	25'-11"	20'-7"	18'-0"	23'-8"	18'-9"	16'-4"	24'-0"	19'-0"	16'-7"
4"	18	0.0451	43	20'-5"	16'-2"	14'-2"	18'-7"	14'-9"	12'-11"	18'-10"	15'-0"	13'-1"
6"	18	0.0451	43	28'-0"	22'-2"	19'-5"	25'-6"	20'-3"	17'-8"	25'-11"	20'-7"	18'-0"

Notes:

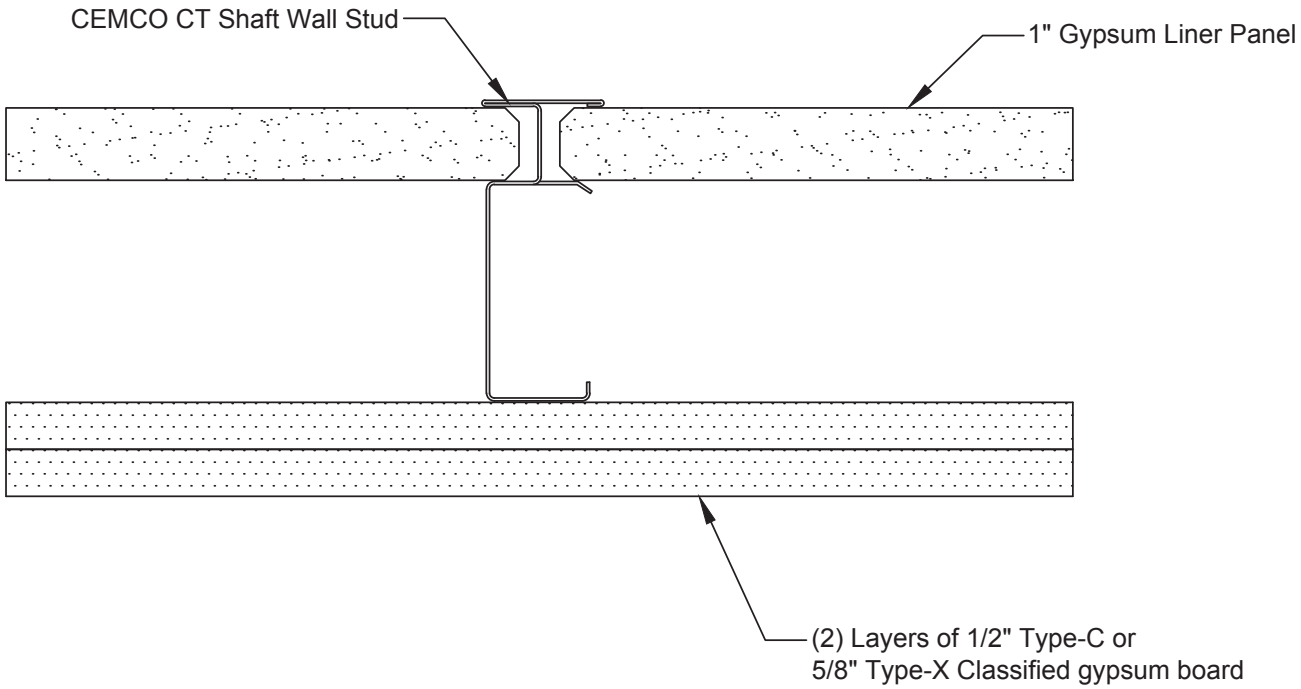
1. Not designed to carry live loads, mechanical loads or for material storage area use.

