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City of Puyallup
Development & Permitting Services
ISSUED PERMIT

Building	Planning
Engineering	Public Works
Fire	Traffic

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

UPS and Battery Room Build-Out
Structural Calculations

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

Project Number 24201
March 01, 2024

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, 2018
ASCE 7-16
AISI Standards
- AISI S100-16
- AISI S200-12
- AISI S210-12
- AISI S211-12
- AISI S212-12
- AISI S240-12

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)

CEILING CONSTRUCTION: 2-HOUR RATING

	2.5 psf	PLYWOOD (3/4" ATTACHED w/ #10 SCREWS @ 12" o.c.)
2plf/2ft =	1.0 psf	8" STUDS, 43-mil min 24" o.c. w/ SCREWS @ 12" o.c
	2.5 psf	5/8" Gyp (1st layer)
	2.5 psf	5/8" Gyp (2nd layer)
	2.5 psf	5/8" Gyp (3rd layer)
1/2plf/2ft =	1/4 psf	HAT-SHAPED FURRING PERP. TO JOISTS
	2.5 psf	5/8" Gyp (4th Layer)
	5 psf	MEP
≈	3/4 psf	GIRDERS
	19.5 psf	

use 20psf DEAD LOAD

CEILING HEIGHT, Z = 12ft
STRUCTURE HEIGHT h =

ROOF LIVE LOAD = 40psf

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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 72" oc (mid-ht) 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

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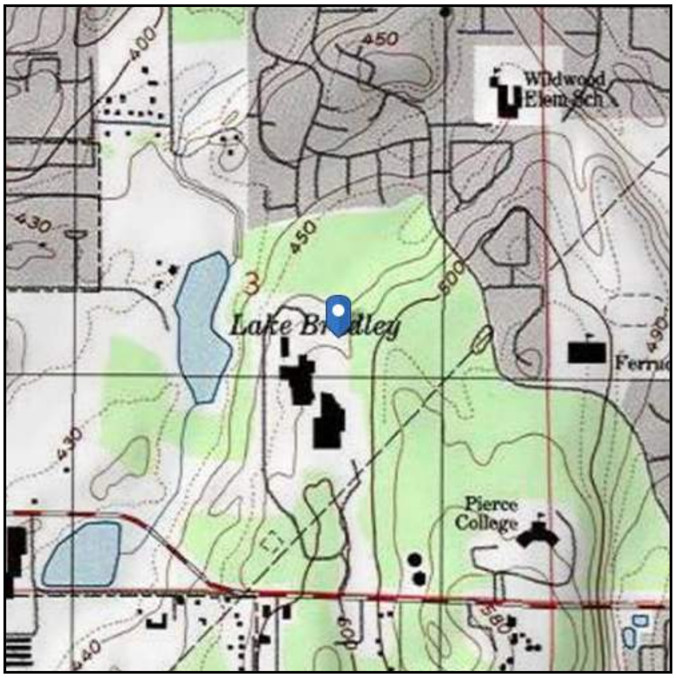
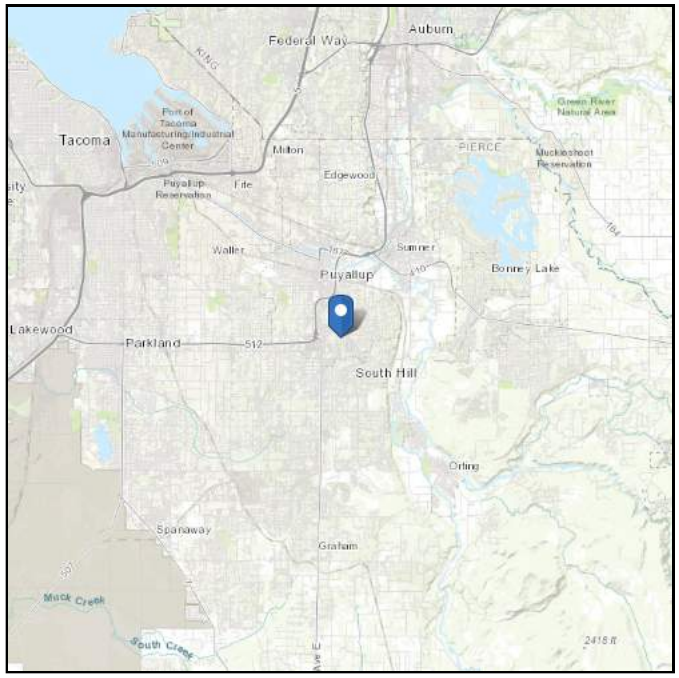
ASCE Hazards Report

Address:
1023 39th Ave SE
Puyallup, Washington
98374

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see Section 11.4.3)

Latitude: 47.160853
Longitude: -122.279318
Elevation: 482.88472036372787 ft (NAVD 88)





Wind

Results:

Wind Speed	98 Vmph
10-year MRI	67 Vmph
25-year MRI	73 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source:	ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed:	Mon Feb 05 2024

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

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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} :	1.509	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: Mon Feb 05 2024

Date Source: USGS Seismic Design Maps

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Seismic Forces

Wall Type Infill Walls

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 = 1

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

F_d = 0.483W (LRFD)

$E_{ASD} = 0.7F_d$ = 0.338W (ASD)

ASD Force = 4.6 PSF

Fastener - Anchorage to Concrete

a_p = 1 R_p = 2.5 Ω_o = 2.5

S_{DS} = 1.006 I_p = 1 z/h = 1

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

F_d = 1.207W (LRFD)

$E_{ASD} = 0.7F_d/1.2$*= 0.845W (ASD)

ASD Force = 11.4 PSF

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ANCHOR AND CONNECTOR DESIGN INFORMATION

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Track Connection Distances - Based on Connector Capacities

PRESSURE	MAX HEIGHT						
For 5.0 psf (GWB finishes)							
Max Considered Height							
13.50	Track Demand =	(Ht)/2*5psf =	33.8 plf				
	Connection to Concrete**	MIN SHOTPIN CAPACITY	v =	120lbs/anchor	spacing ≤	18.7 in	@ (11.4psf)
	Connection to Steel	MIN SCREW CAPACITY	v =	230lbs/anchor	spacing ≤	30.0 in	

** Where seismic forces control anchorage, Fastener spacing calculated includes Overstrength Reduction

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Project: CENTERIS

Date: 2/7/24

CHECK TRACK FOR MAX FASTENER SPACING

S_{MAX} must meet $M_{A\,400T125-33} = 3.97$ k·in

$V_{A\,400T125-33} = 940^{\#}$

Uniform Load (DEMAND) = 5psf * (12'-0")/2
= 30plf

for 36" o.c. SPACING, $M_{DEMAND} \leq \frac{wL^2}{8} = \frac{(30plf)(36")^2}{8} = 4.86$ k·in ✗

THIS IS TOO Large!

→ if SPACING IS 30" o.c. → $M_{DEMAND} = 3.375$ k·in ✓

Check Shear = $V_{DEMAND} = 30plf * \frac{30" o.c.}{2} * \frac{1ft}{12"} = 37.5^{\#}$ ✓ $\leq 940^{\#}$ OK

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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]

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

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

[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.

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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

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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):			$^3/_{16}$		$^1/_4$		$^3/_8$		$^1/_2$		≥ $^3/_4$	
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

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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

SCREW ALLOWABLE LOADS & UL ASSEMBLIES

SCREW ALLOWABLE LOADS (LBS.)

MODEL NO.	DESIGN THICKNESS (in)	MIN. THICKNESS (in)	FY YIELD (ksi)	FU TENSILE (ksi)	#6 SCREW (0.138" dia; 0.25" head)		#8 SCREW (0.164" Dia; 0.3125" Head)		#10 SCREW (0.190" Dia; 0.340" Head)		#12 SCREW (0.216" Dia; 0.340" Head)	
					SHEAR	TENSION	SHEAR	TENSION	SHEAR	TENSION	SHEAR	TENSION
VIPER-X-18	0.0188	0.0179	57	65	142[1]	48	150[1]	57	164[1]	66	109	75
VIPER-X-22	0.0235	0.0223	57	65	174[1]	60	184[1]	71	236[1]	82	152	93

Notes:

1 Shear values are tested per AISI S100-12 and S905 procedure.
2. Capacities are based on section E4 of the AISI S100-12 Specification.
3. Capacities are based on Allowable Strength Design (ASD).
4. Screw pull-out capacities are based on listed head diameter.
5. Two sheets of equal thickness and tensile strength are assumed in tabulated values.
6. When materials of different steel thickness and tensile strength are connected, use the lowest value for shear capacity (tilting and bearing), for pull-out capacity use sheet closest to screw tip and for pull-over capacity use sheet closest to screw head.
7. Where multiple fasteners are used, screws are assumed to have a center-to-center spacing of at least 3 times the nominal diameter.
8. Screws are assumed to have a center-of-screw to edge-of-steel dimension of at least 1.5 times the nominal diameter of the screw.
9. When screws are subjected to combination of shear and tension forces, interaction equation of AISI S100-12 Specification section E4.5 shall be used.

UL ASSEMBLIES – VIPER-X FIRE TESTING DATA (ASTM E119)

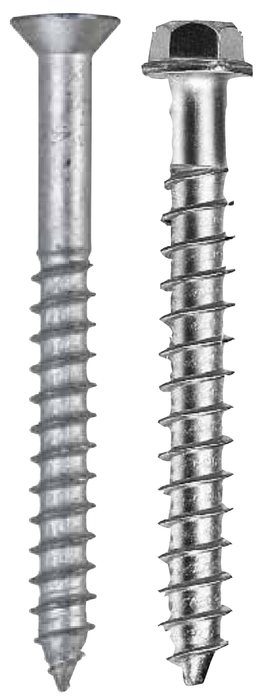
UL DESIGN NO.	VIPER-X (DESIGN THICKNESS)	WALL RATING
U411	18 MIL	2 HR
U412	18 MIL	2 HR
U419	18 MIL	1, 2, 3 or 4 HR
U435	18 MIL	3 or 4 HR
U465	18 MIL	1 HR Chase
V417	18 MIL	1 HR
V435	18 MIL	1 HR
V448	18 MIL	1 HR
V469	18 MIL	1 or 2 HR Chase
V486	18 MIL	1, 2, or 2-1/2 HR
V489	18 MIL	1, 2, 3 or 4 HR
V496	18 MIL	1 or 2 HR Chase
V498	18 MIL	1, 2, 3 or 4 HR
W411	18 MIL	1/2 or 1 HR
W424	18 MIL	1/2 or 1 HR
W433	18 MIL	1/2 HR
W440	18 MIL	1, 2, 3 or 4 HR

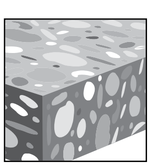
PRCTI20240333

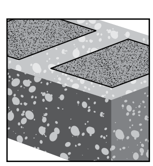
3.3.20 KWIK-CON+ CONCRETE AND MASONRY SCREW

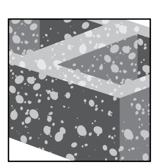
PRODUCT DESCRIPTION

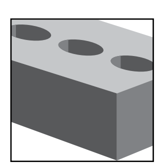
KWIK-CON+ concrete and masonry screw anchors

Anchor System		**Features and Benefits**
	KWIK-CON+ fastener	• Zinc coating with proprietary finish that exceeds 1000 hours of protection from red rust per ASTM B117 • Salt spray testing per ASTM G85 • Coating is more durable than zinc plating alone • Base material specific carbide tipped bits optimize performance in concrete or masonry • Torx Hex washer head for fast secure installations into base material • Torx or Phillips flat head for countersunk applications • Load data available for installations in concrete, grout-filled and hollow concrete masonry units (CMU) and brick • Available in AISI Type 410 Stainless Steel
	KWIK-CON+ drive tool and installation accessories	


Uncracked concrete


Grout-filled concrete masonry


Ungrouted concrete masonry


Brick

Approvals/Listings	
Metro-Dade County	NOA 19-1113.04

PRCTI20240333

Table 1 — Material Properties

Property	Carbon Steel		Stainless Steel	
	Fastener Diameter (inches)		Fastener Diameter (inches)	
	3/16	1/4	3/16	1/4
Minimum Tensile Strength (ksi)	150		130	
Minimum Yield Strength (ksi)	120		105	
Coating	Zinc with organic top coat		N/A	

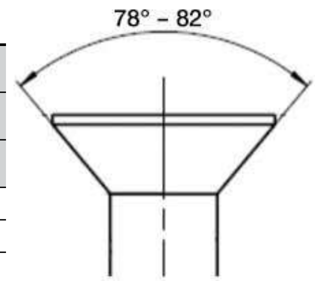


Figure 1 — Flathead KWIK CON+ Head Angle

Table 2 — Physical Dimensions

Characteristic	Nominal anchor diameter (inches)					
	3/16			1/4		
Head Style	Tapered Flat Head	Tapered Flat Head	5/16-in. Hex Washer	Tapered Flat Head	Tapered Flat Head	5/16-in. Hex Washer
Internal recess	#3 Phillips	T-25 TORX	T-25 TORX	#3 Phillips	T-27 TORX	T-25 TORX
Maximum Head Diameter (inches)	0.507	0.385	0.433	0.507	0.507	0.433
Major Thread Diameter (inches)	0.217			0.283		
Minor Diameter (inches)	0.145			0.190		
Shank Diameter (inches)	0.170			0.224		

INSTALLATION

Table 3 — KWIK CON+ Installation Specifications

Setting information	Symbol	Nominal anchor diameter (inches)			
		3/16		1/4	
Embedment (inches)	h_{nom}	1	1-3/4	1	1-3/4
Nominal drill bit diameter (inches)[1]	d_{bit}	3/16		1/4	
Minimum fixture hole diameter (inches)	d_h	1/4		5/16	
Minimum hole depth (inches)	h_o	1-1/4	2	1-1/4	2
Minimum member thickness (inches)	h_{min}	2-1/2	3-1/4	2-1/2	3-1/4
Minimum anchor spacing (inches)	s_{min}	2-1/4		2-1/2	
Critical anchor spacing (inches)	s_{cr}	3	4	3	4
Minimum edge distance (inches)	c_{min}	1-1/8		1-1/2	
Critical edge distance (inches)	c_{cr}	2-1/2	3-1/2	2-1/2	3-1/2

1 Requires matched tolerance drill bit from Hilti, TKC drill bits for concrete, TKB drill bits for other materials.

Table 4 — Load adjustment factors for Hilti KWIK CON+ screw anchors in concrete

Load adjustment factors for anchor spacing f_A						Load adjustment factors for edge distance f_R									
Tension/Shear loads						Tension						Shear			
Embedment (inches)		1	1-3/4	1	1-3/4	Embedment (inches)		1	1-3/4	1	1-3/4	1	1-3/4	1	1-3/4
Spacing (s)		Anchor diameter				Edge Distance		Anchor Diameter				Anchor Diameter			
in.	(mm)	3/16		1/4		in.	(mm)	3/16		1/4		3/16		1/4	
2-1/4	(57)	0.80	0.80			1-1/8	(29)	0.80	0.80			0.30	0.30		
2-1/2	(64)	0.87	0.83	0.80	0.80	1-1/4	(32)	0.82	0.81			0.36	0.34		
2-3/4	(70)	0.93	0.86	0.90	0.86	1-1/2	(38)	0.85	0.83	0.80	0.80	0.49	0.41	0.30	0.30
3	(76)	1.00	0.89	1.00	0.89	1-3/4	(44)	0.89	0.85	0.85	0.83	0.62	0.48	0.48	0.39
3-1/4	(83)		0.91		0.91	2	(51)	0.93	0.87	0.90	0.85	0.75	0.56	0.65	0.48
3-1/2	(89)		0.94		0.94	2-1/4	(57)	0.96	0.89	0.95	0.88	0.87	0.63	0.83	0.56
3-3/4	(95)		0.97		0.97	2-1/2	(64)	1.00	0.92	1.00	0.90	1.00	0.71	1.00	0.65
4	(102)		1.00		1.00	3	(76)		0.96		0.95		0.85		0.83
						3-1/2	(89)		1.00		1.00		1.00		1.00

1 Reduction factors are multiplicative and linear interpolation between s_{cr} and s_{min}, c_{cr} and c_{min} is permitted.

3.3.20

DESIGN INFORMATION IN CONCRETE PER ALLOWALBLE STRESS DESIGN

Table 5 — Tension and shear allowable loads in concrete [1, 2,3]

Nominal anchor diameter (in.)	Nominal embedment in. (mm)	f'c = 2,000 psi		f'c = 4,000 psi		f'c = 6,000 psi	
		Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
3/16	1 (25)	100 (0.4)	260 (1.2)	125 (0.6)	260 (1.2)	185 (0.8)	280 (1.3)
3/16	1-3/4 (44)	275 (1.2)	260 (1.2)	295 (1.3)	265 (1.2)	325 (1.5)	300 (1.3)
1/4	1 (25)	190 (0.9)	325 (1.4)	240 (1.1)	390 (1.7)	275 (1.2)	540 (2.4)
1/4	1-3/4 (44)	425 (1.9)	560 (2.5)	475 (2.1)	600 (2.8)	525 (2.3)	600 (2.7)

1 Screws installed in holes drilled with Hilti TKC carbide bits.
2 Allowable loads are based on a factor of safety of 4.
3 Apply spacing and edge distance reduction factors in Table 4 as needed.

Table 6 — Tension and shear ultimate loads in concrete[1]

Nominal anchor diameter (in.)	Nominal embedment in. (mm)	f'c = 2,000 psi		f'c = 4,000 psi		f'c = 6,000 psi	
		Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
3/16	1 (25)	400 (1.8)	1,050 (4.7)	500 (2.2)	1,050 (4.7)	750 (3.3)	1,150 (5.1)
3/16	1-3/4 (44)	1,100 (4.9)	1,050 (4.7)	1,180 (5.3)	1,070 (4.8)	1,300 (5.8)	1,200 (5.3)
1/4	1 (25)	760 (3.4)	1,300 (5.8)	970 (4.3)	1,575 (7.0)	1,100 (4.9)	2,175 (9.7)
1/4	1-3/4 (44)	1,700 (7.6)	2,250 (10.0)	1,900 (8.5)	2,400 (11.3)	2,100 (9.34)	2,400 (10.7)

1 Screws installed in holes drilled with TKC bits.

Table 7 — Tension and shear allowable loads in grout-filled and hollow concrete masonry units (CMU)[1,2,3,4,5]

Nominal anchor diameter (in.)	Nominal embedment in. (mm)	Tension lb (kN)	Shear lb (kN)
3/16	1 (25)	150 (0.7)	225 (1.0)
3/16	1-3/4 (44)	290 (1.3)	300 (1.3)
1/4	1 (25)	165 (0.7)	275 (1.2)
1/4	1-3/4 (44)	310 (1.4)	400 (1.8)

1 All values for anchors installed in grout-filled or hollow concrete masonry (CMU) with a minimum prism strength of 1,500 psi. CMU may be lightweight, medium-weight or normal-weight conforming to ASTM C90.
2 Screws installed in holes drilled with TKB bits.
3 Allowable loads calculated using a factor of safety of 4.
4 Installation in the mortar joints is outside the scope of the published data.
5 C_{min}, S_{min} equals 4 inches

Table 8 — Tension and shear allowable loads in brick[1,2,3,4,5]

Nominal anchor diameter (in.)	Nominal embedment in. (mm)	Tension lb (kN)	Shear lb (kN)
3/16	1 (25)	125 (0.6)	235 (1.0)
3/16	1-3/4 (44)	350 (1.6)	300 (1.3)
1/4	1 (25)	205 (0.9)	415 (1.8)
1/4	1-3/4 (44)	350 (1.6)	500 (2.2)

1 This test was performed on individual specimens of ASTM C62 common brick. Due to the wide variations encountered in the compressive strength of brick, these values should be considered guide values.
2 Allowable loads are based on a factor of safety of 4.
3 Installation in the mortar joints is outside the scope of the published data.
4 KWIK CON+ installed with TKB bits.
5 C_{min}, S_{min} equals 4 inches

Load values are for anchors installed a minimum of sixteen diameters on center and a minimum edge distance of sixteen diameters. Anchor spacing may be reduced to twelve diameters provided loads are reduced by 20 percent. Edge distance may be reduced to six diameters provided loads are reduced by 20 percent in tension and 70 percent in shear.

Combined shear and tension loading

$$\left(\frac{N_d}{N_{rec}}\right) + \left(\frac{V_d}{V_{rec}}\right) \leq 1.0$$

INSTALLATION INSTRUCTIONS

Installation Instructions For Use (IFU) / Operating Instructions (OI) throughout the document are included with each product package. They can also be viewed or downloaded online at www.hilti.com. Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the (IFU)/Operating Instructions (OI).

PRCTI20240333

DIVIDE BY 5 SAFETY FACTOR FOR ALLOWABLE LOADS

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.

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.

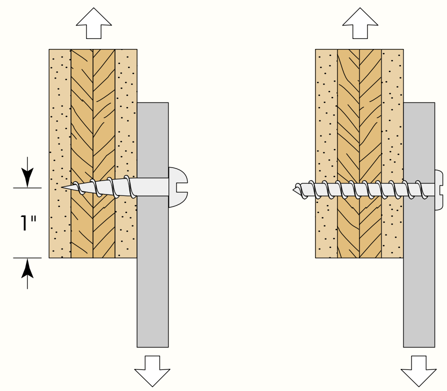


TABLE 2

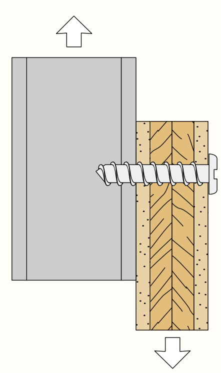
SHEET METAL SCREWS: PLYWOOD-TO-METAL CONNECTIONS[(a)]

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



SCW Head-of-Wall Slide-Clip Connector

PRCTI20240333

SIMPSON Strong-Tie

The SCW connectors offer 1" of upward and 1" of downward movement. They are primarily used in head-of-wall applications that require vertical movement relative to the structure. SCW connectors are often used to strengthen window and door jambs for projects that utilize slip or slotted track.

Material: 54 mil (16 ga.)