2. Dead Loads include: Type-X: 2.2 PSF
Type-C: 2.0 PSF
1" Shaft Liner: 4.0 PSF
CT-Stud Weight

1 Hour Horizontal Assembly



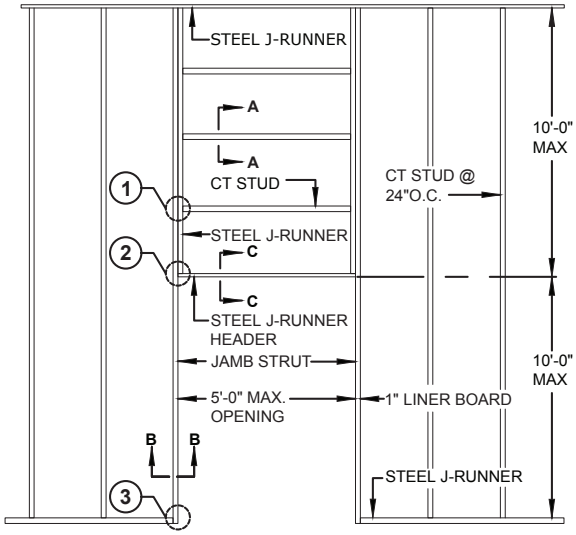
2 Hour Horizontal Assembly



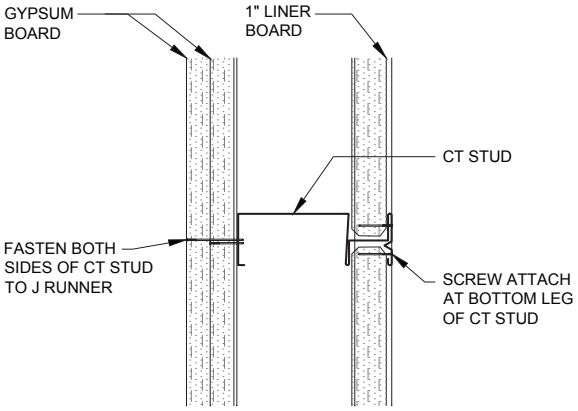
1 Hour	2 Hour	3 Hour	4 Hour
GA WP 6800	GA WP 7040	GA WP 7422	GA WP 7640
GA WP 6801	GA WP 7051	GA WP 7424	
GA WP 6802	GA WP 7052		
GA WP 6850	GA WP 7054		
GA WP 6851	GA WP 7054.4		
GA WP 6904	GA WP 7056		
GA WP 6905	GA WP 7057		
GA WP 7024.3	GA WP 7058		
	GA WP 7059		
	GA WP 7060		
	GA WP 7061		
	GA WP 7062		
	GA WP 7064		
	GA WP 7065.2		
	GA WP 7065.5		
	GA WP 7066		
	GA WP 7067		
	GA WP 7073		
	GA WP 7076		
	GA WP 7077		
	GA WP 7078		
	GA WP 7079		
	GA WP 7080		
	GA WP 7084		
	GA WP 7096		
	GA WP 7097		

Shaft Wall Installation Instructions

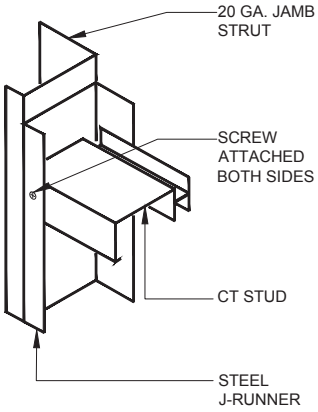
1. Layout per construction drawings. Secure J-Track as perimeter framing on floor and plumb to ceiling, floor and sides. Attach using suitable fasteners not to exceed 24" on-center. Sealant may be required per the specific assembly.
2. Plan the stud layout at 24" on-center and adjust accordingly at either end to avoid the last CT stud installed is no closer than 8" from the end.
3. Cut the first 1" Shaftliner panel 3/4" to 1" less than the total height of the framed section. Plumb the flush against the J-Track and secure with 1-5/8" long #6 Type S screws 24" on-center.
4. Insert a CT Stud (cut 3/4" less than the overall height of the section) into the tracks (top and bottom) and fit tightly over the installed Shaftliner panel. Install top and bottom of the CT stud into both legs of the J-Track.
5. Install the next 1" Shaftliner board (cut 3/4" to 1" shorter than the overall height of the section) into the T-section of the CT Stud.
6. Continue to install successive CT studs and Shaftliner panels as described above until the wall section is closed. The final panel section may be secured using 1-5/8" long #6 Type S screws into the J-Track.
7. For doors, rough openings, and other large penetrations/openings, install J-Track with a 3" back leg as perimeter framing for elevator doors and block cavity using a 12" wide gypsum board filler strips per the door frame manufacturer's instructions.
8. 1" Shaftliner boards may be abutted, spliced, or stacked within the cavity with panels no shorter than 2' in length. Joints of adjacent Shaftliner panels should be alternately stacked or staggered to prevent a continuous joint (horizontal).
9. For a one sided finished vertical system: A 1-hour rating is achieved by installing a layer of 1/2" Type-C or 5/8" Type-X Classified gypsum board horizontally using 1" Type-S or S-12 screws spaced at 24" on-center ensuring the horizontal joints are offset from any splice joints in the shaftliner panels by no less than 12". For a 2-hour system, a face layer of 1/2" Type-C or 5/8" Type-X Classified gypsum board may be installed either horizontally or vertically over the 1-hour system using 1-5/8" Type S or S-12 screws spaced at 8" on-center.
10. For a two-sided finished vertical system: Each side may be installed either horizontally or vertically with 1" Type S or S-12 screws spaced at 8" on-center. Offset edges and ends on opposite sides by at least 24" on-center.
11. For a one-sided finished horizontal system: A 1-hour rating is achieved by installing one layer of 1/2" Type-C or 5/8" Type-X Classified gypsum board perpendicular to framing using 1" Type-S or S-12 screws spaced at 24" on-center ensuring long-edged joints are offset from any splice joints in the shaftliner panels by no less than 12". For a 2-hour system, a face layer of 1/2" Type-C or 5/8" Type-X Classified gypsum board may be installed either perpendicular or parallel to framing over the 1-hour system using 1-5/8" Type-S or S-12 screws spaced at 8" on-center.
12. If installing for HVAC ducts, consult with the HVAC engineer regarding the level of caulking and sealant required. All joints on the face layers must be taped and finished with joint compound meeting ASTM C 475. All penetration openings must be filled with approved fire-stopping sealants.



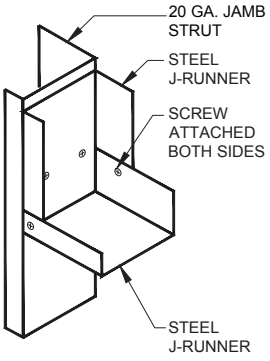
ELEVATOR DOOR ROUGH OPENING



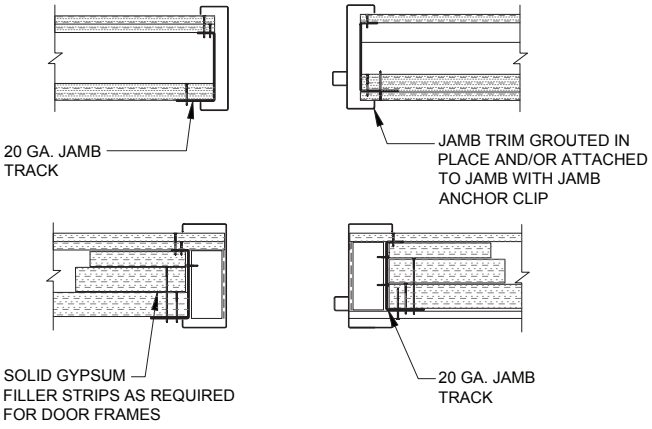
4 SECTION A-A



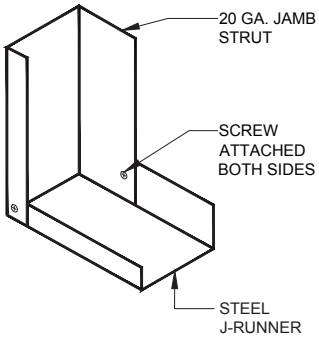
1 HORIZONTAL ATTACHMENT CT STUD TO J-RUNNER