Finish: Galvanized (G90)

Installation:

- Use the specified type and number of anchors.
- Use the specified number of #14 shouldered screws (included). Install shouldered screws in the slots adjacent to the No-Equal® stamp.
- Use a maximum of one screw per slot.
- For installations to wood framing, see Simpson Strong-Tie® engineering letter L-CF-DEFCLIPW at **strongtie.com**.

Codes: See p. 13 for Code Reference Key Chart

Ordering Information:

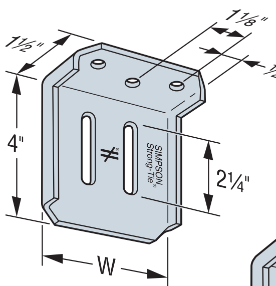
SCW3.25-KT contains:

- Box of 25 connectors
- 55 XLSH34B1414 #14 shouldered screws

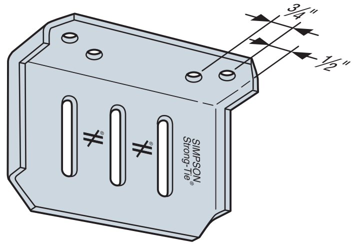
SCW5.5-KT contains:

- Box of 25 connectors
- 83 XLSH34B1414 #14 shouldered screws

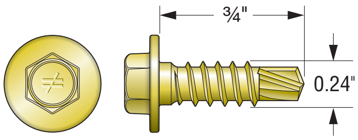
Note: Replacement #14 shouldered screws for SCW connectors are XLSH34B1414-RP83.



SCW3.25



SCW5.5

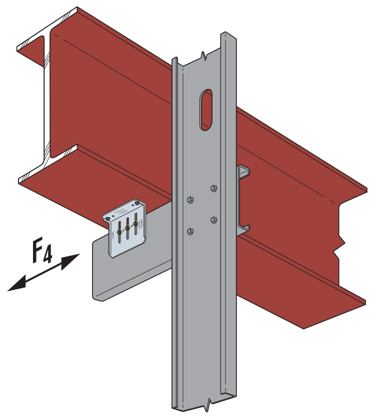


XLSH34B1414
#14 Shouldered Screw for Attachment to Stud Framing
(included)

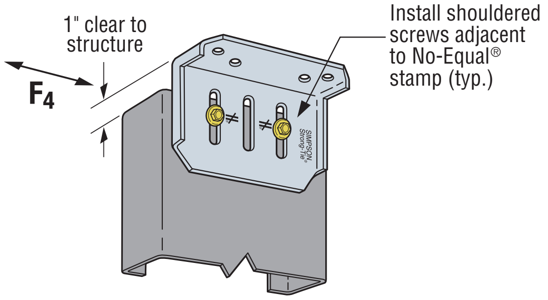
SCW Allowable Connector Loads (lb.)

Model No.	Connector Material Thickness mil (ga.)	W (in.)	No. of #14 Shouldered Screws	Stud Thickness 33 mil (20 ga.) F_4	Stud Thickness 43 mil (18 ga.) F_4	Stud Thickness 54 mil (16 ga.) F_4	Code Ref.
SCW3.25	54 (16)	3¼	2	455	630	755	IBC, FL, LA
SCW5.5	54 (16)	5½	2[1]	455	630	995	
			3	455	630	1,220[3]	

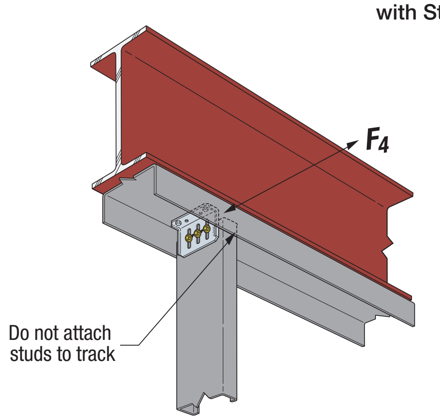
1. When the SCW5.5 connector is used with two shouldered screws, install screws in the outermost slots.
2. Allowable loads are based on clips installed with all holes in the anchor leg filled with #12–14 screws. For other anchorage installations, the capacity of the connection system will be the minimum of the tabulated value and the allowable load from the SCW Allowable Anchorage Loads table on p. 49.
3. Tabulated loads are applicable for the following framing widths:
   SCW3.25 — 3½", 3⅝", 4" and 5½"
   SCW5.5 — 6", 8" (18 ga. min.), 10" and 12" (16 ga. min.)



Typical SCW Installation with Stud Strut



SCW5.5 Installation with Two Shouldered Screws
(three shouldered screws and SCW3.25 similar)



Typical SCW Installation at Stud

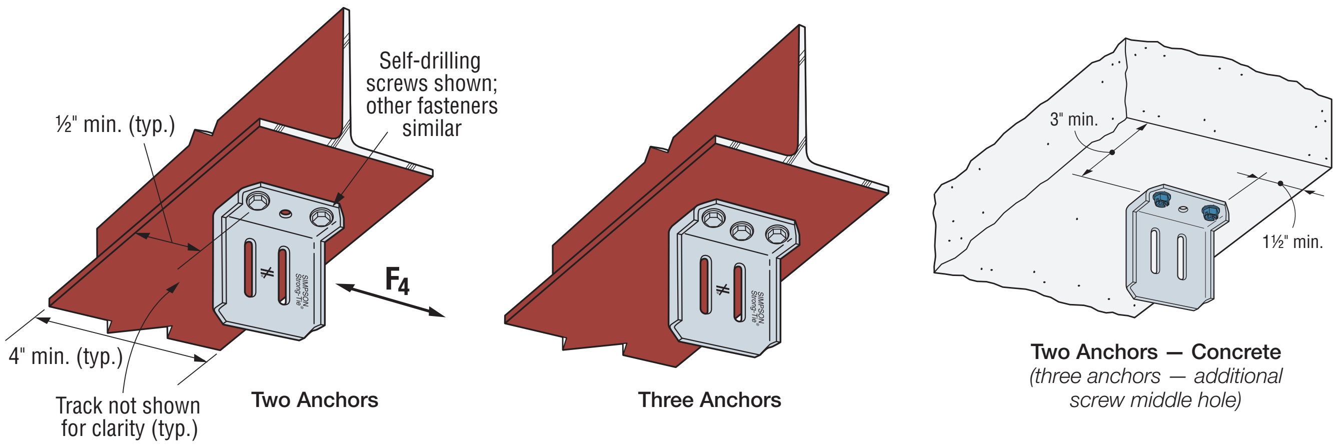
SCW Head-of-Wall Slide-Clip Connector

PRCTI20240333

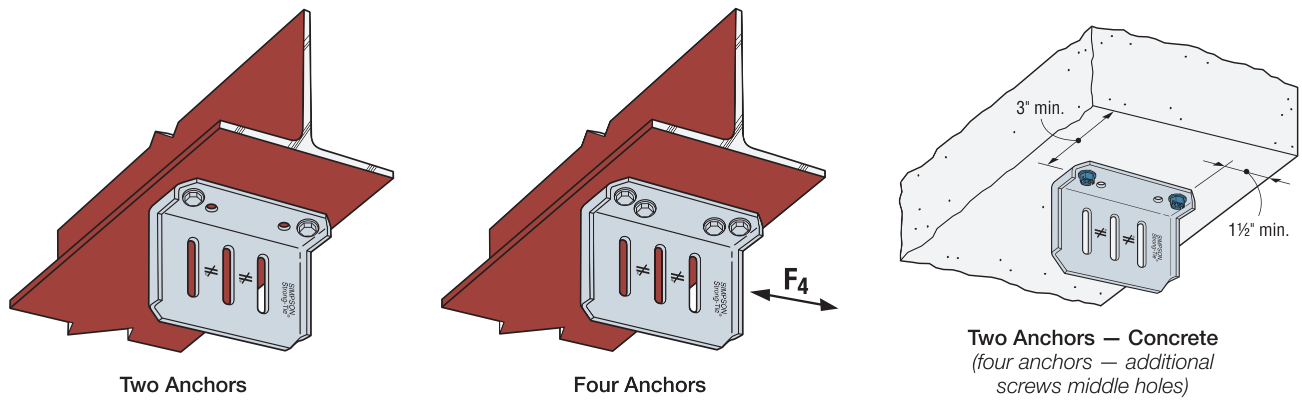
SCW Allowable Anchorage Loads (lb.)

Model No.	Anchorage Type	Minimum Base Material	No. of Anchors	Allowable Load F_4
SCW3.25	#12–24 self-drilling screws	A36 steel 3⁄16" thick	2	715
			3	1,075
	Simpson Strong-Tie® 0.157" x ⅝" powder-actuated fasteners PDPAT-62KP	A36 steel 3⁄16" thick	2	715
			3	1,075
	Simpson Strong-Tie ¼" x 1¾" Titen Turbo™[3]	Concrete f'_c = 2,500 psi	2	285
			3	350
SCW5.5	#12–24 self-drilling screws	A36 steel 3⁄16" thick	2	775
			4	1,550
	Simpson Strong-Tie 0.157" x ⅝" powder-actuated fasteners PDPAT-62KP	A36 steel 3⁄16" thick	2	745
			4	1,490
	Simpson Strong-Tie ¼" x 1¾" Titen Turbo[3]	Concrete f'_c = 2,500 psi	2	285
			4	775

1. For additional important information, see General Information and Notes on p. 26.
2. Allowable loads are for clip anchorage only. The capacity of the connection system will be the minimum of the tabulated value and the allowable load from the SCW Allowable Connector Loads table on p. 48.
3. Tabulated values require a minimum 1½" edge distance for masonry screws in concrete.
4. See the current *Fastening Systems* catalog at **strongtie.com** for more information on Simpson Strong-Tie fasteners.



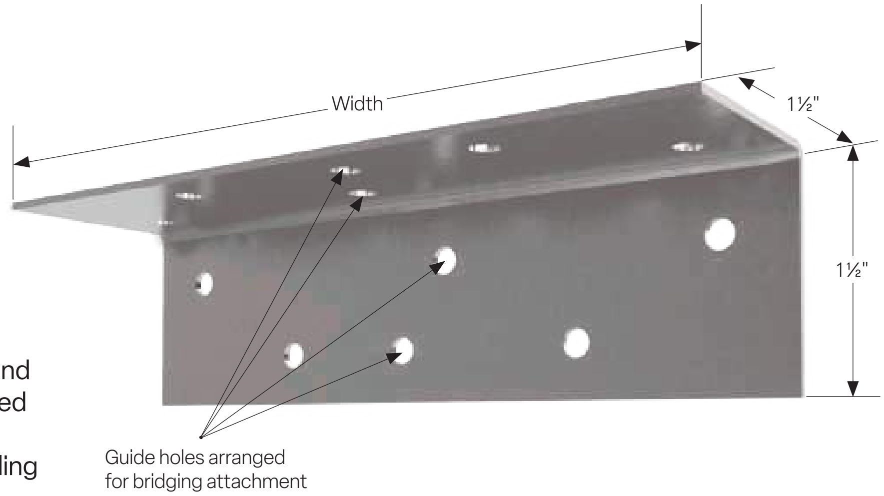
SCW3.25 Anchor Layout



SCW5.5 Anchor Layout

PRCTI20240333

MA
Multi-Use Secure Clip



Product Application

The MA multi-use secure clip is used in a variety of different applications, including head-of-wall, joist connections, rafter and truss connections, reinforcing header connections, and bridging.

The MA secure clip is designed to resist vertical and lateral loads. Pre-punched guide holes are provided in each leg to allow for efficient installation. Clips come packaged in durable buckets for easy handling on the jobsite.

Features and Benefits

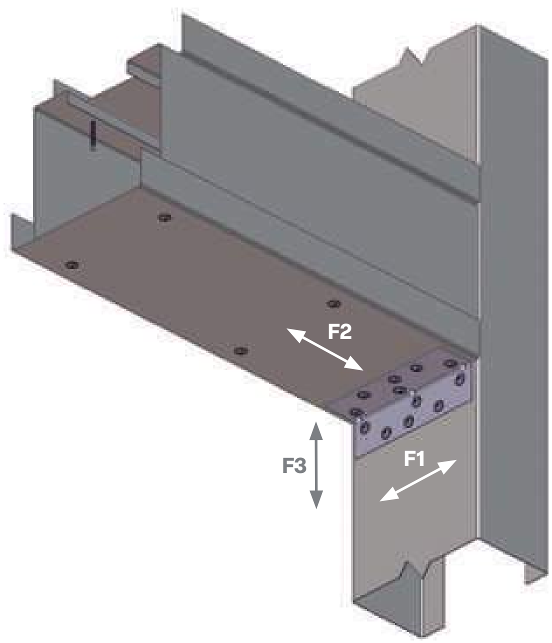
- Variety of lengths available
- Loads based on #10 screws
- Pre-punched guide holes
- No labor used cutting scrap or angle

Material Composition

- Mill certified steel
- ASTM A653/A653M
- 54 mil
  - *57 ksi yield strength*
  - *65 ksi tensile strength*
  - *G60/G90 galvanized coating*
- 68 mil
  - *57 ksi yield strength*
  - *65 ksi tensile strength*
  - *G60/90 galvanized coating*

Quantity / Order Information

Part No.	Length	Qty / Bucket	Lbs / Bucket
MA350-54	3½"	200	34
MA350-68	3½"	200	42
MA550-54	5½"	100	26
MA550-68	5½"	100	32
MA750-54	7½"	100	35
MA750-68	7½"	100	44
MA950-54	9½"	100	44
MA950-68	9½"	100	55



PRCTI20240333

MA
Multi-Use Secure Clip Allowable Loads

Part No.	Stud Properties			F1 Allowable Loads (lbs)		F2 Allowable Loads (lbs)		F3 Allowable Loads (lbs)	
	Mil	Gauge	Fy (ksi)	2 #10 Screws	3 #10 Screws	2 #10 Screws	3 #10 Screws	2 #10 Screws	3 #10 Screws
MA350	33EQS	20	57	402	603	206	310	206	310
	33	20	33	353	530	168	251	168	251
	43EQS	18	57	635	952	280	420	280	420
	43	18	33	526	789	219	328	219	328
	54	16	50	1068	1602	396	594	396	594
	68	14	50	1510	2266	499	749	499	749
	97	12	50	2261	2420	712	965	712	965
Maximum Allowable Clip Capacity				Max F1 = 2420 lbs		Max F2 = 965 lbs		Max F3 = 965 lbs	

Part No.	Stud Properties			F1 Allowable Loads (lbs)			F2 Allowable Loads (lbs)			F3 Allowable Loads (lbs)		
	Mil	Gauge	Fy (ksi)	2 #10 Screws	4 #10 Screws	5 #10 Screws	2 #10 Screws	4 #10 Screws	5 #10 Screws	2 #10 Screws	4 #10 Screws	5 #10 Screws
MA550	33EQS	20	57	402	804	1005	206	413	516	206	413	516
	33	20	33	353	707	884	168	335	419	168	335	419
	43EQS	18	57	635	1269	1587	280	560	700	280	560	700
	43	18	33	526	1052	1315	219	437	547	219	437	547
	54	16	50	1068	2136	2671	396	792	855	396	792	855
	68	14	50	1510	2980	2980	499	855	855	499	855	855
	97	12	50	2261	2980	2980	712	855	855	712	855	855
Maximum Allowable Clip Capacity				Max F1 = 2980 lbs			Max F2 = 855 lbs			Max F3 = 855 lbs		

Part No.	Stud Properties			F1 Allowable Loads (lbs)			F2 Allowable Loads (lbs)			F3 Allowable Loads (lbs)		
	Mil	Gauge	Fy (ksi)	2 #10 Screws	4 #10 Screws	7 #10 Screws	2 #10 Screws	4 #10 Screws	7 #10 Screws	2 #10 Screws	4 #10 Screws	7 #10 Screws
MA750	33EQS	20	57	402	804	1407	206	413	722	206	413	722
	33	20	33	353	707	1237	168	335	597	168	335	597
	43EQS	18	57	635	1269	2221	280	560	980	280	560	980
	43	18	33	526	1052	1841	219	437	765	219	437	765
	54	16	50	1068	2136	3739	396	792	1387	396	792	1387
	68	14	50	1510	3021	5286	499	998	1740	499	998	1740
	97	12	50	2261	4521	6100	712	1424	1740	712	1424	1740
Maximum Allowable Clip Capacity				Max F1 = 6100 lbs			Max F2 = 1740 lbs			Max F3 = 1740 lbs		

Part No.	Stud Properties			F1 Allowable Loads (lbs)			F2 Allowable Loads (lbs)			F3 Allowable Loads (lbs)		
	Mil	Gauge	Fy (ksi)	2 #10 Screws	5 #10 Screws	9 #10 Screws	2 #10 Screws	5 #10 Screws	9 #10 Screws	2 #10 Screws	5 #10 Screws	9 #10 Screws
MA950	33EQS	20	57	402	1005	1809	206	516	929	206	516	929
	33	20	33	353	884	1590	168	419	754	168	419	754
	43EQS	18	57	635	1587	2856	280	700	1260	280	700	1260
	43	18	33	526	1315	2367	219	547	984	219	547	984
	54	16	50	1068	2671	4807	396	991	1740	396	991	1740
	68	14	50	1510	3776	6100	499	1248	1740	499	1248	1740
	97	12	50	2261	5652	6100	712	1740	1740	712	1740	1740
Maximum Allowable Clip Capacity				Max F1 = 6100 lbs			Max F2 = 1740 lbs			Max F3 = 1740 lbs		

Table Notes

1. Allowable loads have not been increased for wind, seismic activity, or other factors.
2. The allowable loads are based on the steel properties of the members being connected, per AISI S100.
3. The nominal strength of the screw must be at least 3.75 times the allowable load.
4. Screw shear capacities are based on allowable strength design (ASD) and include a safety factor of 3.0.
5. Penetration of screws through joined materials should not be less than three exposed threads. Install and tighten screws in accordance with the screw manufacturer's recommendations.
6. Allowable loads indicated on the table(s) are for force in single direction only. The designer shall use the combined forces check as required by AISI S100 if more than one force is applied to the connection.

PRCTI20240333

S/JCT and S/HJCT Steel-Joist Connectors

This product is preferable to similar connectors because of a) easier installation, b) higher loads, c) lower installed cost, or a combination of these features.

The S/JCT and S/HJCT are unique, skewable steel-joist framing connectors that combine strength, versatility and low installed cost. The connectors can be used with CFS headers, wood headers, steel I-beams (with welds or PAF fasteners) and masonry walls. Installed cost is minimized since these products are shear rather than bearing connectors, eliminating the need for web stiffeners. The connectors also feature horizontal tabs that facilitate top flange alignment and joist support during screw installation.

Material: S/JCT — 68 mil (14 ga.); S/HJCT — 97 mil (12 ga.)

Finish: Galvanized

Features:

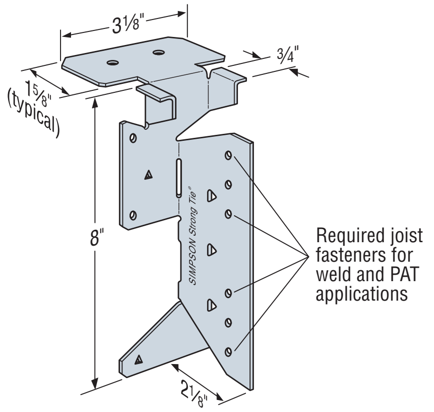
- Uni-directional: Joist can be attached from left or right
- One size fits joists 8" through 14" deep
- Optional holes for additional load capacity
- Simplicity of design
- Quick and easy installation
- Field skewable up to 45° left or right

Installation:

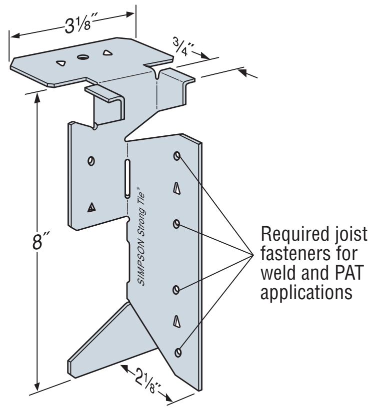
- Attach hanger with specified fasteners. Use round holes for minimum load, use round and triangle holes for maximum load.
- May be used for weld-on applications. The minimum required weld to the top flange is ⅛" x 2½" fillet weld to each side of top flange. Consult the code for special considerations when welding galvanized steel.
- May be installed using PDPAT-62KP (0.157" x ⅝") powder-actuated fasteners. Steel headers with thicknesses between ¼" and ¾" having a minimum F_y = 36 ksi. A Red (level 5) or Purple (level 6) powder load may be required to achieve specified penetration (p). See illustration on p. 203.

Codes: See p. 13 for Code Reference Key Chart

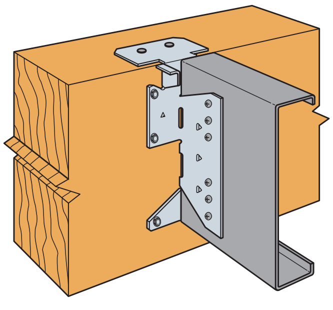
Ordering Information: The S/JCT is sold in cartons of 50. The S/HJCT is sold in kits as the S/HJCT-KT and contains five (5) connectors and (95) #14 screws.



S/HJCT



S/JCT



S/HJCT Installation with a 4x10 Wood Header

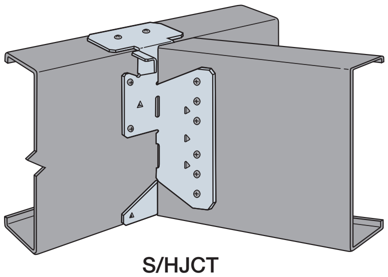
Model No.	Fasteners[7]			Allowable Load[1] (lb.)		Code Ref.
	Top	Face	Joist	Uplift	Down	
Attached to CFS Header: 54 mil (16 ga.)[3] — Straight Hanger						
S/JCT (min.)	(1) #10	(2) #10	(4) #10	940	1,195	IBC, FL, LA
S/JCT (max.)	(1) #10	(4) #10	(6) #10	1,435	2,105	
S/HJCT (min.)	(2) #10	(4) #14	(6) #14	1,510	2,920	
S/HJCT (max.)	(2) #10	(8) #14	(9) #14	1,670	3,855	
Attached to CFS Header: 54 mil (16 ga.)[3] — Skewed Hanger						
S/JCT (min.)	(1) #10	(2) #10	(4) #10	940	1,135	
S/JCT (max.)	(1) #10	(4) #10	(6) #10	940	1,185	
S/HJCT (min.)	(2) #10	(4) #14	(6) #14	1,510	2,305	
Attached to Steel Header[4] — Straight and Skewed Hanger						
S/JCT (min.)	⅛" x 2½" fillet weld to each side of top flange		(4) #10	145	940	
S/HJCT (min.)			(4) #14	195	1,450	
S/HJCT (min.) Skew			(4) #14	195	1,235	
S/JCT (min.)	(2) 0.157" x ⅝" powder-actuated fastener[8]		(4) #10	145	750	—
S/HJCT (min.)			(4) #14	195	1,185	
Attached to Masonry — Straight and Skewed Hanger						
S/HJCT (min.)	(2) ¼" x 2¼" Titen Turbo™	(4) ¼" x 2¼" Titen Turbo	(6) #14	710	1,785	
S/HJCT (min.) Skew				710	1,410	

Model No.	Fasteners[7]			Allowable Load[1,2] (lb.)		Code Ref.
	Top	Face	Joist	Uplift (160)	Down (100)	
Attached to 4x DF/SP Wood Header — Straight Hanger						
S/JCT (min.)	(1) 10d	(2) 10d	(4) #10	555	945	IBC, FL, LA
S/JCT (max.)	(1) 10d	(4) 10d	(6) #10	945	1,465	
S/HJCT (min.)	(2) 10d	(4) ¼"x3" SDS	(6) #14	1,210	2,625	
S/HJCT (max.)	(2) 10d	(8) ¼"x3" SDS	(9) #14	1,475	2,980	
Attached to 4x DF/SP Wood Header — Skewed Hanger						
S/JCT (min.)	(1) 10d	(2) 10d	(4) #10	390	845	
S/JCT (max.)	(1) 10d	(4) 10d	(6) #10	775	1,300	
S/HJCT (min.)	(2) 10d	(4) ¼" x 3" SDS	(6) #14	1,210	1,935	

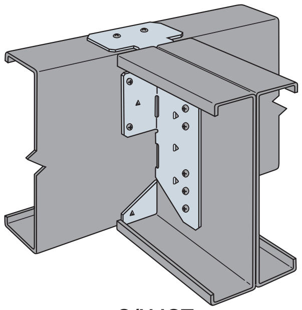
1. Allowable loads are based on a minimum of single 54 mil (16 ga.) CFS joist member. CFS joist shall be laterally braced per designer specification.
2. Allowable loads for wood header are based on 4x DF/SP minimum, for SPF/HF wood species use an adjustment factor of 0.72.
3. CFS header must be braced to prevent web buckling per designer specification and header must have full bearing of 1⅝" flange-depth.
4. Backing in the steel beam cavity is not required behind the hanger for load listed.
5. Screws shall be installed using joist hanger holes screwing through the hanger into the joist.
6. CFS joists with up to a 0.50" gap (short cut), use an adjustment factor of 0.87 and joists with a 0.50" to 0.90" gap (short cut), use an adjustment factor of 0.75.
7. See the current *Fastening Systems* catalog at **strongtie.com** for more information on Simpson Strong-Tie fasteners.
8. See p. 203 for more information.

Joist Framing Connectors

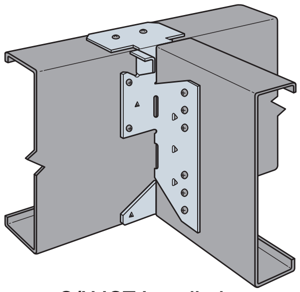
S/JCT and S/HJCT Steel-Joist Connectors



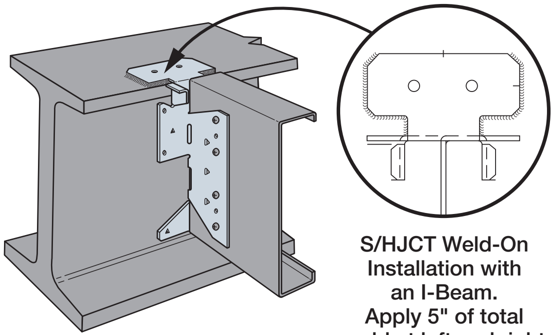
S/HJCT
Skewed 45° Installation



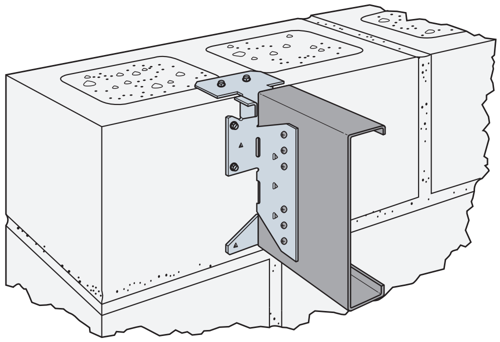
S/HJCT
Double-Joist Installation



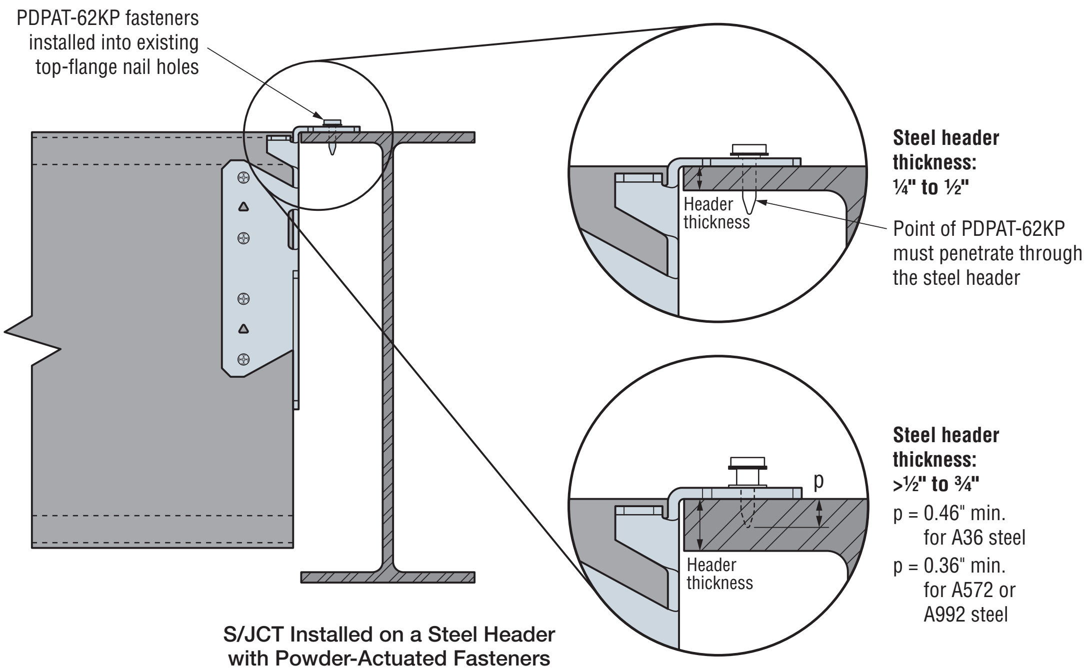
S/HJCT Installation
with a CFS Steel Header



S/HJCT Weld-On Installation with an I-Beam. Apply 5" of total weld at left and right edges, as shown.



S/HJCT Installation
on Masonry Header



S/JCT Installed on a Steel Header
with Powder-Actuated Fasteners

PRCTI20240333

BSE

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

INFILL CFS WALL DESIGNS

PRCTI20240333

Project Name: Centeris

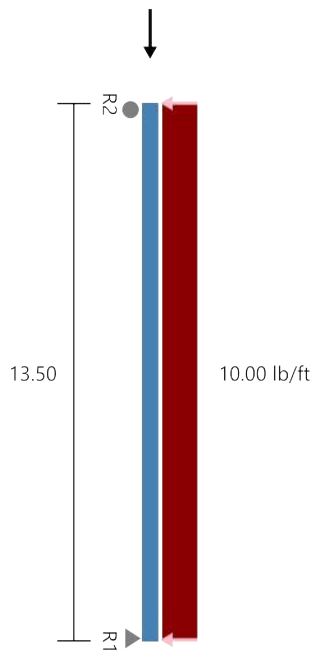
Model: 6" STUD 13'-6"

Code: 2012 NASPEC [AISI S100-2012]

TYPICAL INFILL WALL
6" STUDS

Date: 02/28/2024

Simpson Strong-Tie® CFS Designer™ 5.0.1.0



Section : 600S125-33 (33 ksi) @ 24" o.c. Single C Stud (punched)

Maxo = 608.4 ft-lb **Va =** 638.1 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	48.0", 48.0"	48.0", 162.0"	N/A	-

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
R2	67.5	--Slip Track Design, Ref Connectors--				NO
R1	67.5	--Stud/Track Design, Ref Connectors--				NO

Gravity Load

Type	Load (lb)
Uniform	24.00plf

	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	324.0(c)	1282.2(c)	25%	KΦ=0.00 lb-in/in Max KL/r = 128
	Max. Shear, lbs	67.5	638.1	11%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	227.8	526.3	43%	Ma-dist (control),KΦ=0.00 lb-in/in
	Moment Stability, ft-lbs	227.8	518.4	44%	
	Shear/Moment	0.37	1.00	37%	Shear 0.0, Moment 227.8
	Axial/Moment	0.58	1.00	58%	Axial 192.5(c), Moment 219.8
	Deflection Span, in	0.186	--meets L/870--		

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R2	67.5	0.0	600SLT250-33 (33) & (1) .157" SST PDPA/PDPAT-62KP to steel (3/16" to 1/2" thickness)	45.00 %	41.25 %
R1	67.5	324.0	600T125-33 (33) & (1) .157", 3/4" embed SST PDPA/PDPAT to 4000 nw concrete	27.78 %	50.00 %

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

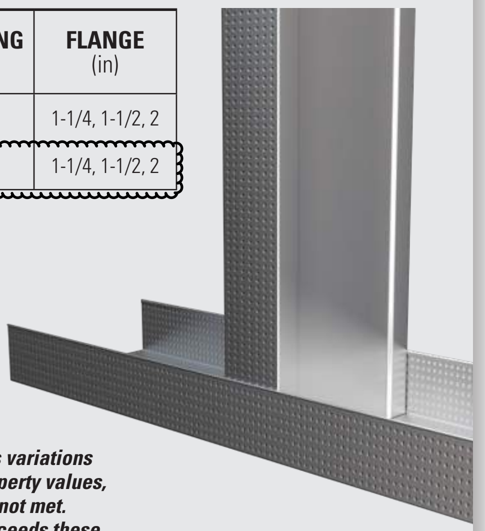
PHYSICAL PROPERTIES

Viper-X Stud®

MODEL NO.	DESIGN THICKNESS (in)	MINIMUM THICKNESS (in)	YIELD (ksi)	WEB SIZES (in)	COATING 1,2	FLANGE (in)	RETURN LIP (in)
VIPER-X-18	0.0188	0.0179	57	1-5/8, 2-1/2, 3-1/2, 3-5/8, 4, 6	G40	1-7/16	3/8
VIPER-X-22	0.0235	0.0223	57	1-5/8, 2-1/2, 3-1/2, 3-5/8, 4, 6	G40	1-7/16	3/8

Viper-X Track®

MODEL NO.	DESIGN THICKNESS (in)	MINIMUM THICKNESS (in)	YIELD (ksi)	WEB SIZES (in)	COATING 1,2	FLANGE (in)
VIPER-X-18 TRACK	0.0188	0.0179	57	1-5/8, 2-1/2, 3-1/2, 3-5/8, 4, 6	G40	1-1/4, 1-1/2, 2
VIPER-X-22 TRACK	0.0235	0.0223	57	1-5/8, 2-1/2, 3-1/2, 3-5/8, 4, 6	G40	1-1/4, 1-1/2, 2



Notes:

1. Web height to thickness ratio (h/t) exceeds 200. Web stiffeners required at all support points and concentrated loads.
2. Members having a web height to thickness ratio (h/t) value exceeding 260 will not have effective properties listed, only gross properties will be listed.
3. Web height value (h) used for h/t calculation is the flat width of the web. For (S) members, this is the out to out member size, minus twice the thickness, minus twice the inside bend radius.
4. Members having a flange width to thickness ratio (b/t) value exceeding 60 must be considered for use with the limitations described in AISI S100-12 section B1.
5. Flange width value (b) used for b/t calculation is the flat width of the flange. For (S) members, this is the out to out member size, minus twice the thickness, minus twice the inside bend radius.
6. Per ASTM C645 & ASTM A1003 Table 1.
7. G60 and G90 available upon request.

Viper-X High Performance Studs and Tracks are in compliance with ASTM C645. ASTM C645 Section 5.1 allows for permissible dimensional thickness variations, Section 8.2 allows for thickness variations and exemptions from minimum section property values, if specified performance requirements are not met. The Viper-X Framing product meets and exceeds these requirements.

GENERAL TABLE NOTES

1. The yield strength for all Viper-X Products is 57 ksi.
2. Tabulated gross properties are based on full, unreduced section away from punchouts.
3. Punch-out sizes are 0.75” x 2.00” for stud depths 1.625” and 2.50”, and 1.50” x 2.75” for stud depths 3.50” and deeper.
4. Factory punchouts are in accordance with section C5 of AISI S201-12. The distance from the center of the last punchout to the end of the stud is 12 inches.
5. For Allowable Stress Design (ASD) method, factors of safety of 1.67 and 1.6 respectively, are used for moment and shear capacities as per AISI S100-12.
6. Design stiffening lip is 3/8” for all studs.

Notations

Ix	Moment of Inertia about the X axis of Gross Section
Iy	Moment of Inertia about the Y axis of Gross Section
Rx, Ry	Radius of Gyration about the X and Y axes, respectively of Gross Section
J	St. Venant Torsion Constant
Cw	Torsional Warping Constant
Xo	Distance from Shear Center to Centroid Along the X axis
Ro	Polar Radius of Gyration about the Shear Center
ß	Torsional-Flexural Constant
Ixe	Effective Moment of Inertia at Punch-out about the X axis (for deflection calculation)
Sxe	Effective Section Modulus about the X axis at Punch-out
Ma-l	Allowable Moment based on Local Buckling
Ma-d	Allowable Moment based on Distortional Buckling
Vag	Allowable Shear at Gross Section

For more information, please contact CEMCO’s Technical Service Department at 800-416-2278.
This technical information reflects the most current information available and supersedes any and all previous publications effective February 18, 2021 #VSX-V1-8/2017

NON-COMPOSITE LIMITING WALL HEIGHTS – FULLY BRACED

VIPER-X MEMBER	YIELD (ksi)	DESIGN THICKNESS (in)	SPACING O.C. (in)	5 PSF			7.5 PSF			10 PSF		
				L/120	L/240	L/360	L/120	L/240	L/360	L/120	L/240	L/360
162VXS144-18	57	0.0188	12	10' 3"	8' 2"	7' 2"	9' 0"	7' 2"	6' 3"	8' 2"	6' 6"	5' 8"
	57	0.0188	16	9' 5"	7' 6"	6' 6"	8' 3"	6' 6"	5' 9"	7' 6"	5' 11"	5' 2"
	57	0.0188	24	8' 2"	6' 6"	5' 8"	7' 2"	5' 8"	4' 11"	6' 3" f	5' 2"	4' 6"
250VXS144-18	57	0.0188	12	14' 2"	11' 4"	9' 10"	12' 5"	9' 10"	8' 8"	11' 4"	9' 0"	7' 10"
	57	0.0188	16	13' 1"	10' 4"	9' 1"	11' 5"	9' 1"	7' 11"	10' 1" f	8' 3"	7' 2"
	57	0.0188	24	11' 4"	9' 0"	7' 10"	9' 6" f	7' 10"	6' 10"	8' 3" f	7' 1"	6' 3"
350VXS144-18	57	0.0188	12	18' 6"	14' 8"	12' 10"	16' 0" f	12' 10"	11' 2"	13' 11"	11' 8"	10' 2"
	57	0.0188	16	16' 11"	13' 5"	11' 9"	13' 11" f	11' 9"	10' 3"	12' 0" f	10' 8"	9' 4"
	57	0.0188	24	13' 11" f	11' 8"	10' 2"	11' 4" f	10' 2"	8' 11"	9' 10" f	9' 3"	8' 1"
362VXS144-18	57	0.0188	12	19' 0"	15' 2"	13' 2"	16' 4" f	13' 2"	11' 6"	14' 2" f	12' 0"	10' 6"
	57	0.0188	16	17' 4" f	13' 10"	12' 1"	14' 2" f	12' 1"	10' 7"	12' 3" f	11' 0"	9' 7"
	57	0.0188	24	14' 2" f	12' 0"	10' 6"	11' 7" f	10' 6"	9' 2"	10' 0"	9' 6"	8' 4"
400VXS144-18[1]	57	0.0188	12	20' 6"	16' 3"	14' 3"	17' 3" f	14' 3"	12' 5"	14' 11" f	13' 0"	11' 4"
	57	0.0188	16	18' 4" f	14' 11"	13' 0"	14' 11" f	13' 0"	11' 5"	12' 11" f	11' 10"	10' 4"
	57	0.0188	24	14' 11" f	12' 11"	11' 4"	12' 2" f	11' 4"	9' 10"	10' 6" f	10' 3"	9' 0"
600VXS144-18[1]	57	0.0188	12	25' 9" f	22' 4"	19' 6"	21' 0" f	19' 6"	17' 0"	17' 7" w	17' 7" w	15' 6"
	57	0.0188	16	22' 3" f	20' 6"	17' 11"	17' 8" w	17' 8" w	15' 7"	13' 3" w	13' 3" w	13' 3" w
	57	0.0188	24	17' 7" w	17' 7" w	15' 6"	11' 9" w	11' 9" w	11' 9" w	8' 10" w	8' 10" w	8' 10" w
162VXS144-22	57	0.0235	12	10' 7"	8' 5"	7' 4"	9' 3"	7' 4"	6' 5"	8' 5"	6' 8"	5' 10"
	57	0.0235	16	9' 8"	7' 8"	6' 9"	8' 6"	6' 9"	5' 10"	7' 8"	6' 1"	5' 4"
	57	0.0235	24	8' 5"	6' 8"	5' 10"	7' 4"	5' 10"	5' 1"	6' 8"	5' 3"	4' 7"
250VXS144-22	57	0.0235	12	15' 6"	12' 4"	10' 9''	13' 6"	10' 9"	9' 5"	12' 4"	9' 9"	8' 6"
	57	0.0235	16	14' 2"	11' 3''	9' 10"	12' 5"	9' 10"	8' 7"	11' 3"	8' 11"	7' 10"
	57	0.0235	24	12' 4"	9' 9''	8' 6"	10' 9"	8' 6"	7' 5"	9' 8" f	7' 9"	6' 9"
350VXS144-22	57	0.0235	12	20' 1"	15' 11"	13' 11"	17' 7"	13' 11"	12' 2"	15' 11"	12' 8"	11' 1"
	57	0.0235	16	18' 5"	14' 7"	12' 9"	16' 1"	12' 9"	11' 2"	14' 1" f	11' 7"	10' 2"
	57	0.0235	24	15' 11"	12' 8"	11' 1"	13' 3" f	11' 1"	9' 8"	11' 6" f	10' 1"	8' 9"
362VXS144-22	57	0.0235	12	20' 8"	16' 5"	14' 4"	18' 0"	14' 4"	12' 6"	16' 5"	13' 0"	11' 4"
	57	0.0235	16	18' 11"	15' 0"	13' 1"	16' 6"	13' 1"	11' 6"	14' 4" f	11' 11"	10' 5"
	57	0.0235	24	16' 5"	13' 0"	11' 4"	13' 6" f	11' 4"	9' 11"	11' 8" f	10' 4"	9' 0"
400VXS144-22[1]	57	0.0235	12	22' 4"	17' 8"	15' 6"	19' 6"	15' 6"	13' 6"	17' 6" f	14' 1"	12' 3"
	57	0.0235	16	20' 5"	16'3"	14' 2"	17' 6" f	14' 2"	12' 5"	15' 2" f	12' 11"	11' 3"
	57	0.0235	24	17' 6" f	14' 1"	12' 3"	14' 3" f	12' 3"	10' 9"	12' 4" f	11' 2"	9' 9"
600VXS144-22[1]	57	0.0235	12	30' 3" f	24' 4"	21' 3"	24' 8" f	21' 3"	18' 7"	21' 5" f	19' 4"	16' 10"
	57	0.0235	16	26' 3" f	22' 4"	19' 6"	21[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15' 5"
	57	0.0235	24	21' 5" f	19' 4"	16' 10"	17[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13' 5"

UP TO 14'-2" MAX WITHOUT WEB STIFFENERS
BASED ON #8 SMS TENSION LOAD = 71 LBS

Notes:

1. *Web height to thickness ratio (h/t) exceeds 200. Web stiffeners required at all support points and concentrated loads.*
2. *Lateral loads of 5 psf, 7.5 psf, and 10 psf have NOT been reduced for strength or deflection checks. Full lateral load is applied.*
3. *Limiting heights are in accordance with AISI S100-12 using all steel non-composite design.*
4. *Limiting heights are established by considering flexure (f), web crippling (w) and deflection.*
5. *Allowable moment is the lesser of Mal and Mad. Stud distortional buckling based on an assumed KΦ = 0.*
6. *For bending, studs are assumed to be adequately braced to develop full allowable moment.*
7. *Studs are fully braced when unbraced length is less than Lu. See section properties table for Lu values.*
8. *Web crippling check is based on AISI S100-12 section C3.4.2 Condition 1: End One-Flange Loading with 1" end bearing.*
9. *See page 4 for additional table notes.*