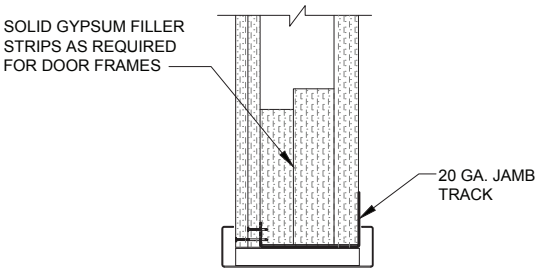
2 HEADER DETAIL



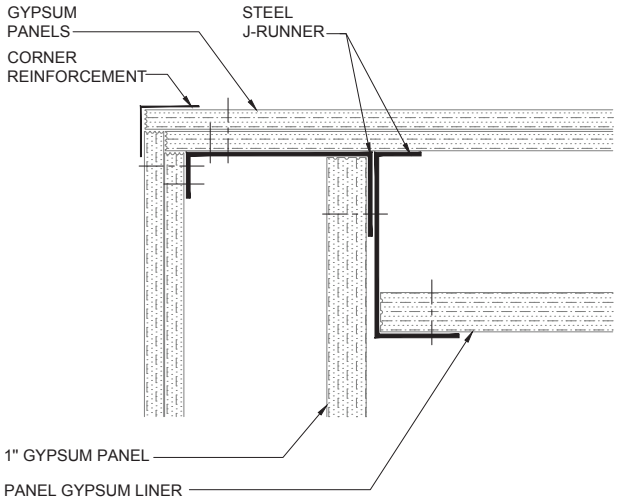
5 JAMB DETAIL SECTION B-B



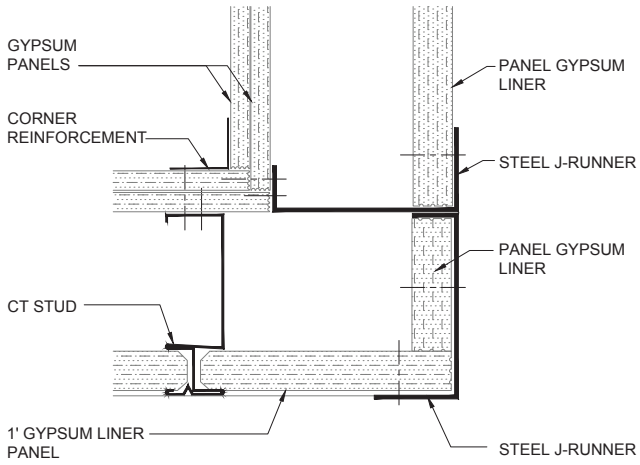
3 JAMB DETAIL



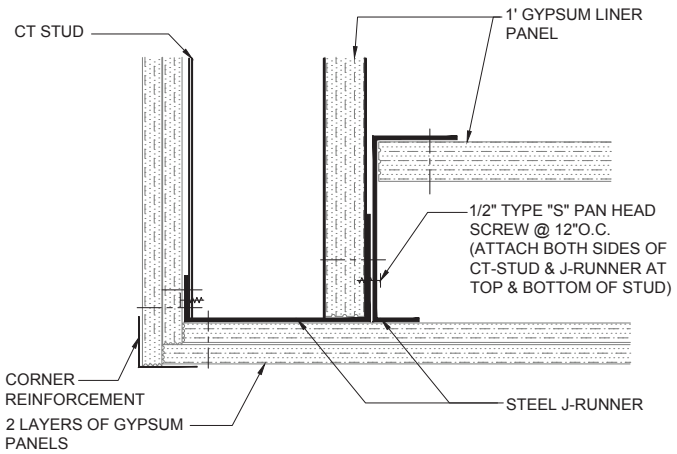
6 HEADER DETAIL SECTION C-C



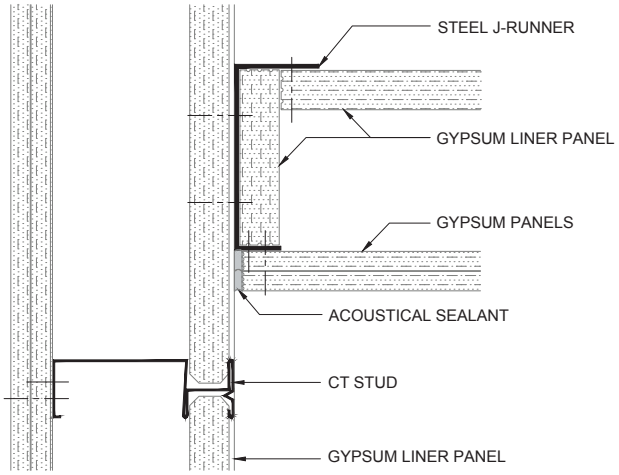
7 OUTSIDE CORNER



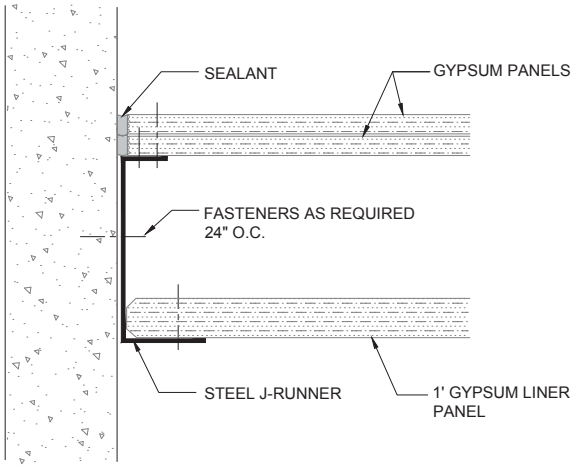
8 INSIDE CORNER



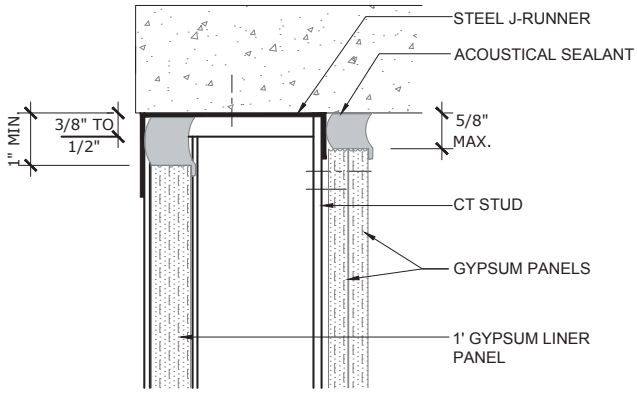
9 INSIDE CORNER



10 WALL JUNCTION



11 WALL INTERSECTION



12 HEAD SECTION (UL TBD)

Notes

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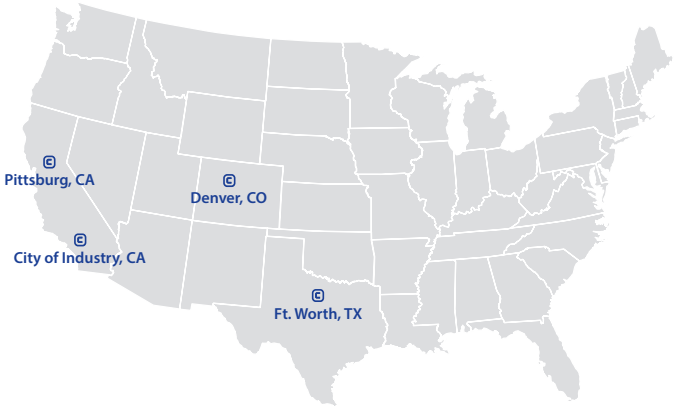

STEEL FRAMING INDUSTRY ASSOCIATION

Effective 07/08/2022

BSE
Brienen ***S***tructural ***E***ngineers, P.S.

CFS JOIST FRAMING DESIGN

BSE

***B**rienen **S**tructural **E**ngineers, P.S.*

JOIST BRACING REQUIREMENTS, CONTINUED

B2.6 Bracing Design

Bracing members shall be designed either on the basis of discretely braced design or on the basis of continuously braced design, in accordance with the following:

(a) Discretely Braced Design. For discretely braced design, *bracing* members shall be designed in accordance with Section C2.2 of AISI S100 [CSA S136].

(b) Continuously Braced Design. For continuously braced design, *bracing* members shall be designed in accordance with Section C2.2 of AISI S100 [CSA S136], unless the following requirements, as applicable, are met:

(1) Members are spaced no greater than 24 inches (610 mm) on center.

(2) The sheathing or deck shall consist of a minimum of 3/8 inch (9.5 mm) wood *structural sheathing* that complies with DOC PS 1, DOC PS 2, CSA O437 or CSA O325, or *steel deck* with a minimum profile depth of 9/16 in. (14.3 mm) and a minimum thickness of 0.0269 in. (0.683 mm). The sheathing or deck shall be attached with minimum No. 8 screws at a maximum 12 inches (305 mm) on center.