ALLOWABLE COMPOSITE HEIGHTS – NON-LOAD BEARING WALLS

VIPER-X MEMBER	YIELD (ksi)	DESIGN THICKNESS (in)	SPACING O.C. (in)	5 PSF			7.5 PSF			10 PSF		
				L/120	L/240	L/360	L/120	L/240	L/360	L/120	L/240	L/360
162VXS144-18	57	0.0188	12	14'-6"	11'-6"	10'-0"	12'-8"	10'-0"	8'-6"	11'-6"	8'-11"	7'-7"
	57	0.0188	16	13'-2"	10'-5"	8'-10"	11'-6"	8'-11"	7'-7"	10'-5"	7'-11"	-
	57	0.0188	24	11'-6"	8'-11"	7'-7"	10'-0"	7'-7"	-	8'-11"	-	-
250VXS144-18	57	0.0188	12	18'-5"	14'-7"	12'-9"	16'-1"	12'-9"	11'-2"	14'-7"	11'-7"	10'-2"
	57	0.0188	16	16'-9"	13'-4"	11'-7"	14'-8"	11'-7"	10'-2"	13'-4"	10'-7"	8'-10"
	57	0.0188	24	14'-7"	11'-7"	10'-2"	12'-9"	10'-2"	8'-6"	11'-6"	8'-11"	7'-6"
350VXS144-18	57	0.0188	12	22'-3"	17'-8"	15'-4"	19'-5"	15'-5"	13'-6"	17'-8"	14'-0"	12'-3"
	57	0.0188	16	20'-3"	16'-1"	14'-0"	17'-8"	14'-0"	12'-3"	15'-10"	12'-9"	11'-2"
	57	0.0188	24	17'-8"	13'-12"	12'-3"	14'-11"	12'-3"	10'-9"	12'-11"	11'-2"	9'-8"
362VXS144-18	57	0.0188	12	22'-6"	17'-11"	15'-8"	19'-8"	15'-8"	13'-8"	17'-11"	14'-3"	12'-5"
	57	0.0188	16	20'-5"	16'-3"	14'-3"	17'-11"	14'-3"	12'-5"	16'-0"	12'-11"	11'-4"
	57	0.0188	24	17'-10"	14'-3"	12'-5"	15'-2"	12'-5"	10'-9"	13'-1"	11'-3"	9'-10"
400VXS144-18	57	0.0188	12	23'-7"	18'-8"	16'-4"	20'-7"	12'-11"	14'-3"	18'-8"	14'-10"	13'-0"
	57	0.0188	16	21'-5"	17'-0"	14'-10"	18'-9"	14'-10"	13'-0"	16'-9"	13'-6"	11'-10"
	57	0.0188	24	18'-8"	14'-10"	13'-0"	15'-10"	13'-0"	11'-4"	13'-9"	11'-10"	10'-0"
600VXS144-18	57	0.0188	12	31'-5"	24'-11"	21'-9"	27'-0"	21'-9"	19'-0"	23'-5"	19'-10"	17'-4"
	57	0.0188	16	28'-7"	22'-8"	19'-10"	22'-6"	19'-10"	17'-4"	20'-3"	18'-0"	15'-9"
	57	0.0188	24	23'-5"	19'-10"	17'-4"	19'-1"	17'-4"	15'-1"	16'-7"	15'-9"	13'-7"
162VXS144-22	57	0.0235	12	14'-8"	11'-8"	10'-2"	12'-10"	10'-2"	8'-8"	11'-8"	9'-1"	7'-8"
	57	0.0235	16	13'-4"	10'-7"	10'-0"	11'-8"	9'-1"	7'-9"	10'-7"	8'-1"	-
	57	0.0235	24	11'-8"	9'-1"	-	10'-2"	-	-	9'-1"	-	-
250VXS144-22	57	0.0235	12	18'-11"	15'-0"	13'-1"	16'-6"	13'-1"	11'-5"	15'-0"	11'-11"	10'-5"
	57	0.0235	16	17'-2"	13'-8"	11'-11"	15'-0"	11'-11"	10'-6"	13'-8"	10'-10"	10'-0"
	57	0.0235	24	15'-0"	11'-11"	10'-5"	13'-1"	10'-5"	8'-10"	11'-10"	9'-3"	7'-9"
350VXS144-22	57	0.0235	12	23'-4"	18'-6"	16'-2"	20'-5"	16'-2"	14'-2"	18'-6"	14'-8"	12'-10"
	57	0.0235	16	21'-3"	16'-10"	14'-9"	18'-6"	14'-9"	12'-10"	16'-8"	13'-4"	11'-8"
	57	0.0235	24	18'-6"	14'-8"	12'-10"	15'-11"	12'-10"	11'-3"	14'-1"	11'-8"	10'-1"
362VXS144-22	57	0.0235	12	25'-0"	18'-9"	16'-5"	20'-8"	16'-5"	14'-4"	18'-9"	14'-11"	13'-0"
	57	0.0235	16	23'-8"	17'-1"	14'-11"	18'-10"	14'-11"	13'-1"	17'-0"	13'-7"	11'-10"
	57	0.0235	24	18'-9"	14'-11"	13'-0"	16'-2"	13'-0"	11'-5"	14'-4"	11'-10"	10'-3"
400VXS144-22	57	0.0235	12	24'-9"	19'-8"	17'-2"	21'-8"	19'-0"	15'-0"	19'-8"	15'-7"	13'-8"
	57	0.0235	16	22'-6"	17'-11"	15'-8"	19'-8"	15'-8"	13'-8"	17'-9"	14'-2"	12'-5"
	57	0.0235	24	19'-8"	15'-7"	13'-8"	16'-11"	13'-8"	11'-11"	15'-0"	12'-5"	10'-8"
600VXS144-22	57	0.0235	12	33'-1"	26'-3"	22'-11"	28'-8"	22'-11"	20'-1"	25'-5"	20'-10"	18'-3"
	57	0.0235	16	30'-1"	23'-11"	20'-10"	31'-0"	20'-10"	18'-3"	22'-6"	18'-12"	16'-7"
	57	0.0235	24	25'-5"	20'-10"	18'-3"	21'-5"	18'-3"	15'-11"	19'-0"	16'-7"	14'-5"

Notes:

1. *Viper composite limiting heights are based on testing in accordance with ICC-ES acceptance criteria AC86-2012.*

2. *Limiting heights are established by considering flexure, shear, web crippling, and deflection.*

3. *No screws are required between stud and track, except as required by ASTM C754. Composite heights are based on using standard top track. Mechanically fastening of gypsum panel to the stud and track is required.*

4. *Viper-X composite limiting heights based on a single layer of 5/8" type X gypsum board applied vertically to both sides of the wall over full height. 5/8" Type X wallboard from the following manufacturers are acceptable: USG, National, Georgia- Pacific, Temple Inland, CertainTeed, American, & LaFarge.*

5. *See page 4 for additional table notes.*

PRCTI20240333

Table Notes

1. 5 pounds per square foot (psf), 7.5 psf, and 10 psf loads have **not** been reduced for strength or deflection checks; full lateral load is applied.
2. Web crippling check is based on 1" end bearing.
3. Allowable moment is the lesser of M_{al} and M_{ad}. Stud distortional buckling based on an assumed $K\varphi = 0$.
4. Limiting heights are based on steel properties only (non-composite) without the contribution of sheathing to strengthen and stiffen the assembly. Properly fastened sheathing is still required for members to be considered fully braced.
5. See page 5 for additional table notes.

SUPREME Interior Wall Heights - Non-Composite - Fully Braced

Section	Fy (ksi)	L_u	Spacing (in) oc	5 psf			7.5 psf			10 psf		
				L/120	L/240	L/360	L/120	L/240	L/360	L/120	L/240	L/360
162SFS125-D25	57	24.4	12	9' 4"	-	-	-	-	-	-	-	-
			16	8' 1"	-	-	-	-	-	-	-	-
			24	-	-	-	-	-	-	-	-	-
162SFS-D20	57	29.1	12	10' 5"	8' 3"	-	9' 1"	-	-	-	-	-
			16	9' 5"	-	-	-	-	-	-	-	-
			24	-	-	-	-	-	-	-	-	-
162SFS-30EQD	57	29.0	12	11' 0"	8' 9"	-	9' 8"	-	-	8' 9"	-	-
			16	10' 0"	-	-	8' 9"	-	-	-	-	-
			24	8' 9"	-	-	-	-	-	-	-	-
162SFS-33EQD	57	29.0	12	11' 0"	8' 9"	-	9' 8"	-	-	8' 9"	-	-
			16	10' 0"	-	-	8' 9"	-	-	-	-	-
			24	8' 9"	-	-	-	-	-	-	-	-
250SFS125-D25	57	24.0	12	12' 10"	10' 2"	8' 11"	10' 6"	8' 11"	-	9' 1"	8' 1"	-
			16	11' 2"	9' 3"	8' 1"	9' 1"	8' 1"	-	-	-	-
			24	9' 1"	8' 1"	-	-	-	-	-	-	-
250SFS-D20	57	28.1	12	14' 4"	11' 4"	9' 11"	12' 4"	9' 11"	8' 8"	10' 8"	9' 0"	-
			16	13' 0"	10' 4"	9' 0"	10' 8"	9' 0"	-	9' 3"	8' 2"	-
			24	10' 8"	9' 0"	-	8' 9"	-	-	-	-	-
250SFS-30EQD	57	28.0	12	15' 4"	12' 2"	10' 7"	13' 5"	10' 7"	9' 3"	12' 2"	9' 8"	8' 5"
			16	13' 11"	11' 1"	9' 8"	12' 2"	9' 8"	8' 5"	11' 1"	8' 9"	-
			24	12' 2"	9' 8"	8' 5"	10' 7"	8' 5"	-	9' 5"	-	-
250SFS-33EQD	57	28.0	12	15' 4"	12' 2"	10' 7"	13' 5"	10' 7"	9' 3"	12' 2"	9' 8"	8' 5"
			16	13' 11"	11' 1"	9' 8"	12' 2"	9' 8"	8' 5"	11' 1"	8' 9"	-
			24	12' 2"	9' 8"	8' 5"	10' 7"	8' 5"	-	9' 5"	-	-
350SFS125-D25 [1]	57	23.6	12	14' 4"	12' 11"	11' 3"	11' 8"	11' 3"	9' 10"	10' 1"	10' 1"	8' 11"
			16	12' 5"	11' 9"	10' 3"	10' 1"	10' 1"	8' 11"	8' 9"	8' 9"	8' 1"
			24	10' 1"	10' 1"	8' 11"	8' 3"	8' 3"	-	-	-	-
350SFS-D20	57	27.6	12	17' 11"	14' 7"	12' 8"	14' 7"	12' 8"	11' 1"	12' 8"	11' 7"	10' 1"
			16	15' 6"	13' 3"	11' 7"	12' 8"	11' 7"	10' 1"	10' 11"	10' 6"	9' 2"
			24	12' 8"	11' 7"	10' 1"	10' 4"	10' 1"	8' 10"	8' 11"e	8' 11"e	8' 0"
350SFS-30EQD	57	27.6	12	19' 11"	15' 10"	13' 10"	17' 5"	13' 10"	12' 1"	15' 10"	12' 7"	10' 11"
			16	18' 1"	14' 4"	12' 7"	15' 10"	12' 7"	10' 11"	13' 9"	11' 5"	9' 11"
			24	15' 10"	12' 7"	10' 11"	13' 0"	10' 11"	9' 7"	11' 3"	9' 11"	8' 8"
350SFS-33EQD	57	27.6	12	19' 11"	15' 10"	13' 10"	17' 5"	13' 10"	12' 1"	15' 10"	12' 7"	10' 11"
			16	18' 1"	14' 4"	12' 7"	15' 10"	12' 7"	10' 11"	13' 9"	11' 5"	9' 11"
			24	15' 10"	12' 7"	10' 11"	13' 0"	10' 11"	9' 7"	11' 3"	9' 11"	8' 8"
362SFS125-D25 [1]	57	23.6	12	14' 6"	13' 5"	11' 9"	11' 10"	11' 8"	10' 3"	10' 3"	10' 3"	9' 4"
			16	12' 7"	12' 2"	10' 8"	10' 3"	10' 3"	9' 4"	8' 11"	8' 11"	8' 5"
			24	10' 3"	10' 3"	9' 4"	8' 5"	8' 5"	8' 1"	-	-	-
362SFS-D20	57	27.6	12	18' 4"	15' 2"	13' 3"	14' 11"	13' 2"	11' 7"	12' 11"	11' 11"	10' 6"
			16	15' 10"	13' 9"	12' 0"	12' 11"	11' 11"	10' 6"	11' 3"	10' 9"	9' 7"
			24	12' 11"	11' 11"	10' 6"	10' 7"	10' 4"	9' 2"	9' 2" e	9' 2" e	8' 3"
362SFS-30EQD	57	27.5	12	20' 6"	16' 3"	14' 2"	17' 11"	14' 2"	12' 5"	16' 3"	12' 11"	11' 3"
			16	18' 7"	14' 9"	12' 11"	16' 3"	12' 11"	11' 3"	14' 1"	11' 9"	10' 3"
			24	16' 3"	12' 11"	11' 3"	13' 3"	11' 3"	9' 10"	11' 6"	10' 3"	8' 11"
362SFS-33EQD	57	27.5	12	20' 6"	16' 3"	14' 2"	17' 11"	14' 2"	12' 5"	16' 3"	12' 11"	11' 3"
			16	18' 7"	14' 9"	12' 11"	16' 3"	12' 11"	11' 3"	14' 1"	11' 9"	10' 3"
			24	16' 3"	12' 11"	11' 3"	13' 3"	11' 3"	9' 10"	11' 6"	10' 3"	8' 11"

[1] Web height-to-thickness ratio exceeds 200. Web stiffeners are required at all support points and concentrated loads.
"e" Web stiffeners required at ends.

PRCTI20240333

SSMA

SUPREME Interior Wall Heights - Non-Composite - Fully Braced

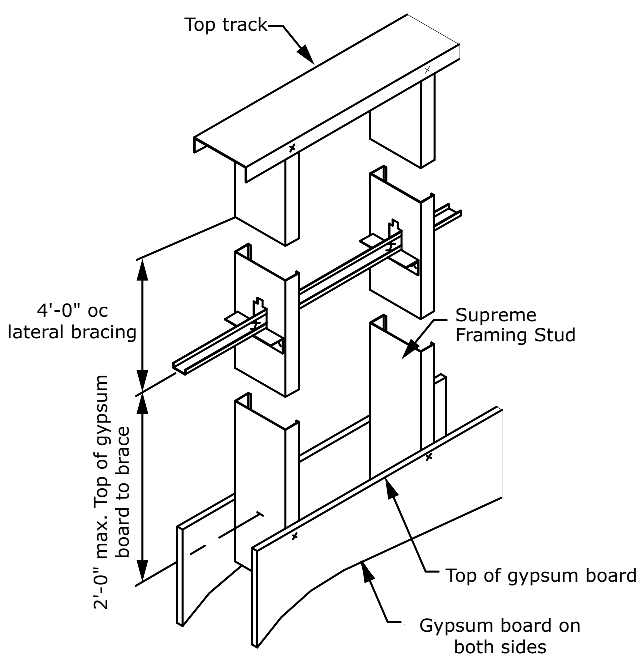
Section	Fy (ksi)	L_u	Spacing (in) oc	5 psf			7.5 psf			10 psf		
				L/120	L/240	L/360	L/120	L/240	L/360	L/120	L/240	L/360
			12	15' 0"	14' 1"	12' 4"	12' 3"	12' 3"	10' 9"	10' 7"	10' 7"	9' 9"
400SFS125-D25 [1]	57	23.4	16	13' 0"	12' 10"	11' 2"	10' 7"	10' 7"	9' 9"	9' 2"	9' 2"	8' 10"
			24	10' 7"	10' 7"	9' 9"	8' 8"	8' 8"	8' 6"	-	-	-
			12	19' 5"	16' 0"	14' 0"	15' 11"	14' 0"	12' 3"	13' 9"	12' 9"	11' 1"
400SFS-D20 [1]	57	27.5	16	16' 10"	14' 7"	12' 9"	13' 9"	12' 9"	11' 1"	11' 11"	11' 7"	10' 1"
			24	13' 9"	12' 9"	11' 1"	11' 3"	11' 1"	9' 8"	9' 8"	9' 9"	8' 10"
			12	22' 2"	17' 7"	15' 4"	19' 4"	15' 4"	13' 5"	17' 1"	13' 11"	12' 2"
400SFS-30EQD	57	27.4	16	20' 2"	16' 0"	13' 11"	17' 1"	13' 11"	12' 2"	14' 10"	12' 8"	11' 1"
			24	17' 1"	13' 11"	12' 2"	13' 11"	12' 2"	10' 8"	12' 1"	11' 1"	9' 8"
			12	22' 2"	17' 7"	15' 4"	19' 4"	15' 4"	13' 5"	17' 1"	13' 11"	12' 2"
400SFS-33EQD	57	27.4	16	20' 2"	16' 0"	13' 11"	17' 1"	13' 11"	12' 2"	14' 10"	12' 8"	11' 1"
			24	17' 1"	13' 11"	12' 2"	13' 11"	12' 2"	10' 8"	12' 1"	11' 1"	9' 8"
			12	28' 5"	22' 8"	19' 10"	23' 3"	19' 10"	17' 4"	20' 1"	18' 0"	15' 9"
550SFS-30EQD [1]	57	26.9	16	24' 8"	20' 7"	18' 0"	20' 1"	18' 0"	15' 9"	17' 5"	16' 4"	14' 3"
			24	20' 1"	18' 0"	15' 9"	16' 5"	15' 9"	13' 9"	14' 2"	14' 2"	12' 6"
			12	28' 5"	22' 8"	19' 10"	23' 3"	19' 10"	17' 4"	20' 1"	18' 0"	15' 9"
550SFS-33EQD [1]	57	26.9	16	24' 8"	20' 7"	18' 0"	20' 1"	18' 0"	15' 9"	17' 5"	16' 4"	14' 3"
			24	20' 1"	18' 0"	15' 9"	16' 5"	15' 9"	13' 9"	14' 2"	14' 2"	12' 6"
			12	29' 8"	23' 7"	20' 8"	24' 2"	20' 8"	18' 0"	20' 11"	18' 9"	16' 4"
600SFS-30EQD [1]	57	26.7	16	25' 8"	21' 5"	18' 9"	20' 11"	18' 9"	16' 4"	18' 2"	17' 0"	14' 10"
			24	20' 11"	18' 9"	16' 4"	17' 1"	16' 4"	14' 3"	14' 10"	14' 10"	13' 0"
			12	29' 8"	23' 7"	20' 8"	24' 2"	20' 8"	18' 0"	20' 11"	18' 9"	16' 4"
600SFS-33EQD [1]	57	26.7	16	25' 8"	21' 5"	18' 9"	20' 11"	18' 9"	16' 4"	18' 2"	17' 0"	14' 10"
			24	20' 11"	18' 9"	16' 4"	17' 1"	16' 4"	14' 3"	14' 10"	14' 10"	13' 0"

[1]Web height-to-thickness ratio exceeds 200. Web stiffeners are required at all support points and concentrated loads.
"e" Web stiffeners required at ends.

See Table Notes on page 24.

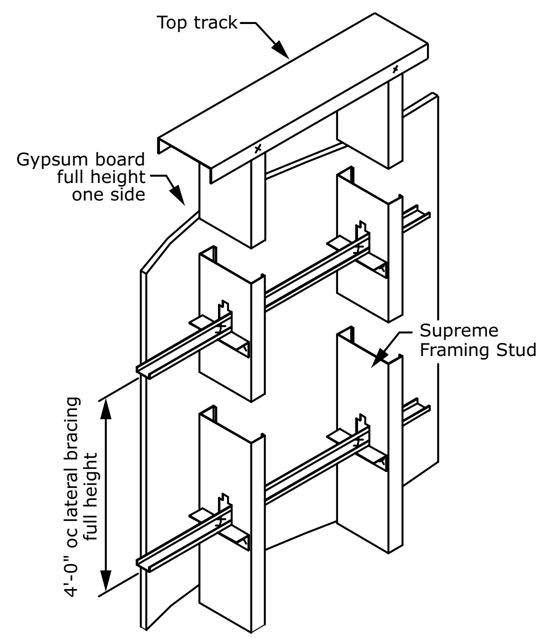
Lateral Bracing

Example of lateral bracing at wall not sheathed at full height.



Lateral Bracing

Example of lateral bracing at wall sheathed at full height on one side.