(3) *Floor joists* and *ceiling joists* with simple or continuous spans that exceed 8 feet (2.44 m) shall have the tension *flanges* laterally braced. Each intermediate brace shall be spaced at 8 feet (2.44 m) maximum and shall be designed to resist a required lateral force, P_L, determined in accordance with the following:

For uniform *loads*:

$$P_L = 1.5(m/d)\,F \qquad \text{(Eq. B2.6-1)}$$

where

m = Distance from shear center to mid-plane of *web*
d = Depth of *C-shape* section
F = *w*a
w = Uniform *design load* [*factored load*]
a = Distance between center line of braces

FOR OUR 10" DEEP JOISTS
PL = 1.5*(1.14"/10")*(1.2*20psf + 1.6*40psf)*(2ft oc) * (8ft)
PL = 240 lbs

YIELD STRENGTH OF 33MIL x 1 1/2" STRAP
φTn = (0.9)*(1.5")*(0.035")*(33ksi) = 1560 lbs

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JOIST BRACING REQUIREMENTS

APPLICABLE SECTION FOR DETAIL 14/MS1.2

B1.2 Design Basis

The proportioning, designing and detailing of *cold-formed steel light-frame lateral force-resisting systems, trusses, structural members, connections* and *connectors* shall be in accordance with AISI S100 [CSA S136], and the reference documents except as modified or supplemented by the requirements of this Standard.

B1.2.1 Floor Joists, Ceiling Joists and Roof Rafters

B1.2.1.1 *Floor joists, ceiling joists* and *roof rafters* shall be designed either on the basis of discretely braced design or on the basis of continuously braced design, in accordance with the following:

(a) Discretely Braced Design. Floor and roof assemblies using discretely braced design shall be designed neglecting the structural *bracing* and composite-action contribution of attached sheathing or deck. The discretely braced design requirements of the Standard shall be applied to assemblies where the

sheathing or deck is not attached directly to *structural members*.

(b) Continuously Braced Design. Unless noted otherwise in Section B2 or B4, the continuously braced design requirements of this Standard shall be limited to assemblies where *structural sheathing* or *steel deck* is attached directly to *floor joists, ceiling joists* and *roof rafters* that comply with all of the following conditions:

(1) Maximum *web* depth = 14 inches (356 mm)
(2) Maximum *design thickness* = 0.1242 inches (3.155 mm)
(3) Minimum design *yield strength*, F_y = 33 ksi (230 MPa)
(4) Maximum design *yield strength*, F_y = 50 ksi (345 MPa)

APPLICABLE SECTION FOR BRACING USING PW WEAR SURFACE TOP AND GYP BOT

TYP CFS CEILING JOISTS
10" STUDS, 24" OC.

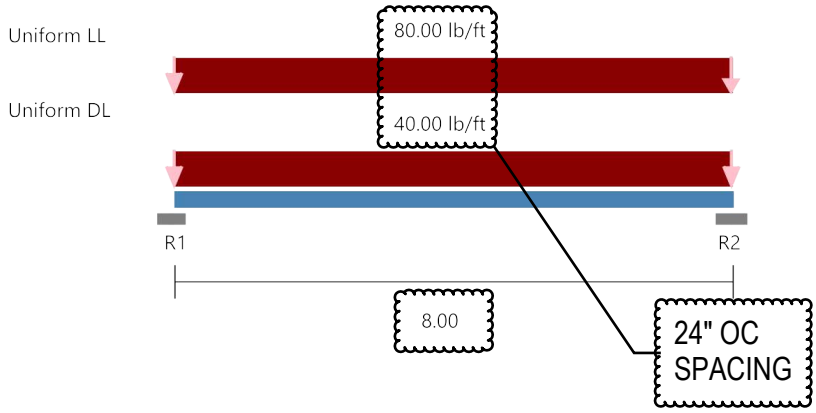
Project Name: Centeris

Model: 8ft Floor Joist 10" @ 24" OC - 40 psf LL

Code: AISI S100-16w/S2-20

Date: 10/02/2025

Simpson Strong-Tie® CFS Designer™ 5.2.8.0



Section : 1000S200-54 (50 ksi) @ 24 in" o.c. Single C Stud (punched)
Maxo = 4254.2 ft-lb **Va =** 1660.8 lb **I =** 10.769 in^4

Deflection Limits: Total Load - 240 Live Load - 360

Load Comb:
1. DL + LL All spans
2. DL + LL Even spans
3. DL + LL Odd spans
4. LL All spans
5. LL Even spans
6. LL Odd spans

ATTACH TO FULL-HEIGHT STUD W/ (6) #10 SMS Ra = 600LBS & TO HSS W/ (3) SHOTPINS Ra = 690LBS

Joist Flexural and Deflection

	Mmax (ft-lb)	K-phi (lb-in/in)	Lm (in)	Ma-dist (ft-lb)	Mmax/ Ma min	Load Comb.	TL Defl	Load Comb.	LL Defl	Load Comb.
Span	960	0.0	96.0	3770.5	0.255	1	L/2758	1	L/4137	4

Joist Bending and Web Crippling

Support	Load (lb)	Load Comb.	Bearing (in)	Pa (lb)	Pn (lb)	Max Intr.	Load Comb.	Stiffeners Required
R1	480.0	1	1.00	553.2	968.1	0.45	1	NO
R2	480.0	1	1.00	553.2	968.1	0.45	1	NO

Joist Bending and Shear

Support	Vmax (lb)	Load Comb.	Va Factor	V/Va	M/Ma	Intr. Unstiffened	Load Comb.	Intr. Stiffened	Load Comb.
R1	480.0	1	1.000	0.29	0.00	0.29	1	N/A	N/A
R2	480.0	1	1.000	0.29	0.00	0.29	1	N/A	N/A

Joist Reaction and Connections

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R1	0.0	480.0	S/DHUTF (3)#10 Joist & (6)#10 top,(8)#14 x 2" face to 14ga top plate	28.24 %	28.24 %
R2	0.0	480.0	S/DHUTF (3)#10 Joist & (6)#10 top,(8)#14 x 2" face to 14ga top plate	28.24 %	28.24 %

* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

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LATERAL DESIGN

WALL CONSTRUCTION: (4) LAYERS GYP - (4)(2.5PSF) = 10PSF
METAL STUDS - = 1.5PSF
ACOUSTIC INSULATION - = 2PSF
13.5PSF
USE 14 PSF

BATTERY ROOM EXPANSION (ROOM 173)

TOTAL CEILING SEISMIC WEIGHT = (20PSF)(384 FT²) = 7.7K
TOP HALF OF WALLS = ½(11.17FT)(14PSF)(54FT) = = 5.0K
TOTAL WALL LENGTH

TOTAL SEISMIC MASS = 12.7K

FIND F_p PER ASCE 7-16, EQN 13.3-1

$$F_p = \frac{0.4(a_p) S_{DS} W_p}{R_p/I_p}\left(1+2\frac{z}{h}\right) = \frac{0.4(1.0)(1.006)(12.1K)}{(2.5/1.0)}\left(1+2\left(\frac{11.17'}{47'}\right)\right)$$

$F_p = 0.237W_p < F_{p_{MIN}} = 0.3 S_{DS} I_p W_p = 0.302W_p$ ∴ F_p = 3.8K TOTAL

~~BATTERY ROOM EXPANSION (ROOM 110D)~~

~~TOTAL CEILING SEISMIC WEIGHT = (20PSF)(128 FT²) = 2.6K~~
~~TOP HALF OF WALLS = ½(19.5FT)(14PSF)(40FT) = 3.8K~~
~~TOTAL WALL LENGTH~~

~~TOTAL SEISMIC MASS = 6.4K~~
~~& F_p = 1.9K TOTAL~~

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Diaphragm Shear Provisions from AISI 400-20, Section F2.4

F2.4 Shear Strength

F2.4.1 Nominal Strength

The *nominal strength* of *diaphragms* sheathed with *wood structural panels* is permitted to be determined in accordance with Eq. F2.4.1-1 subject to the requirements in Section F2.4.1.1.

$$V_n = v_n L \qquad \text{(Eq. F2.4.1-1)}$$

where

L = *Diaphragm* resistance length, in ft (m)

v_n = *Nominal shear strength* per unit length as specified in Table F2.4-1, lb/ft (kN/m)

F2.4.1.1 Requirements for Tabulated Systems

The following requirements shall apply to *diaphragms* sheathed with *wood structural panels*:

(a) The aspect ratio (length:width) of the *diaphragm* does not exceed 4:1 for blocked *diaphragms* and 3:1 for unblocked *diaphragms*.