BSE

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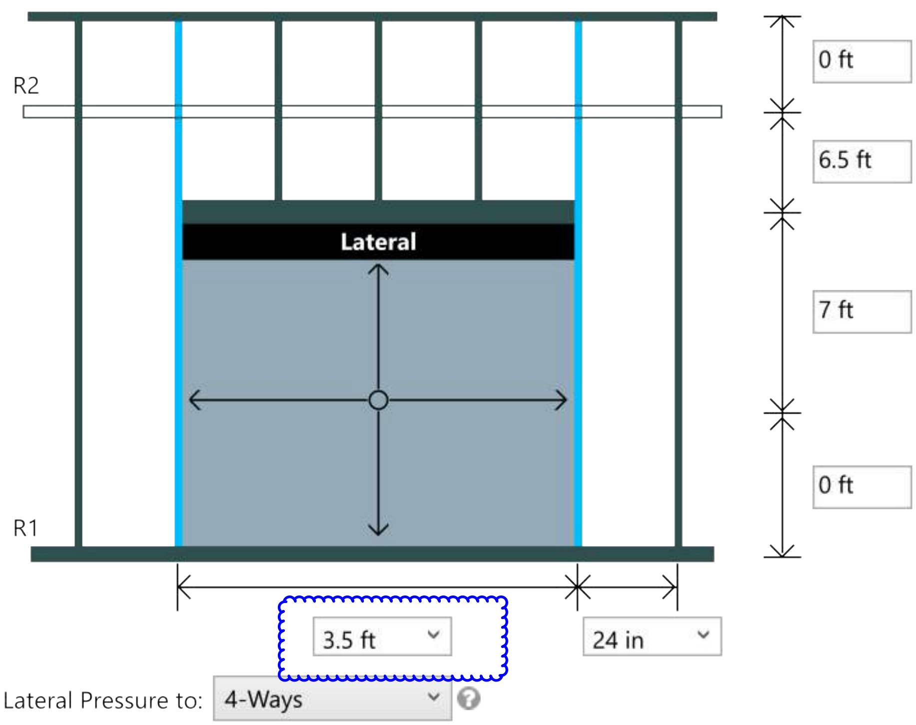
INFILL CFS OPENING DESIGNS

PRCTI20240333

Project Name: Centeris - Copy
Model: FINAL - 6" INFILL HDR @ SGL DRWY
Code: 2012 NASPEC [AISI S100-2012]

SINGLE DOOR OPN'G INFILL WALL 6" STUDS

Date: 02/29/2024
Simpson Strong-Tie® CFS Designer™ 5.0.1.0



Design Loads

Wall Lateral Pressure :	**5 psf**
Parapet Lateral Pressure :	
RO Lateral Pressure :	**4-Ways**
Lateral element force multiplier	
Strength :	**1.0**
Deflection :	**0.7**
Header:	**Strongback, Lateral Track**
Gravity Load at Header:	**14 psf**

Brace Settings

Component(s)	Members(s)	Flexural Bracing	Axial KyLy	Axial KtLt	Distortional K-Phi(lb-in/in)	Distortional Lm	Interconnection Spacing
Wall Studs	600S125-33(33), Single@24 in o/c	48 in	48 in	48 in	0	None	N/A
Jamb Studs	600S125-33(33), Single	48 in	48 in	48 in	0	None	N/A
Lateral Header	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)
Wall Studs	600S125-33(33), Single@24 in o/c	0.0	N/A	227.8	67.5	67.5	67.5
Jamb Studs	600S125-33(33), Single	159.3	128	312.8	85.2	92.8	64.4
Lateral Header	600T125-33(33), Single	N/A	N/A	33.8	36.1	N/A	36.1

Design Results

Component(s)	Members(s)	Deflection Span	Deflection Parapet	A + M Interaction	V + M Interaction	Web Stiffners	Design OK
Wall Studs	600S125-33(33), Single@24 in o/c	L/1243	L/0	0.439	0.11	NA	Yes
Jamb Studs	600S125-33(33), Single	L/964	L/0	0.724	0.52	NA	Yes
Lateral Header	600T125-33(33), Single	L/30173	NA	0.07	0.07	No	Yes

Simpson Strong-Tie® Connectors @ Studs

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie® Connector	Connector Interaction	Anchor Interaction
R2	67.50	0.00	SCB45.5(2) & (2) #12-24 SST X or XL to A36 Steel	13.78 %	6.05 %
R1	67.50	378.00	600T125-33 (33) & (1) .157" SST PDPA/PDPAT-62KP to steel (3/16" to 1/2" thickness)	27.78 %	30.65 %

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

Project Name: Centeris - Copy
Model: FINAL - 6" INFILL HDR @ SGL DRWY
Date: 02/29/2024
Code: 2012 NASPEC [AISI S100-2012]
Simpson Strong-Tie® CFS Designer™ 5.0.1.0

Simpson Strong-Tie® Connectors @ Jambs

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie® Connector	Connector Interaction	Anchor Interaction
R2	64.38	0.00	600T250-33 (33) & (1) .157" SST PDPA/PDPAT-62KP to steel (3/16" to 1/2" thickness)	67.42 %	39.34 %
R1	92.81	446.25	600T125-33 (33) & (1) .157", 3/4" embed SST PDPA/PDPAT to 4000 nw concrete	76.40 %	68.75 %

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

Simpson Strong-Tie® Wall Stud Bridging Connectors @ Studs

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	48	N/A	0.0	No Soln	No Soln	No Soln	No Soln	No Soln	No Soln

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	48	4	0.0	No Soln	No Soln	No Soln	No Soln	No Soln	No Soln

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.

PRCTI20240333

Project Name: Centeris - Copy

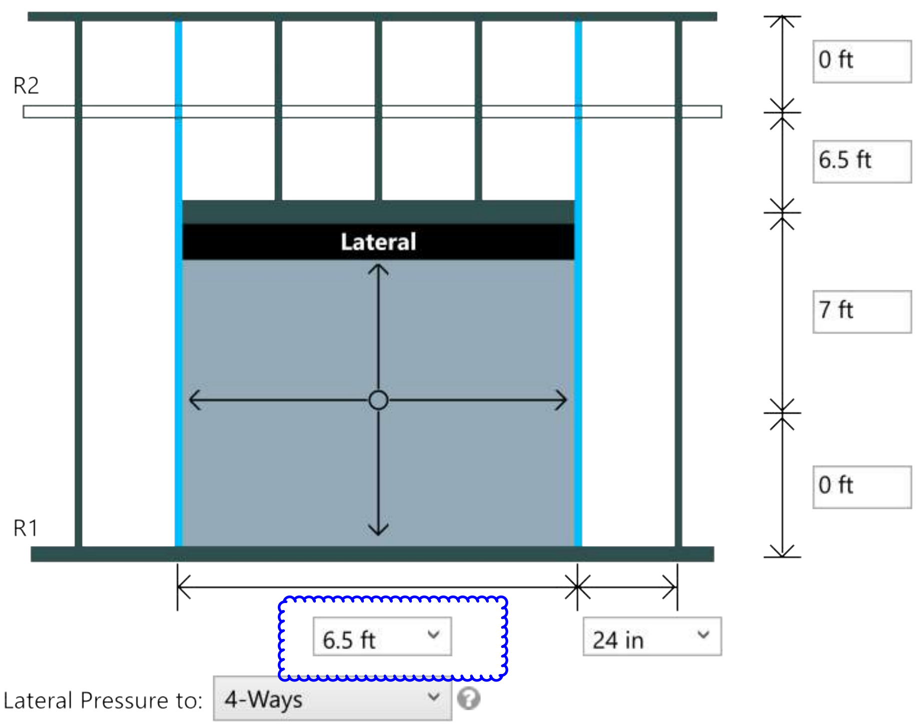
Model: FINAL - 6" INFILL HDR @ DBL DRWY

Code: 2012 NASPEC [AISI S100-2012]

DOUBLE DOOR OPN'G
INFILL WALL
6" STUDS

Date: 02/29/2024

Simpson Strong-Tie® CFS Designer™ 5.0.1.0



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:	**Strongback, Lateral Track**
Gravity Load at Header:	**14 psf**

Brace Settings

Component(s)	Members(s)	Flexural Bracing	Axial KyLy	Axial KtLt	Distortional K-Phi(lb-in/in)	Distortional Lm	Interconnection Spacing
Wall Studs	600S125-33(33), Single@24 in o/c	48 in	48 in	48 in	0	None	N/A
Jamb Studs	600S125-43(33), Single	48 in	48 in	48 in	0	None	N/A
Lateral Header	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)
Wall Studs	600S125-33(33), Single@24 in o/c	0.0	N/A	227.8	67.5	67.5	67.5
Jamb Studs	600S125-43(33), Single	295.8	130	483.4	117.0	143.4	90.6
Lateral Header	600T125-33(33), Single	N/A	N/A	143.0	79.2	N/A	79.2

Design Results

Component(s)	Members(s)	Deflection Span	Deflection Parapet	A + M Interaction	V + M Interaction	Web Stiffners	Design OK
Wall Studs	600S125-33(33), Single@24 in o/c	L/870	L/0	0.439	0.11	NA	Yes
Jamb Studs	600S125-43(33), Single	L/601	L/0	0.829	0.53	NA	Yes
Lateral Header	600T125-33(33), Single	L/2704	NA	0.29	0.29	No	Yes

Simpson Strong-Tie® Connectors @ Studs

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie® Connector	Connector Interaction	Anchor Interaction
R2	67.50	0.00	SCB45.5(2) & (2) #12-24 SST X or XL to A36 Steel	13.78 %	6.05 %
R1	67.50	378.00	600T125-33 (33) & (1) .157" SST PDPA/PDPAT-62KP to steel (3/16" to 1/2" thickness)	27.78 %	30.65 %

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

PRCTI20240333

Project Name: Centeris - Copy
Model: FINAL - 6" INFILL HDR @ DBL DRWY
Code: 2012 NASPEC [AISI S100-2012]

Date: 02/29/2024
Simpson Strong-Tie® CFS Designer™ 5.0.1.0

Simpson Strong-Tie® Connectors @ Jambs

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie® Connector	Connector Interaction	Anchor Interaction
R2	90.63	0.00	600T250-33 (33) & (1) .157" SST PDPA/PDPAT-62KP to steel (3/16" to 1/2" thickness)	94.91 %	55.38 %
R1	143.44	582.75	600T125-33 (33) & (1) .157" SST PDPA/PDPAT-62KP to steel (3/16" to 1/2" thickness)	69.96 %	65.14 %

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

Simpson Strong-Tie® Wall Stud Bridging Connectors @ Studs

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	48	N/A	0.0	No Soln	No Soln	No Soln	No Soln	No Soln	No Soln

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	48	4	0.0	No Soln	No Soln	No Soln	No Soln	No Soln	No Soln

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.

BSE

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

CFS JOIST FRAMING DESIGN

BSE

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

JOISTS: DEAD = 20psf TOT
LIVE = 40psf

IF WE USE 8" STUDS → 800S200-68 @ 24" o.c.
800S162-54 @ 16" o.c.

If WE USE 10" STUDS → 1000 S 200-54 @ 24" o.c.
1000 S 137-54 @ 16" o.c.

RXN = @ 24" SPACING = 960#
@ 16" SPACING = 640#

JOIST CONNECTOR TO GIRDER: USE S/HJC W/ (6) #14 SMS TO JOIST AND 0.157" PDPAT-62KP TO STEEL

FOR 54 mil JOISTS, V_{ALLOW} = 1190#
DEMAND (ASD) = 960#
DCR = 0.81 ✓

(FOR MORE INFO, SEE Simpson CFS Designer OUTPUT)

BSE

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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*:

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

where

m = Distance from shear center to mid-plane of *web*

d = Depth of *C-shape* section

F = *wa*

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

PRCTI20240333

BSE

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

JOIST BRACING REQUIREMENTS

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

APPLICABLE SECTION FOR DETAIL 14/MS1.2

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

PRCTI20240333

Project Name: Centeris

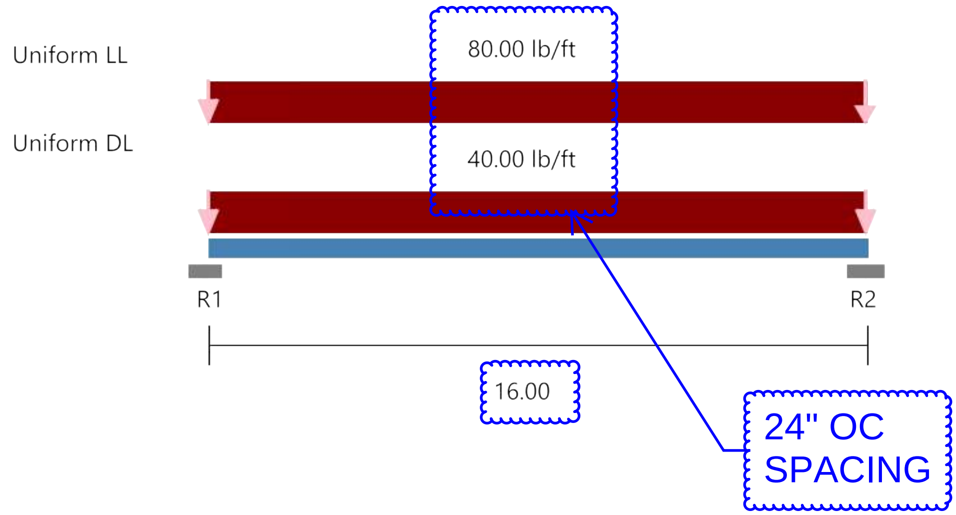
Model: 16ft Floor Joist @ 10" @ 24" OC

Code: 2012 NASPEC [AISI S100-2012]

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

Date: 02/08/2024

Simpson Strong-Tie® CFS Designer™ 5.0.1.0



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

HANGER CONNECTION STIFFENS JOIST

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	3840	0.0	192.0	3884.7	0.988	1	L/345	1	L/517	4

Joist Bending and Web Crippling

Support	Load (lb)	Load Comb.	Bearing (in)	Pa (lb)	Pn (lb)	Max Intr.	Load Comb.	Stiffeners Required
R1	960.0	1	1.00	553.2	968.1	0.90	1	YES
R2	960.0	1	1.00	553.2	968.1	0.90	1	YES

Joist Bending and Shear

Support	Vmax (lb)	Load Comb.	Va Factor	V/Va	M/Ma	Intr. Unstiffened	Load Comb.	Intr. Stiffened	Load Comb.
R1	960.0	1	1.000	0.58	0.00	0.58	1	N/A	N/A
R2	960.0	1	1.000	0.58	0.00	0.58	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	960.0	S/HJCT (min) (6)#14 joist & (2) SST 0.157" PDPAT-62KP to A36 Steel	32.88 %	81.01 %

Project Name: Centeris

Model: 16ft Floor Joist @ 10" @ 24" OC - 40 psf LL - Duplicate

Date: 02/08/2024

Code: 2012 NASPEC [AISI S100-2012]

Simpson Strong-Tie® CFS Designer™ 5.0.1.0

R2	0.0	960.0	S/HJCT (min) (6)#14 joist & (2) SST 0.157" PDPAT-62KP to A36 Steel	32.88 %	81.01 %

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

PRCTI20240333

BSE

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

HSS GIRDER FRAMING DESIGN

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

PRCTI20240333

BSE

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

GIRDERS: LENGTH = 16' - 20" COLUMN ≈ 14'-6"
DEAD = 20 psf, LIVE = 40 psf

~~If we use 10" STUDS → (2) 1000S350-97 BOX HDR (mom = 98.8%)~~

If we use HSS TUBE → $M_A = 25.5$ k·ft

$$I_{REQ'D} \geq \frac{5(960^{\#}/ft)(14.5')^4}{384(29{,}000ksi)(0.7")} * \frac{1k(12in)^3}{1000^{\#}(1ft)^3} = 47.0 in^3$$

L/240

use HSS 8x4x5/16"

Rxn = 7.0 KIPS (ASD) OR (10.3 KIPS LRFD)

CHECK STIFFNESS OF HSS

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thickness, t (in.)	Nominal Wt. (lb/ft)	Area, A (in.²)	b/t	h/t	Axis X-X I (in.⁴)	Axis X-X S (in.³)	Axis X-X r (in.)	Axis X-X Z (in.³)
HSS8×4×5/8	0.581	42.30	11.7	3.88	10.8	82.0	20.5	2.64	27.4
×1/2	0.465	35.24	9.74	5.60	14.2	71.8	17.9	2.71	23.5
×3/8	0.349	27.48	7.58	8.46	19.9	58.7	14.7	2.78	18.8
×5/16	0.291	23.34	6.43	10.7	24.5	51.0	12.8	2.82	16.1
×1/4	0.233	19.02	5.24	14.2	31.3	42.5	10.6	2.85	13.3
×3/16	0.174	14.53	3.98	20.0	43.0	33.1	8.27	2.88	10.2
×1/8	0.116	9.86	2.70	31.5	66.0	22.9	5.73	2.92	7.02

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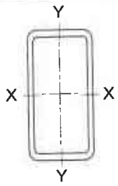
CHECK STRENGTH OF HSS



HSS8–HSS5

Table 3-12 (continued) Available Flexural Strength, kip-ft Rectangular HSS

F_y = 50 ksi

Shape		X-Axis M_n/Ω_b ASD	X-Axis $\phi_b M_n$ LRFD	Y-Axis M_n/Ω_b ASD	Y-Axis $\phi_b M_n$ LRFD
HSS8×4×	5/8	68.4	103	41.4	62.3
	1/2	58.6	88.1	35.7	53.6
	3/8	46.9	70.5	28.7	43.1
	5/16	40.2	60.4	24.7	37.2
	1/4	33.2	49.9	18.9	28.4
	3/16	25.4	38.3	12.5	18.8
	1/8	15.4	23.1	6.94	10.4

Shape		X-Axis M_n/Ω_b ASD	X-Axis $\phi_b M_n$ LRFD	Y-Axis M_n/Ω_b ASD	Y-Axis $\phi_b M_n$ LRFD
HSS7×2×	1/4	19.1	28.7	7.53	11.3
	3/16	14.8	22.3	4.97	7.47
	1/8	10.3	15.5	2.79	4.19
HSS6×5×	1/2	42.9	64.5	37.9	57.0
	3/8	34.4	51.8	30.4	45.8
	5/16	29.7	44.6	26.2	39.4
	1/4	24.6	37.0	21.8	32.7

CHECK AVAILABILITY OF HSS

AISC MEMBERS

HSS Rectangular	Grade	Atlas Tube Inc.	Nucor Tubular Products
8 x 4 x 5/16	A500	✔	✔

NON-MEMBERS

HSS Rectangular	Grade	Bull Moose Tube Company	EXLTUBE	Hanna Steel Corp.	Longhorn Tube LP	Maruichi American Corp.	Maruichi Leavitt Pipe and Tube	Vest Inc.	Welded Tube Of Canada
8 x 4 x 5/16	A500	✔		✔	✔	✔	✔	✔	✔

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

CHECK CONNECTION OF HSS GIRDERS TO (E) CONC. COLUMNS

DEMANDS: VERTICAL RXNS = 7.0 KIPS (ASD)
OR 10.3 K (LRFD) ← USE THIS IN HILTI PROFIS

AXIAL DEMANDS = $F_{P_{ASD}} = 0.7F_P$ ← PER LATERAL SECTION

$F_{P_{ASD}} = (0.7)(1.3K) = 910^{\#}$ (ASD)
AMPLIFIED CONN LOAD = $(2.5)(910^{\#})$
$F_P \Omega_o = 2275^{\#}$ (ASD)

$F_{P_{LRFD}} = F_P = 1.3K$
Amplified CONN LOAD = (2.5)(1.3K)
$F_P \Omega_o = 3.25K$ (LRFD)

USE THIS IN HILTI PROFIS

BASEPLATE CHECKS OUT – PER HILTI PROFIS ANCHORAGE
MAX PLATE STRESS USING FEM

$\sigma_{vonmises} = 14.5\ ksi \rightarrow DCR = \frac{14.5\ ksi}{(36)/(1.67)} = \underline{0.67}$ ← OK

ANCHORAGE TO CONCRETE
COMBINED FORCES ON ANCHORS OK PER HILTI PROFIS
CALCULATIONS ON FOLLOWING PAGES
Tension ≤ 62% utilization (SEISMIC Case 1.2D+0.5L+E)
Shear ≤ 90% UTILIZATION (Non-Seismic Case 1.2D+1.6L)

COMBINATION ≤ 90% (NON-SEISMIC CASE)

PRCTI20240333

Check Bolts in Side Plates

Amplified Seismic Load, Total = 3.25 K

ϕT_n of A36 A.B = (0.9)(36ksi)(0.442 in²) = 14.32K

Check Bolt Brg @ Hole - AISC Section J3.10

$R_{u\,max} = \sqrt{(\text{Tension Demand})^2 + (\text{Shear Demand})^2}$

$= \sqrt{(3.25K/4)^2 + (10.7K/4)^2}$

$= 2.8$ KIPS

$\phi R_n = (0.75)(1.2 * 2" * 3/8" * 58ksi) = 39K$ OK ✓

OR

$(0.75)(2.4 * 3/4" * 3/8" * 58ksi) = 29K$ OK ✓ CONTROLS

Check Weld of Side Conn. PL to Face-Mounted Plate

Amplified Load = 3.25K (LRFD)

Length of 3/16" fillet weld Req'd

$\phi R_n = 1.392\,DL$

$3.25K = 1.392(3)(L)$

L = 0.78" REQ'D, BUT 8" ON (2) WELDS EA. ARE PROVIDED.

OK

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Specifier's comments:

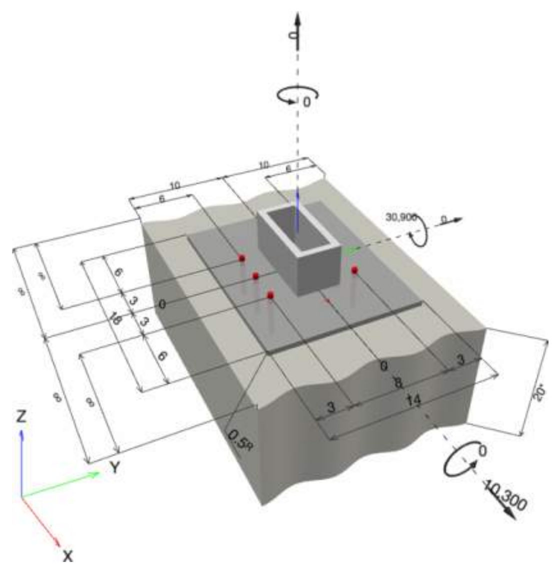
1 Input data

Anchor type and diameter:	**KWIK HUS-EZ (KH-EZ) 1/2 (4 1/4)**
Item number:	418076 KH-EZ 1/2"x5"
Effective embedment depth:	$h_{ef,act}$ = 3.220 in., h_{nom} = 4.250 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-3027
Issued I Valid:	4/1/2022 | 12/1/2023
Proof:	Design Method ACI 318-19 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate[R] :	l_x x l_y x t = 18.000 in. x 14.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	Rectangular HSS (AISC), HSS8X4X.625; (L x W x T) = 8.000 in. x 4.000 in. x 0.625 in.
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 20.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar

Application also possible with KWIK-X 1/2 (4 1/4) hnom2 under the selected boundary conditions.
More information in section Alternative fastening data of this report.