(b) *Joists* and *tracks* are ASTM A1003 Structural Grade 33 (Grade 230) Type H steel for members with a *designation thickness* of 33 and 43 mils, and ASTM A1003 Structural Grade 50 (Grade 340) Type H steel for members with a *designation thickness* equal to or greater than 54 mils.

(c) The minimum *designation thickness* of *structural members* is 33 mils.

(d) *Joists* are C-shape members with a minimum *flange* width of 1-5/8 in. (41.3 mm), minimum *web* depth of 3-1/2 in. (89 mm) and minimum *edge stiffener* of 3/8 in. (9.5 mm).

(e) *Track* has a minimum *flange* width of 1-1/4 in. (31.8 mm) and a minimum *web* depth of 3-1/2 in. (89 mm).

(f) Screws for *structural members* are a minimum No. 8 and are in accordance with ASTM C1513.

(g) *Wood structural panel* sheathing is manufactured using exterior glue and complies with DOC PS-1 and DOC PS-2.

(h) Screws used to attach *wood structural panels* are minimum No. 8 where *structural members* have a *designation thickness* of 54 mils or less and No. 10 where *structural members* have a *designation thickness* greater than 54 mils and comply with ASTM C1513.

(i) Screws in the field of the panel are attached to intermediate supports at a maximum 12-in. (305 mm) spacing along the *structural members*.

(j) Panels less than 12-in. (305-mm) wide are not used.

(k) Maximum *joist* spacing is 24 in. (610 mm) on center.

(l) Where *diaphragms* are designed as blocked, all panel edges are attached to *structural members* or *panel blocking*.

(m) Where used as *blocking*, flat *strap* is a minimum thickness of 33 mils with a minimum width of 1-1/2 in. (38.1 mm) and is installed below the sheathing.

(n) Where *diaphragms* are designed as blocked, the screws are installed through the sheathing to the *blocking*.

(o) Fasteners along the edges in shear panels are placed from panel edges not less than

F2.4.2 Available Strength

The *available strength* ($\phi_v V_n$ or V_n/Ω_v) shall be determined from the *nominal strength* using the applicable *safety factors* and *resistance factors* given in this section in accordance with the applicable design method – *ASD* or *LRFD* as follows:

$\Omega_v = 2.50$ *(ASD)*

$\phi_v = 0.60$ *(LRFD)*

F2.4.3 Design Deflection

The deflection of a *diaphragm* with *wood structural panel* sheathing shown in Table F2.4-1 shall be determined by principles of mechanics considering the deformation of the sheathing and its attachment, *chords* and *collectors*.

Table F2.4-1
Nominal Shear Strength (v_n) per Unit Length for Diaphragms Sheathed With Wood Structural Panel Sheathing [1, 2]
***United States and Mexico* (lb/ft)**

Sheathing	Thickness (in.)	Blocked: Screw spacing at diaphragm boundary edges and at all continuous panel edges (in.) 6	4	2.5	2	Unblocked: Screws spaced maximum of 6 in. on all supported edges: Load perpendicular to unblocked edges and continuous panel joints	All other configurations
		Blocked: Screw spacing at all other panel edges (in.) 6	6	4	3		
Structural I	3/8	768	1022	1660	2045	685	510
	7/16	768	1127	1800	2255	755	565
	15/32	925	1232	1970	2465	825	615
C-D, C-C and other graded wood structural panels	3/8	690	920	1470	1840	615	460
	7/16	760	1015	1620	2030	680	505
	15/32	832	1110	1770	2215	740	555

1. For SI: 1" = 25.4 mm, 1 ft = 0.305 m, 1 lb = 4.45 N
2. For *diaphragms* sheathed with *wood structural panels*, tabulated R_n values are applicable for short-term *load* duration (seismic loads).

3.8k/(0.6*555lb/ft) = 11'5" for diaphragm support, we have significantly more in each direction.