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



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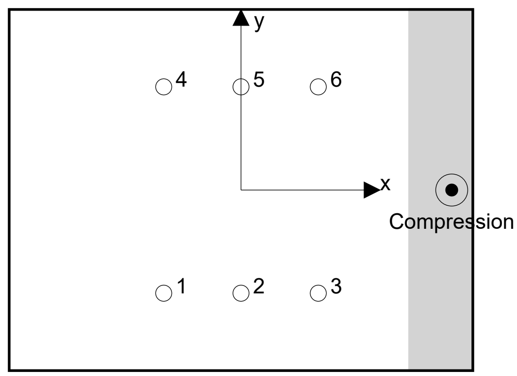
1.1 Load combination and design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 3{,}250$; $V_x = 5{,}800$; $V_y = 0$; $M_x = 0$; $M_y = 17{,}400$; $M_z = 0$;	yes	75
2	Combination 2	$N = 0$; $V_x = 10{,}300$; $V_y = 0$; $M_x = 0$; $M_y = 30{,}900$; $M_z = 0$;	no	90

2 Load case/Resulting anchor forces

Controlling load case: 2 Combination 2



Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	825	1,717	1,717	0
2	566	1,717	1,717	0
3	307	1,717	1,717	0
4	825	1,717	1,717	0
5	566	1,717	1,717	0
6	307	1,717	1,717	0

max. concrete compressive strain: 0.05 [‰]
max. concrete compressive stress: 198 [psi]
resulting tension force in (x/y)=(0.000/0.000): 0 [lb]
resulting compression force in (x/y)=(17.182/7.000): 3,396 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	825	11,778	8	OK
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	3,396	10,059	34	OK

* highest loaded anchor **anchor group (anchors in tension)

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3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-3027

$\phi\ N_{sa} \geq N_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.16	112,540

Calculations

N_{sa} [lb]
18,120

Results

N_{sa} [lb]	ϕ_{steel}	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
18,120	0.650	11,778	825

3.2 Concrete Breakout Failure

$N_{cbg} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$	ACI 318-19 Eq. (17.6.2.1b)
$\phi\ N_{cbg} \geq N_{ua}$	ACI 318-19 Table 17.5.2
A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)	
$A_{Nc0} = 9\ h_{ef}^2$	ACI 318-19 Eq. (17.6.2.1.4)
$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e'_N}{3\ h_{ef}}}\right) \leq 1.0$	ACI 318-19 Eq. (17.6.2.3.1)
$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$	ACI 318-19 Eq. (17.6.2.4.1b)
$\psi_{cp,N} = \mathrm{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$	ACI 318-19 Eq. (17.6.2.6.1b)
$N_b = k_c\ \lambda_a\ \sqrt{f'_c}\ h_{ef}^{1.5}$	ACI 318-19 Eq. (17.6.2.2.1)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
3.220	0.917	0.000	6.000	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
5.250	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
276.56	93.32	0.840	1.000	1.000	1.000	6,212

Results

N_{cbg} [lb]	$\phi_{concrete}$	$\phi\ N_{cbg}$ [lb]	N_{ua} [lb]
15,475	0.650	10,059	3,396

4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	1,717	5,547	31	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	10,300	25,776	40	OK
Concrete edge failure in direction y-**	10,300	12,465	83	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

V_{sa} = ESR value refer to ICC-ES ESR-3027

$\phi\ V_{steel} \geq V_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.16	112,540

Calculations

V_{sa} [lb]
9,245

Results

V_{sa} [lb]	ϕ_{steel}	$\phi\ V_{sa}$ [lb]	V_{ua} [lb]
9,245	0.600	5,547	1,717

4.2 Pryout Strength

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \ \psi_{ed,N} \ \psi_{c,N} \ \psi_{cp,N} \ N_b \right]$ ACI 318-19 Eq. (17.7.3.1b)

$\phi \ V_{cpg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9 \ h_{ef}^2$ ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 \ e'_N}{3 \ h_{ef}}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c \ \lambda_a \ \sqrt{f'_c} \ h_{ef}^{1.5}$ ACI 318-19 Eq. (17.6.2.2.1)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	3.220	0.000	0.000	6.000

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	5.250	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
276.56	93.32	1.000	1.000	1.000	1.000	6,212

Results

V_{cpg} [lb]	$\phi_{concrete}$	$\phi \ V_{cpg}$ [lb]	V_{ua} [lb]
36,823	0.700	25,776	10,300

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4.3 Concrete edge failure in direction y-

$V_{cbg} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ec,V} \; \psi_{ed,V} \; \psi_{c,V} \; \psi_{h,V} \; \psi_{parallel,V} \; V_b$ ACI 318-19 Eq. (17.7.2.1b)

$\phi \; V_{cbg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Vc} see ACI 318-19, Section 17.7.2.1, Fig. R 17.7.2.1(b)

$A_{Vc0} = 4.5 \; c_{a1}^2$ ACI 318-19 Eq. (17.7.2.1.3)

$\psi_{ec,V} = \left(\frac{1}{1 + \frac{e_V^{'}}{1.5c_{a1}}}\right) \leq 1.0$ ACI 318-19 Eq. (17.7.2.3.1)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ ACI 318-19 Eq. (17.7.2.4.1b)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ ACI 318-19 Eq. (17.7.2.6.1)

$V_b = \left(7 \left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda_a \; \sqrt{f_c^{'}} \; c_{a1}^{1.5}$ ACI 318-19 Eq. (17.7.2.2.1a)

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\psi_{c,V}$	h_a [in.]
6.000	-	0.000	1.000	20.000

l_e [in.]	λ_a	d_a [in.]	$f_c^{'}$ [psi]	$\psi_{parallel,V}$
3.220	1.000	0.500	4,000	2.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
216.00	162.00	1.000	1.000	1.000	6,678

Results

V_{cbg} [lb]	$\phi_{concrete}$	$\phi \; V_{cbg}$ [lb]	V_{ua} [lb]
17,807	0.700	12,465	10,300

5 Combined tension and shear loads, per ACI 318-19 section 17.8

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.338	0.826	5/3	90	OK

$\beta_{NV} = \beta_N^{\zeta} + \beta_V^{\zeta} <= 1$

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6 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-19, Section 26.7.

Fastening meets the design criteria!

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7 Installation data

Profile: Rectangular HSS (AISC), HSS8X4X.625; (L x W x T) = 8.000 in. x 4.000 in. x 0.625 in.

Hole diameter in the fixture: d_f = 0.625 in.

Plate thickness (input): 0.500 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: KWIK HUS-EZ (KH-EZ) 1/2 (4 1/4)

Item number: 418076 KH-EZ 1/2"x5"

Maximum installation torque: 540 in.lb

Hole diameter in the base material: 0.500 in.

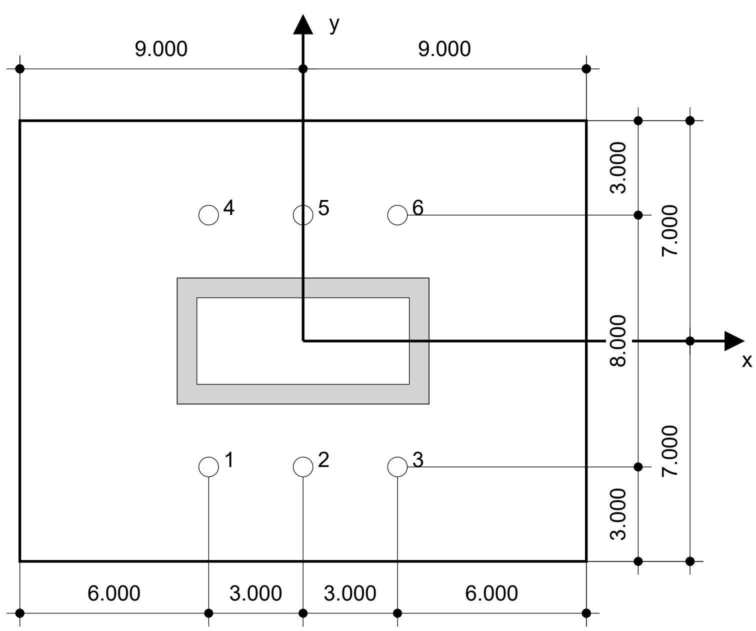
Hole depth in the base material: 4.625 in.

Minimum thickness of the base material: 6.750 in.

Hilti KH-EZ screw anchor with 4.25 in embedment, 1/2 (4 1/4), Carbon steel, installation per ESR-3027

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque wrench



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-3.000	-4.000	-	-	6.000	14.000
2	0.000	-4.000	-	-	6.000	14.000
3	3.000	-4.000	-	-	6.000	14.000

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
4	-3.000	4.000	-	-	14.000	6.000
5	0.000	4.000	-	-	14.000	6.000
6	3.000	4.000	-	-	14.000	6.000

8 Alternative fastening

8.1 Alternative fastening data

Anchor type and diameter:	**KWIK-X 1/2 (4 1/4) hnom2**
Item number:	418076 KH-EZ 1/2"x5" (element) / 2362252 KHC 1/2" LARGE (capsule)
Effective embedment depth:	$h_{ef,opti}$ = 4.250 in. ($h_{ef,limit}$ = 5.500 in.), h_{nom} = 4.250 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-5065
Issued I Valid:	1/1/2023 | 12/1/2023
Proof:	Design Method ACI 318-19 / Chem
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate^R :	l_x x l_y x t = 18.000 in. x 14.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	Rectangular HSS (AISC), HSS8X4X.625; (L x W x T) = 8.000 in. x 4.000 in. x 0.625 in.
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 20.000 in., Temp. short/long: 32/32 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar

Max. Utilization with KWIK-X 1/2 (4 1/4) hnom2: 80 %
Fastening meets the design criteria!

8.2 Installation data

Profile: Rectangular HSS (AISC), HSS8X4X.625; (L x W x T) = 8.000 in. x 4.000 in. x 0.625 in.

Hole diameter in the fixture: d_f = 0.625 in.

Plate thickness (input): 0.500 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: No cleaning of the drilled hole is required

Anchor type and diameter: KWIK-X 1/2 (4 1/4) hnom2

Item number: 418076 KH-EZ 1/2"x5" (element) / 2362252 KHC 1/2" LARGE (capsule)

Maximum installation torque: -

Hole diameter in the base material: 0.500 in.

Hole depth in the base material: 5.250 in.

Minimum thickness of the base material: 6.500 in.

1/2 (4 1/4) hnom2 Hilti KH-EZ Carbon steel screw anchor with Hilti KHC

8.2.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• No accessory required	• SIW 6-A22 Impact Screw Driver

9 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

BSE

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

LATERAL DESIGN

PRCTI20240333

WALL CONSTRUCTION :

(4) layers Gyp	(4)(2.5psf)	= 10psf
MTL STUDS	1.5psf	= 1.5psf
Acoustic Ins.		= 2psf
		13.5psf
		use 14psf

BATTERY ROOM & UPS COMBINED

TOTAL CEILING SEISMIC WEIGHT = (20psf)(1540 ft^2) = 30.8 K

TOP HALF OF WALLS = (1/2) (13 ft) (160ft) (14psf) = 14.6 K

TOT WALL LENGTH = (32 ft x 2) + (48 ft x 2) = 160 ft

TOTAL SEISMIC MASS = 45.4 K

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

$$F_p = \frac{(0.4)(a_p)S_{DS}W_p}{R_p/I_p}\left(1+2\frac{z}{h}\right) = \frac{(0.4)(1.0)(1.006)(45.4\ K)}{2.5/1.0}\left(1+2\left(\frac{12ft}{47ft}\right)\right)$$

$F_p = 0.2432\ W$

= 11.0 K TOTAL

FIND SEISMIC LOAD TO EACH COLUMN

\# of COLUMNS = (12) Cols

$$\text{SEISMIC LOAD PER COLUMN} = \frac{11.0\ K}{(12)\ Cols} = 0.92\ K/Column$$

AT INTERIOR COLUMNS = 16'x16'x20psf = 5.12K MASS

$F_p = (0.2432)(5.12K) = 1.245\ K/COL.$

Controls

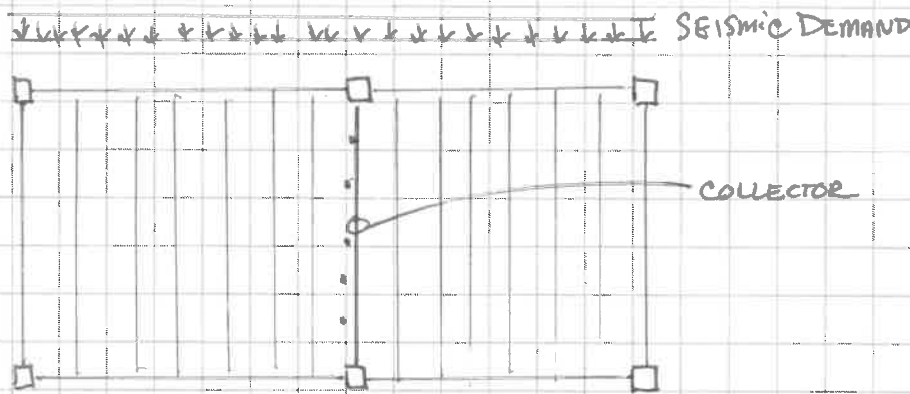
Phone: (206) 397-0000 1316 Central Avenue South, Suite 200, Kent, WA 98032 www.bse-ps.com

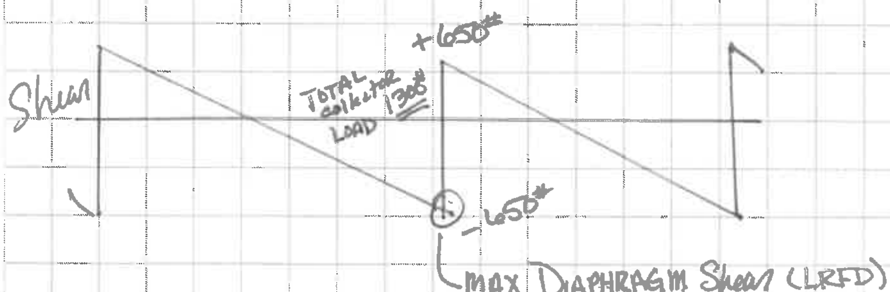
PRCTI20240333

BSE
Brienen Structural Engineers, P.S.

Project: CENTERIS　　Date: 2/9/24

PLYWOOD - ON - MH JOIST DIAPHRAGMS





COLLECTOR LOAD = 1300# LRFD
= 910# (ASD)

SHEAR TRANSFER FROM DIAPHRAGM TO collector = (15) SCREWS THRU PW into Collector

$V_{A,\,SCREW,\,\#10} = 190^{\#}$

$\#\text{ of SCREWS REQ'D} = \dfrac{910^{\#}_{TOT}}{190^{\#}/\text{SCREW}} = 4.8\text{ SCREWS}$

(15) SCREWS PROVIDED

ALLOWABLE DIAPH. SHEAR PER AISI S400-20, § F2.4

$\phi V_n = \phi\, v_n\, L$

$\phi V_n = (0.60)(555^{\#}/ft)(16ft) = 5{,}328^{\#}$

DCR = 0.24

BSE

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

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.

$V_n = v_n L$ (*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:

Ω_v = 2.50 (*ASD*)

ϕ_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				Unblocked	
		Screw spacing at diaphragm boundary edges and at all continuous panel edges (in.)				Screws spaced maximum of 6 in. on all supported edges	
		6	4	2.5	2	Load perpendicular to unblocked edges and continuous panel joints	All other configurations
		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*).

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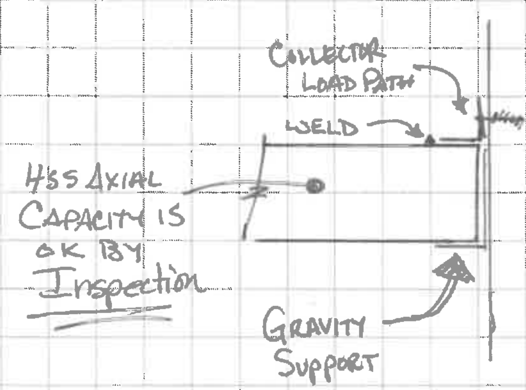
Brienen Structural Engineers, P.S.

Project: CENTERIS   Date: 2/9/24

CONNECTION OF COLLECTOR (HSS) to (E) Conc. COL.



COLLECTOR CONN. LOAD = $\Omega_0 F_p$

= 2.5 (1.3K)

= 3,250# (LRFD)

CHECK WELD

$\phi R_n = 1.392 (D)(L)$ PER AISC manual

$\phi R_n = 1.392 (3)(2.75" \text{NET})$

$\phi R_n = 11.5K$

↳ DCR = 0.28

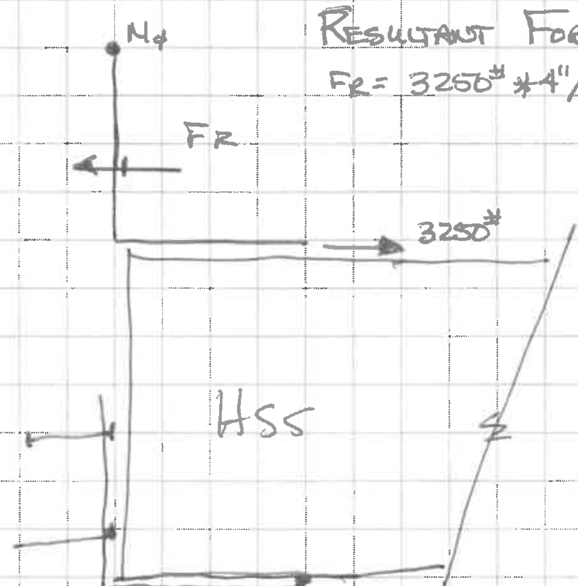
NOTE: LOADS BEARING IN COMPRESSION ARE SIMILAR

CHECK ANCHORS INTO COLUMNS

SEE FOLLOWING PAGES FOR ANCHOR CALC OUTPUT

RESULTANT FORCE TO INCLUDE ECCENTRIC LOAD &

$F_R = 3250\# * 4"/2\tfrac{1}{2} = 5200\#$ CONSIDER PRYING



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Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2024	Date:	2/9/2024
Fastening point:			

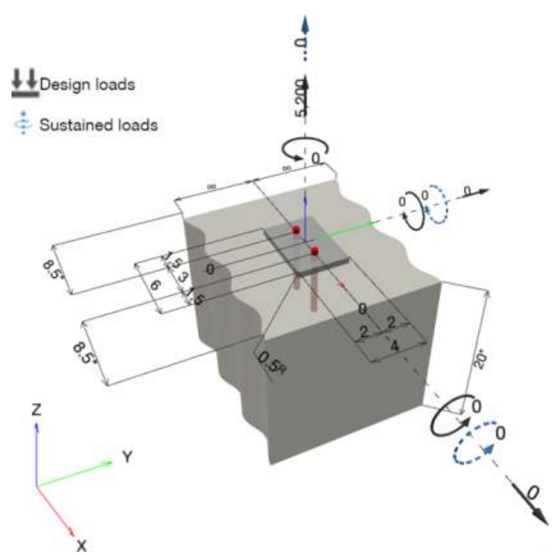
Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-HY 200 V3 + HAS-V-36 (ASTM F1554 Gr.36) 1/2**
Item number:	2198022 HAS-V-36 1/2"x6-1/2" (element) / 2334276 HIT-HY 200-R V3 (adhesive)
Effective embedment depth:	$h_{ef,opti}$ = 4.797 in. ($h_{ef,limit}$ = 10.000 in.)
Material:	ASTM F1554 Grade 36
Evaluation Service Report:	ESR-4868
Issued I Valid:	11/1/2022 | 11/1/2024
Proof:	Design Method ACI 318-19 / Chem
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate[R] :	l_x x l_y x t = 6.000 in. x 4.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 20.000 in., Temp. short/long: 32/32 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.10.5.3 (d))
	Shear load: yes (17.10.6.3 (c))

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



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1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 5{,}200$; $V_x = 0$; $V_y = 0$; $M_x = 0$; $M_y = 0$; $M_z = 0$;	yes	100

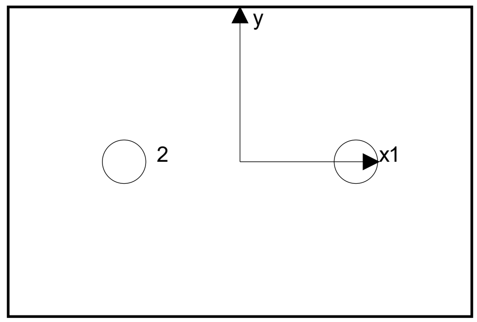
2 Load case/Resulting anchor forces

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	2,600	0	0	0
2	2,600	0	0	0

max. concrete compressive strain: - [‰]
max. concrete compressive stress: - [psi]
resulting tension force in (x/y)=(0.000/0.000): 0 [lb]
resulting compression force in (x/y)=(0.000/0.000): 0 [lb]



Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	2,600	6,172	43	OK
Bond Strength**	5,200	5,223	100	OK
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	5,200	6,655	79	OK

* highest loaded anchor **anchor group (anchors in tension)

3.1 Steel Strength

N_{sa} = ESR value   refer to ICC-ES ESR-4868

$\phi\ N_{sa} \geq N_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.14	58,000

Calculations

N_{sa} [lb]
8,230

Results

N_{sa} [lb]	ϕ_{steel}	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
8,230	0.750	6,172	2,600

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3.2 Bond Strength

$N_{ag} = \left(\frac{A_{Na}}{A_{Na0}}\right) \psi_{ec1,Na}\ \psi_{ec2,Na}\ \psi_{ed,Na}\ \psi_{cp,Na}\ N_{ba}$ ACI 318-19 Eq. (17.6.5.1b)

$\phi\ N_{ag} \geq N_{ua}$ ACI 318-19 Table 17.5.2

A_{Na} see ACI 318-19, Section 17.6.5.1, Fig. R 17.6.5.1(b)

$A_{Na0} = (2\ c_{Na})^2$ ACI 318-19 Eq. (17.6.5.1.2a)

$c_{Na} = 10\ d_a \sqrt{\frac{\tau_{uncr}}{1100}}$ ACI 318-19 Eq. (17.6.5.1.2b)

$\psi_{ec,Na} = \left(\frac{1}{1 + \frac{e'_N}{c_{Na}}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.5.3.1)

$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.5.4.1b)

$\psi_{cp,Na} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.5.5.1b)

$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \alpha_{N,seis} \cdot \pi \cdot d_a \cdot h_{ef}$ ACI 318-19 Eq. (17.6.5.2.1)

Variables

$\tau_{k,c,uncr}$ [psi]	d_a [in.]	h_{ef} [in.]	$c_{a,min}$ [in.]	$\alpha_{overhead}$	$\tau_{k,c}$ [psi]
2,327	0.500	4.797	8.500	1.000	1,190

$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	c_{ac} [in.]	λ_a	$\alpha_{N,seis}$
0.000	0.000	8.542	1.000	0.990

Calculations

c_{Na} [in.]	A_{Na} [in.^{2}]	A_{Na0} [in.^{2}]	$\psi_{ed,Na}$
7.239	253.06	209.62	1.000

$\psi_{ec1,Na}$	$\psi_{ec2,Na}$	$\psi_{cp,Na}$	N_{ba} [lb]
1.000	1.000	1.000	8,875

Results

N_{ag} [lb]	ϕ_{bond}	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\ N_{ag}$ [lb]	N_{ua} [lb]
10,714	0.650	0.750	1.000	5,223	5,200

3.3 Concrete Breakout Failure

$N_{cbg} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$ ACI 318-19 Eq. (17.6.2.1b)

$\phi\ N_{cbg} \geq N_{ua}$ ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e'_N}{3\ h_{ef}}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = MAX\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c\ \lambda_a\ \sqrt{f'_c}\ h_{ef}^{1.5}$ ACI 318-19 Eq. (17.6.2.2.1)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
4.797	0.000	0.000	8.500	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
8.542	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
250.30	207.12	1.000	1.000	1.000	1.000	11,297

Results

N_{cbg} [lb]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\ N_{cbg}$ [lb]	N_{ua} [lb]
13,652	0.650	0.750	1.000	6,655	5,200

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	N/A	N/A	N/A	N/A
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength (Bond Strength controls)*	N/A	N/A	N/A	N/A
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* highest loaded anchor   **anchor group (relevant anchors)

5 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Design Strengths of adhesive anchor systems are influenced by the cleaning method. Refer to the INSTRUCTIONS FOR USE given in the Evaluation Service Report for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- "An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-19, Chapter 17, Section 17.10.5.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Section 17.10.5.3 (b), Section 17.10.5.3 (c), or Section 17.10.5.3 (d). The connection design (shear) shall satisfy the provisions of Section 17.10.6.3 (a), Section 17.10.6.3 (b), or Section 17.10.6.3 (c)."
- Section 17.10.5.3 (b) / Section 17.10.6.3 (a) require the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Section 17.10.5.3 (c) / Section 17.10.6.3 (b) waive the ductility requirements and require the anchors to be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Section 17.10.5.3 (d) / Section 17.10.6.3 (c) waive the ductility requirements and require the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by ω_0.
- Installation of Hilti adhesive anchor systems shall be performed by personnel trained to install Hilti adhesive anchors. Reference ACI 318-19, Section 26.7.

Fastening meets the design criteria!

6 Installation data

Profile: no profile

Hole diameter in the fixture: d_f = 0.562 in.

Plate thickness (input): 0.500 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-HY 200 V3 + HAS-V-36 (ASTM F1554 Gr.36) 1/2

Item number: 2198022 HAS-V-36 1/2"x6-1/2" (element) / 2334276 HIT-HY 200-R V3 (adhesive)

Maximum installation torque: 360 in.lb

Hole diameter in the base material: 0.562 in.

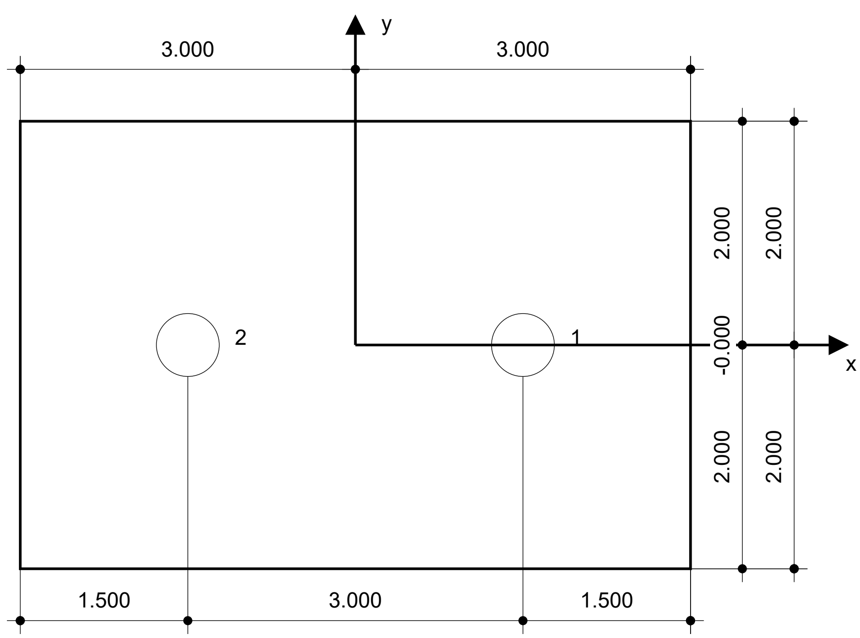
Hole depth in the base material: 4.797 in.

Minimum thickness of the base material: 6.047 in.

1/2 Hilti HAS Carbon steel threaded rod with Hilti HIT-HY 200 V3 Safe Set System

6.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • Torque wrench



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	1.500	-0.000	11.500	8.500	-	-
2	-1.500	-0.000	8.500	11.500	-	-

7 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
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PRCTI20240333

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UPS ROOM CEILING DESIGN

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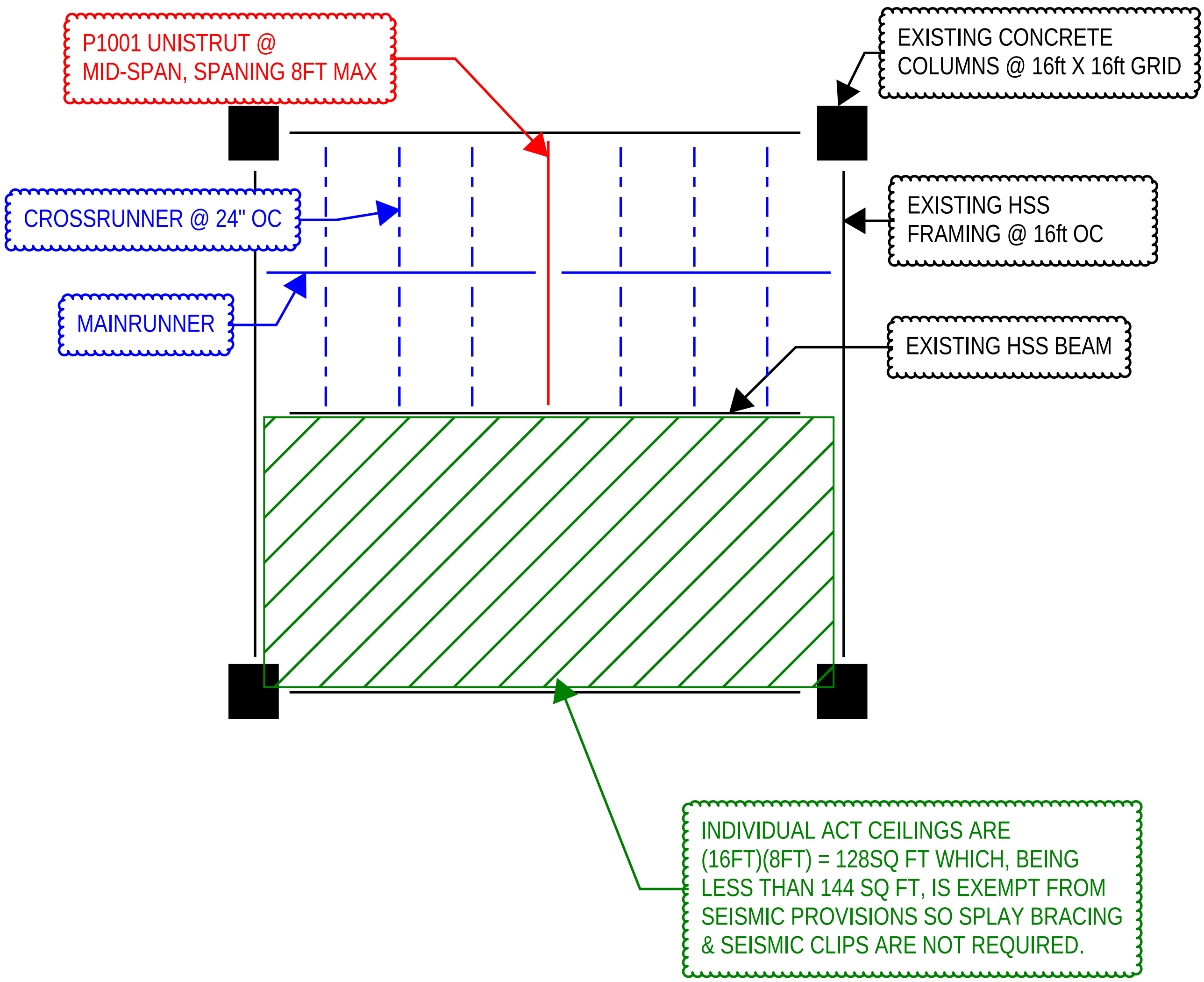
FRAMING INTENT:



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BEAM LOADING FROM UNISTRUT WEBSITE

(https://www.atkore.com/Products/Strut-and-Fittings/Unistrut/1-58-Strut-and-Fittings/Strut-Channel/P1000-Series/P1001)

Beam Loading

Beam Loading - P1001						
Span (in)	Max Allow. Uniform Load (lbs)	Deflection at Uniform load (in)	Uniform Loading at Deflection			Lateral Bracing Reduction Factor
			Span/180 (lbs)	Span/240 (lbs)	Span/360 (lbs)	
24	* 3,500	0.02	* 3,500	* 3,500	* 3,500	1.00
36	3,190	0.07	3,190	3,190	3,190	1.00
48	2,390	0.13	2,390	2,390	2,390	1.00
60	1,910	0.20	1,910	1,910	1,620	0.97
72	1,600	0.28	1,600	1,600	1,130	0.93
84	1,370	0.39	1,370	1,240	830	0.89
96	1,200	0.51	1,200	950	630	0.85
108	1,060	0.64	1,000	750	500	0.81
120	960	0.79	810	610	410	0.78
144	800	1.14	560	420	280	0.70
168	680	1.53	410	310	210	0.63
192	600	2.02	320	240	160	0.56
216	530	2.54	250	190	130	0.49
240	480	3.16	200	150	100	0.44
Note	*Load limited by weld shear					

1200LBS(0.85) = 1020LBS
CEILING TRIBUTARY LOAD IS (3PSF)(4FT)(8FT) = 96LBS WHICH LEAVES 924LBS OF LOAD FOR THE CABLE TRAY.
ASSUMING CABLE TRAY COULD BE A POINT LOAD IN THE CENTER OF THE SPAN, ALLOWABLE LOAD IS REDUCED BY 50% = 462LBS

PRCTI20240333

Atkore Unistrut

UNISTRUT®
BEAM LOAD CALCULATION GUIDE

GUIDE FOR CALCULATING BEAM LOADS FOR UNISTRUT CHANNEL

Loads in the Beam Load Tables for UNISTRUT metal framing channel are given as a total uniform load (W) in pounds. For the more familiar uniform load (w) in pounds per foot or pounds per inch, divide the table load by the span.

Loads under the column headings of "Span/180", "Span/240" and "Span/360" are provided for installations in which deflection (sag) of the loaded UNISTRUT channel must be limited. These ratios are standard engineering practice and, when applicable, are usually given by the Professional Engineer of Record or the Project Specifications. Actual deflection from these preset ratios equals the span (inches or feet) divided by the number 180, 240 or 360. When designing to one of these deflection limits, the allowed uniform load is generally less than the values under the column heading "Maximum Allowed Uniform Load". For further information or assistance on this issue, please contact us.

All 5 notes below the beam load tables must be followed to obtain the final usable load on the channel. Failure to do so produces the wrong working load. These notes require adjustments to the Maximum Allowed Uniform Load for:

- Pierced Channel (if applicable)
- Unbraced Length
- Channel Weight
- Midspan Point Loads (if applicable)

Use the following 5 steps to accurately determine the allowed working load of UNISTRUT channel:

1. **STEP #1:** Determine Maximum Allowed Uniform Load from Load Table
2. **STEP #2:** Multiply the Applicable Pierced Hole Factor (only if using a Beam Load Table for the solid channel)
   - 0.95 for "KO
   - 0.90 for "HS" & "H3"
   - 0.85 for "T", "SL" & "WT"
   - 0.70 for "DS"
3. **STEP #3:** Multiply by the Unbraced Length Factor
4. **STEP #4:** Subtract the Channel Weight
5. **STEP #5:** Multiply by 50% for Midspan Loading (if applicable)

The result after step #4 is the net allowed total uniform load in pounds. The result after step #5 is the allowed midspan point load.

For more info visit atkore.com/unistrut

RCA Rigid Connector Angles

PRCTI20240333

SIMPSON Strong-Tie

The Simpson Strong-Tie® rigid connector angle is a general purpose clip angle designed for a wide range of cold-formed steel construction applications. With prepunched holes for fastener attachment, these L-shaped clips save time and labor on the job.

Features:

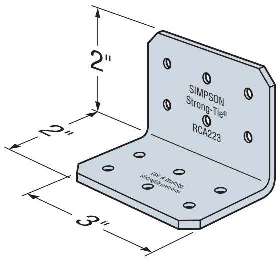
- Use with miscellaneous header/sill connections to jamb studs, jamb stud reinforcement at track, u-channel bridging, stud-blocking, bypass curtain-wall framing, joist connections and other versatile options
- Easy to install, with prepunched holes for quick and accurate fastener attachment

Material: RCAXXX/54 — 54 mil (16 ga.), 50 ksi
RCAXXX/68 — 68 mil (14 ga.), 50 ksi
RCAXXX/97 — 97 mil (12 ga.), 50 ksi
(**Note:** "XXX" is model number shown below.)

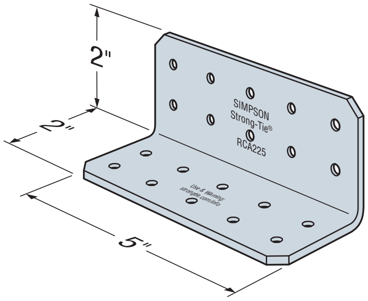
Finish: Galvanized (G90)

Installation:

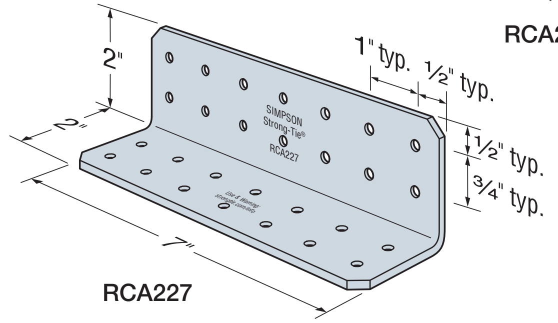
- Use all specified anchors/fasteners



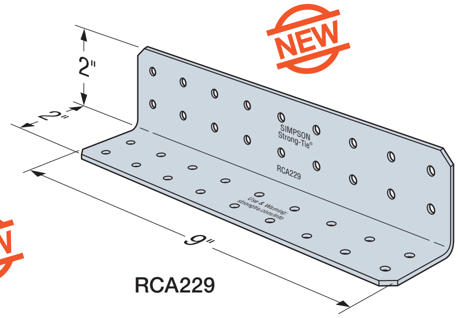
RCA223



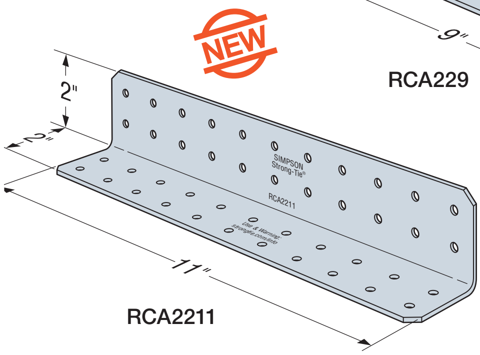
RCA225



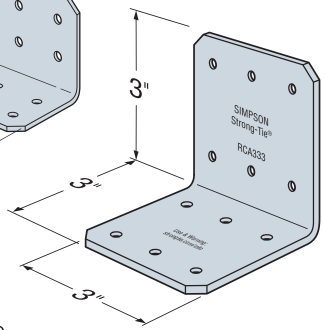
RCA227



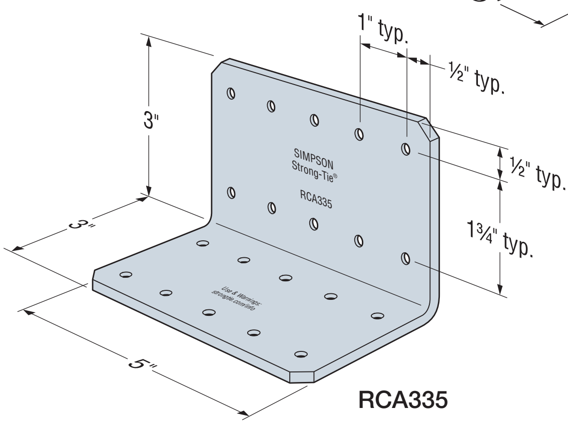
RCA229



RCA2211



RCA333



RCA335

Ordering Information

Model No.	Ordering SKU	Bucket Quantity
RCA223/54	RCA223/54-R150	150
RCA223/68	RCA223/68-R125	125
RCA223/97	RCA223/97-R90	90
RCA225/54	RCA225/54-R90	90
RCA225/68	RCA225/68-R75	75
RCA225/97	RCA225/97-R55	55
RCA227/54	RCA227/54-R65	65
RCA227/68	RCA227/68-R55	55
RCA227/97	RCA227/97-R40	40
RCA229/54	RCA229/54-R50	50
RCA229/68	RCA229/68-R50	50
RCA229/97	RCA229/97-R35	35
RCA2211/54	RCA2211/54-R45	45
RCA2211/68	RCA2211/68-R40	40
RCA2211/97	RCA2211/97-R30	30
RCA333/54	RCA333/54-R100	100
RCA333/68	RCA333/68-R85	85
RCA333/97	RCA333/97-R60	60
RCA335/54	RCA335/54-R60	60
RCA335/68	RCA335/68-R50	50
RCA335/97	RCA335/97-R35	35

RCA Rigid Connector Angles

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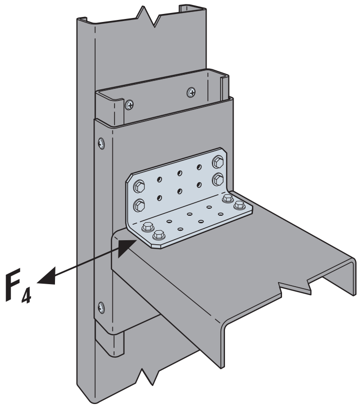
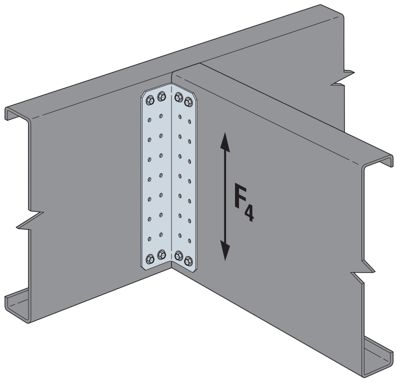
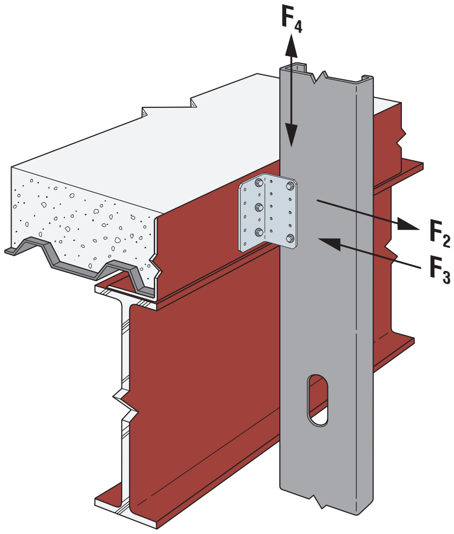


Typical RCA225 Installation at Sill/Jamb

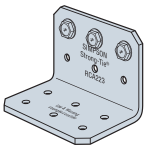
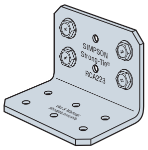
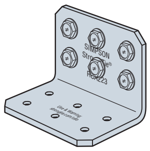
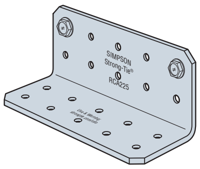
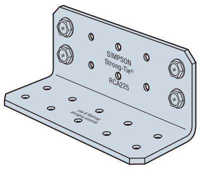
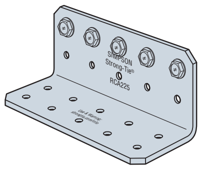
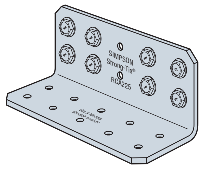
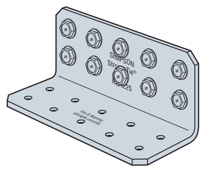
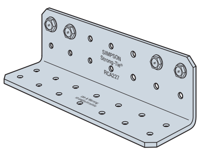
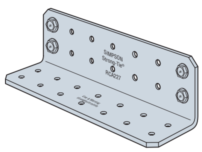
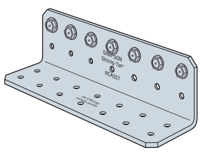
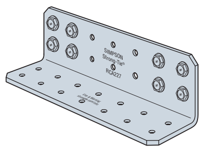
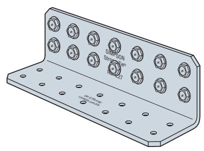
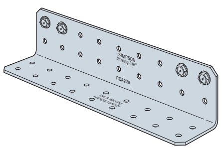
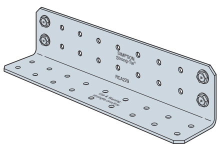
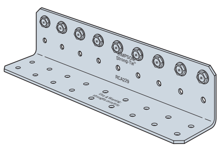
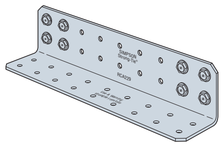
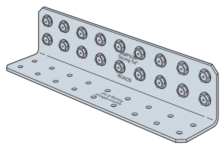
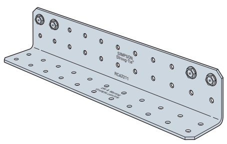
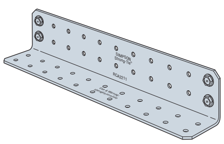
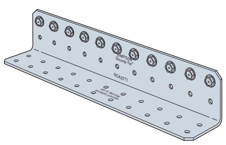
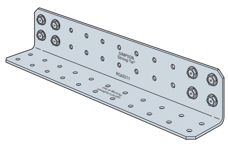
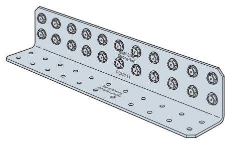


Typical RCA229 Installation at Joist Connection



Typical RCA335 Installation at Bypass Framing

Screw Patterns for Rigid Connector Angles

Models	Pattern 3A	Pattern 3B	Pattern 3C		
RCA223/54 RCA223/68 RCA223/97 RCA333/54 RCA333/68 RCA333/97					
Models	**Pattern 5A**	**Pattern 5B**	**Pattern 5C**	**Pattern 5D**	**Pattern 5E**
RCA225/54 RCA225/68 RCA225/97 RCA335/54 RCA335/68 RCA335/97					
Models	**Pattern 7A**	**Pattern 7B**	**Pattern 7C**	**Pattern 7D**	**Pattern 7E**
RCA227/54 RCA227/68 RCA227/97					
Models	**Pattern 9A**	**Pattern 9B**	**Pattern 9C**	**Pattern 9D**	**Pattern 9E**
RCA229/54 RCA229/68 RCA229/97					
Models	**Pattern 11A**	**Pattern 11B**	**Pattern 11C**	**Pattern 11D**	**Pattern 11E**
RCA2211/54 RCA2211/68 RCA2211/97					

RCA Rigid Connector Angles

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RCA Rigid Connector Angles Allowable Loads (lb.)

Model	No. of #10 Screws[5,6]	Screw Pattern	Stud Framing Thickness[11]								
			33 mil (20 ga.)			43 mil (18 ga.)			54 mil (16 ga.)		
			F_2	F_3	F_4	F_2	F_3	F_4	F_2	F_3	F_4
RCA223/54	3	3A	205	495	200	205	590	310	205	590	620
	4	3B	205	580	390	205	580	605	205	580	1,095
	6	3C	205	865	480	205	865	740	205	865	1,095
RCA223/68	3	3A	310	495	200	310	765	310	310	815	620
	4	3B	310	660	390	310	805	605	310	805	1,210
	6	3C	310	990	480	310	[illegible]	[illegible]	310	1,205	1,350
RCA223/97	3	3A	495	495	200	630	[illegible]	[illegible]	[illegible]	1,415	620
	4	3B	630	660	390	630	[illegible]	[illegible]	630	1,265	1,210
	6	3C	630	990	480	630	1,530	740	630	1,895	1,485
RCA225/54	2	5A	330	330	265	340	390	410	340	390	815
	4	5B	340	580	535	340	580	830	340	580	1,660
	5	5C	340	825	460	340	980	705	340	980	1,310
	8	5D	340	1,155	915	340	1,155	1,420	340	1,155	1,825
	10	5E	340	1,445	1,035	340	1,445	1,600	340	1,445	1,825
RCA225/68	2	5A	330	330	265	510	510	410	520	545	815
	4	5B	520	660	535	520	805	830	520	805	1,660
	5	5C	520	825	460	520	1,275	705	520	1,360	1,415
	8	5D	520	1,320	915	520	1,605	1,420	520	1,605	2,255
	10	5E	520	1,650	1,035	520	2,010	1,600	520	2,010	2,255
RCA225/97	2	5A	330	330	265	510	510	410	1,020	945	815
	4	5B	660	660	535	1,020	1,020	830	1,050	1,265	1,660
	5	5C	825	825	460	1,050	1,275	705	1,050	2,360	1,415
	8	5D	1,050	1,320	915	1,050	2,040	1,420	1,050	2,525	2,835
	10	5E	1,050	1,650	1,035	1,050	2,550	1,600	1,050	3,155	3,200
RCA227/54	4	7A	475	660	545	475	785	840	475	785	1,675
	4	7B	475	580	595	475	580	920	475	580	1,840
	7	7C	475	1,155	765	475	1,280	1,185	475	1,280	1,685
	8	7D	475	1,155	1,120	475	1,155	1,730	475	1,155	2,555
	14	7E	475	2,025	1,685	475	2,025	2,555	475	2,025	2,555
RCA227/68	4	7A	660	660	545	725	1,020	840	725	1,090	1,675
	4	7B	660	660	595	725	805	920	725	805	1,840
	7	7C	725	1,155	765	725	1,780	1,185	725	1,780	2,370
	8	7D	725	1,320	1,120	725	1,605	1,730	725	1,605	3,155
	14	7E	725	2,310	1,685	725	2,810	2,605	725	2,810	3,155
RCA227/97	4	7A	660	660	545	1,020	1,020	840	1,470	1,890	1,675
	4	7B	660	660	595	1,020	1,020	920	1,470	1,265	1,840
	7	7C	1,155	1,155	765	1,470	1,785	1,185	1,470	3,080	2,370
	8	7D	1,320	1,320	1,120	1,470	2,040	1,730	1,470	2,525	3,460
	14	7E	1,470	2,310	1,685	1,470	3,570	2,605	1,470	4,420	4,490
RCA229/54	4	9A	615	660	595	615	1,020	920	615	1,100	1,840
	4	9B	615	660	620	615	815	960	615	815	1,920
	9	9C	615	1,485	1,105	615	2,295	1,705	615	2,475	3,410
	8	9D	615	1,320	1,210	615	1,630	1,865	615	1,630	3,735
	18	9E	615	2,970	2,375	615	3,665	3,670	615	3,665	4,715
RCA229/68	4	9A	660	660	595	935	1,020	920	935	1,525	1,840
	4	9B	660	660	620	935	1,020	960	935	1,130	1,920
	9	9C	935	1,485	1,105	935	2,295	1,705	935	3,435	3,410
	8	9D	935	1,320	1,210	935	2,040	1,865	935	2,260	3,735
	18	9E	935	2,970	2,375	935	4,590	3,670	935	5,090	5,750
RCA229/97	4	9A	660	660	595	1,020	1,020	920	1,890	2,040	1,840
	4	9B	660	660	620	1,020	1,020	960	1,890	1,610	1,920
	9	9C	1,485	1,485	1,105	1,890	2,295	1,705	1,890	4,590	3,410
	8	9D	1,320	1,320	1,210	1,890	2,040	1,865	1,890	3,220	3,735
	18	9E	1,890	2,970	2,375	1,890	4,590	3,670	1,890	7,240	7,340

EA SIDE OF UNISTRUT

See footnotes on p. 106.

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3.2.5.2 MATERIAL SPECIFICATIONS

Fastener designation	Fastener material	Fastener plating[1]	Steel washer or clip plating[1,2]	Washer or clip plating[1,2]
X-P*	Carbon Steel	5 µm Zinc	N/A	N/A
X-U*	Carbon Steel	5 µm Zinc	Carbon Steel	5 µm Zinc
DS/EDS	Carbon Steel	5 µm Zinc	N/A	N/A
X-C	Carbon Steel	5 µm Zinc	Carbon Steel	5 µm Zinc
X-R, X-CR[3]	SAE 316	N/A	SAE 316	N/A
X-C/ X-P/ X-PN/ X-S: G2/G3/B3	Carbon Steel	2-10 µm Zinc	N/A	N/A
X-CT Forming Nail	Carbon Steel	5 µm Zinc	N/A	N/A
BC X-C	Carbon Steel	5 µm Zinc	Carbon Steel	5 µm Zinc

1 The 5 µm zinc coating is in accordance with ASTM B 633, SC 1, Type III. Refer to Section 2.3.3.1 for more information.

2 Most fasteners have a plastic washer for guidance when installing. Not all fastener lengths have a pre-mounted steel washer. Refer to Section 3.2.2.4 for more information on available fasteners.

3. The X-CR and X-R fastener material is a proprietary material, which provides a corrosion resistance equivalent to SAE 316 stainless steel. The steel washer material is SAE 316 stainless steel.

* More details about the innovative X-P and X-U fasteners can be found in Section 3.2.6.

3.2.5.3 TECHNICAL DATA

(2) HILTI X-U ANCHORS
EMBEDED 1" MIN EA SIDE
& END OF UNISTRUT

Allowable loads in normal weight concrete [1,2]

Fastener description	Fastener	Shank diameter in. (mm)	Minimum embedment in. (mm)	Concrete compressive strength 2000 psi Tension lb (kN)	2000 psi Shear lb (kN)	4000 psi Tension lb (kN)	4000 psi Shear lb (kN)	6000 psi Tension lb (kN)	6000 psi Shear lb (kN)	8000 psi Tension lb (kN)	8000 psi Shear lb (kN)
Premium Concrete Fastener	X-P	**0.157** (4.0)	**3/4** (19)	**100** (0.44)	**155** (0.69)	**100** (0.44)	**175** (0.78)	**105** (0.47)	**205** (0.91)	**135** (0.60)	**205** (0.91)
			1 (25)	**165** (0.73)	**220** (0.98)	**180** (0.80)	**225** (1.00)	**150** (0.67)	**300** (1.33)	**150** (0.67)	**215** (0.96)
			1-1/4 (32)	**240** (1.07)	**310** (1.38)	**280** (1.25)	**310** (1.38)	**180** (0.80)	**425** (1.89)	–	–
			1-1/2 (38)	**310** (1.38)	**420** (1.87)	–	–	–	–	–	–
Universal Knurled Shank Fasteners	X-U	**0.157** (4.0)	**3/4** (19)	**100** (0.44)	**125** (0.57)	**100** (0.44)	**125** (0.57)	**105** (0.47)	**205** (0.91)	–	–
			1 (25)	**165** (0.73)	**190** (0.85)	**170** (0.76)	**225** (1.00)	**110** (0.49)	**280** (1.25)	–	–
			1-1/4 (32)	**240** (1.07)	**310** (1.38)	**280** (1.25)	**310** (1.38)	**180** (0.80)	**425** (1.89)	–	–
			1-1/2 (38)	**275** (1.22)	**420** (1.87)	**325** (1.45)	**420** (1.87)	–	–	–	–
Standard Fastener	X-C (Black collated strip or guidance washer)	**0.138** (3.5)	**3/4** (19)	**45** (0.20)	**75** (0.33)	**65** (0.29)	**105** (0.47)	**95** (0.42)	**195** (0.87)	–	–
			1 (25)	**85** (0.38)	**150** (0.67)	**160** (0.71)	**200** (0.89)	**105** (0.47)	**270** (1.20)	–	–
			1-1/4 (32)	**130** (0.58)	**210** (0.93)	**270** (1.20)	**290** (1.29)	**165** (0.73)	**325** (1.45)	–	–
			1-1/2 (38)	**175** (0.78)	**260** (1.16)	**270** (1.20)	**360** (1.60)	–	–	–	–
Heavy Duty Fastener	DS	**0.177** (4.5)	**3/4** (19)	**50** (0.22)	**120** (0.53)	**125** (0.56)	**135** (0.60)	–	–	–	–
			1 (25)	**130** (0.58)	**195** (0.87)	**155** (0.69)	**240** (1.07)	–	–	–	–
			1-1/4 (32)	**220** (0.98)	**385** (1.71)	**270** (1.20)	**425** (1.89)	–	–	–	–
			1-1/2 (38)	**300** (1.33)	**405** (1.80)	**355** (1.58)	**450** (2.00)	–	–	–	–
Stainless Steel Fastener	X-CR	**0.145** (3.7)	**3/4** (19)	**30** (0.13)	**40** (0.18)	**65** (0.29)	**40** (0.18)	–	–	–	–
			1 (25)	**55** (0.24)	**185** (0.82)	**120** (0.53)	**190** (0.85)	**100** (0.44)	**170** (0.76)	–	–
			1-1/4 (32)	**110** (0.49)	**290** (1.29)	**125** (0.56)	**300** (1.33)	**120** (0.53)	**440** (1.96)	–	–
			1-1/2 (38)	**265** (1.18)	**405** (1.80)	**350** (1.56)	**450** (2.00)	–	–	–	–
Gas Fastener	X-C B3, X-C G3	**0.118** (3.0)	**3/4** (19)	**110** (0.5)	**190** (0.9)	**110** (0.5)	**190** (0.9)	**110** (0.5)	**190** (0.9)	–	–
Premium Gas Fastener	X-GHP, X-P 17 G2, X-P 20 G2, X-P G3, X-P B3	**0.118** (3.0)	**5/8** (16)	–	–	**50** (0.2)	**120** (0.5)	**50** (0.2)	**90** (0.4)	–	–
			3/4 (19)	**80** (0.4)	**120** (0.5)	–	–	–	–	–	–
Forming Fastener	X-CT 47[3]	**0.145** (3.7)	**1** (25)	**60** (0.27)	**65** (0.29)	–	–	–	–	–	–
	X-CT 62[3]	**0.145** (3.7)	**1** (25)	**75** (0.33)	**75** (0.33)	–	–	–	–	–	–

1 The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

2 Multiple fasteners are recommended for any attachment.

3 For temporary fastening of formwork only.

PRCTI20240333

Allowable loads in minimum ASTM A36 (F_y ≥ 36 ksi, F_u ≥ 58 ksi) steel[1,2,4,5]

Fastener description	Fastener	Shank diameter in. (mm)	Steel thickness (in.)											
			1/8		3/16		1/4		3/8		1/2		≥3/4	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
Universal knurled shank*	X-U[6]	0.157 (4.0)	–	–	535 (2.38)	720 (3.20)	775 (3.45)	720 (3.20)	935 (4.16)	720 (3.20)	900 (4.00)	720 (3.20)	350 (1.56)	375 (1.67)
Stepped-shank knurling-lengthwise	X-U 15[7]	0.145 (3.7)	–	–	155 [illegible]	395 [illegible]	230 [illegible]	395 [illegible]	420 [illegible]	450 (2.00)	365 (1.62)	500 (2.22)	365 (1.62)	400 (1.78)
Standard knurled shank	X-S13	0.145 (3.7)	140 (0.62)	300 (1.33)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	450 (2.00)	–	–	–	–
Drywall smooth shank w/metal top hat washer	X-S16	0.145 (3.7)	–	–	225 (1.00)	420 (1.87)	225 (1.00)	430 (1.91)	225 (1.00)	430 (1.91)	225 (1.00)	430 (1.91)	–	–
Heavy duty knurled shank	EDS[3]	0.177 (4.5)	–	–	305 (1.36)	615 (2.67)	625 (2.78)	870 (3.87)	715 (3.18)	870 (3.87)	890 (3.96)	960 (4.27)	400 (1.78)	655 (2.91)
Heavy duty smooth shank	DS	0.177 (4.5)	–	–	365 (1.62)	725 (3.22)	580 (2.58)	725 (3.22)	695 (3.09)	725 (3.22)	735 (3.27)	860 (3.83)	–	–
Stainless steel smooth shank	X-R[10]	0.145 (3.7)	–	–	460 (2.05)	460 (2.05)	615 (2.74)	500 (2.22)	–	–	–	–	–	–
	X-R[8,10]	0.145 (3.7)	300 (1.33)	190 (0.85)	615 (2.74)	495 (2.20)	760 (3.38)	500 (2.22)	220 (0.98)	325 (1.45)	225 (1.00)	335 (1.49)	–	–
Standard gas fastener for steel	X-EGN 14[9], X-S 14 B3	0.118 (3.0)	140 (0.6)	230 (1.0)	220 (1.0)	245 (1.1)	225 (1.0)	290 (1.3)	280 (1.2)	330 (1.5)	280 (1.2)	330 (1.5)	280 (1.2)	330 (1.5)
Standard gas fastener for steel	X-EGN 14[8,9] X-S 14 B38	0.118 (3.0)	–	–	220 (1.0)	295 (1.3)	260 (1.2)	355 (1.6)	280 (1.2)	385 (1.7)	280 (1.2)	385 (1.7)	280 (1.2)	385 (1.7)
Premium gas fastener	X-GHP, X-P G3, X-P B3	0.118 (3.0)	125 (0.6)	230 (1.0)	170 (0.8)	245 (1.1)	200 (0.9)	230 (1.0)	250 (1.1)	255 (1.1)	–	–	–	–

(2) HILTI X-U ANCHORS EA SIDE & END OF UNISTRUT

1 The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
2 Low-velocity fasteners shall be driven to where the point of the fastener penetrates through the steel base material in accordance with Section 3.2.2.3, except as noted in this table.
3 EDS fasteners installed into greater than 1/2" thick steel require 1/2" minimum penetration.
4 Multiple fasteners are recommended for any attachment.
5 Refer to guidelines for fastening to steel, Section 3.2.2, for application limits.
6 Tabulated allowable load values provided for 3/4" steel are based upon minimum point penetration of 1/2" into the steel. If 1/2" point penetration into the steel is not achieved, but a point penetration of at least 3/8" is obtained, the tabulated tension value should be reduced by 20 percent and the tabulated shear load should be reduced by 8 percent.
7 X-U 15 fasteners installed into greater than 3/8" thick steel require 15/32" minimum penetration into the steel.
8 Based on testing with F_y = 50 ksi base material.
9 Fasteners installed into 3/8" or thicker base steel require 0.320" minimum penetration depth into the steel.
10 Fasteners installed into 3/8" or thicker base require 0.38" minimum penetration depth into the steel.

Allowable tensile pullover and shear bearing load capacities for steel framing with power driven fasteners[1,2,3,4]

Fastener description	Fastener	Head dia. in. (mm)	Sheet steel thickness													
			14 ga.		16 ga.		18 ga.		20 ga.		22 ga.		24 ga.		25/26 ga.	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
0.157" shank with or w/o plastic washers or MX collation	X-U, X-P	0.322 (8.2)	825 (3.67)	1,085 (4.83)	685 (3.05)	720 (3.20)	490 (2.18)	525 (2.34)	360 (1.60)	445 (1.98)	300 (1.33)	330 (1.47)	205 (0.91)	255 (1.13)	120 (0.53)	145 (0.64)
0.145" shank with or w/o plastic washers or MX collation	X-C, X-R	0.322 (8.2)	–	985 (4.38)	685 (3.05)	720 (3.20)	490 (2.18)	515 (2.29)	360 (1.60)	440 (1.96)	300 (1.33)	310 (1.38)	205 (0.91)	235 (1.05)	120 (0.53)	145 (0.64)
0.177" shank without washer	DS, EDS	0.322 (8.2)	965 (4.29)	1,085 (4.83)	810 (3.60)	815 (3.63)	625 (2.78)	535 (2.38)	460 (2.05)	465 (2.07)	360 (1.60)	350 (1.56)	300 (1.33)	260 (1.16)	240 (1.07)	180 (0.80)
0.145" shank with plastic top hat washers	X-S13 THP X-S16 TH	0.322 (8.2)	–	985 (4.38)	685 (3.05)	720 (3.20)	490 (2.18)	515 (2.29)	360 (1.60)	440 (1.96)	300 (1.33)	310 (1.38)	205 (0.91)	235 (1.05)	120 (0.53)	145 (0.64)
0.118" shank with MX collation	X-EGN, X-GN, X-GHP	0.276 (6.8)	–	–	–	–	325 (1.45)	390 (1.73)	265 (1.18)	335 (1.49)	250 (1.11)	235 (1.05)	170 (0.76)	185 (0.82)	100 (0.44)	125 (0.56)

1 Allowable load values are based on a safety factor of 3.0.
2 Allowable pullover capacities of sheet steel should be compared to the allowable fastener tensile load capacities in concrete, steel, and masonry to determine controlling resistance load.
3 Allowable shear bearing capacities of sheet steel should be compared to allowable fastener shear capacities in concrete, steel and masonry to determine controlling resistance load.
4 Data is based on the following minimum sheet steel properties, F_y = 33 ksi, F_u = 45 ksi (ASTM A653 material).

* More details about the innovative X-U fastener can be found in Section 3.2.6.

BSE

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

Ceiling Design

Ceiling Weight, W

	PSF
• USG Donn Brand Framing	1
• (1) Layer 3/4" USG Mars ACT	1
• Finishes, MEP, Misc	1

→ $W_{MAX} \approx 3$ PSF

Seismic Force per ASCE

a_p = 1 R_p = 2.5

S_{DS} = 1.006 I_p = 1 z/h = 1

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

F_d = 0.483W (LRFD) → $E_{ASD} = 0.7F_d$ = 0.338W (ASD)

→ E_{MAX} = 1 PSF

BSE

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

ACT:
Grid System = USG Donn Brand Advancespan
Panel = USG 2ft x 4ft 3/4in Mars 88189CR

System Weight = 3.0 PSF
Total Ceiling Area per grid is <144sq ft so Seismic Provisions are not required.

Main Runner Spacing = 4' oc
Main Runner Distributed Loads wmax = 3.0 PSF x 4' = 12 PLF
Use Main Runner DXAS, Allowable Load = 12PLF ≥ wmax --> OK

Cross Runner Span = 4' max between main runners @ 2' oc
Use Cross Runner DXL424

Main Runner and Cross Runner Info Attached.

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

USG Ceiling Solutions

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WITH CLEAN ROOM, HIGH-NRC AND AIRCARE™ COATING OPTIONS

USG Mars™ Healthcare Acoustical Panels with ClimaPlus™ Performance/USG Donn® Brand DX®/DXL™ Acoustical Suspension System

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FEATURES AND BENEFITS

- Water-repellent membrane designed to be durable and safe with common disinfectants.**
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- Acoustics and cleanability exceed FGI guidelines for healthcare.
- Meets USDA/FSIS guidelines for use in food-processing areas.
- Achieves FDA standards for smoothness, durability and cleanability.
- Clean Room tested to ISO 5 (Class 100) (Items 86169CR, 88189CR, 86684CR, 88683CR).
- ClimaPlus™ 30-year limited system warranty against visible sag, mold and mildew.
- AirCare™ coating applied to face and back reduces 75% of formaldehyde over a 10-year period.[4]
- GREENGUARD Gold certified for low emitting performance.
- Balanced Acoustics. High-NRC and High-CAC provide excellent sound control that assist in addressing HIPAA standards.
- USG Mars™ Healthcare Acoustical Panels is part of the Ecoblueprint™ portfolio — meeting today's sustainability standards. For sustainability documentation go to USG.com or CGCInc.com.

APPLICATIONS

- Kitchen and food-prep areas
- Lavatories and restrooms
- Laboratories and Clean Rooms
- Nurses' stations/ waiting rooms
- Treatment/patient rooms

SUBSTRATE

- Wet-formed mineral fiber

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30 YEAR LIMITED SYSTEM WARRANTY
• No Visible Sag
• Mold/Mildew Protection

BA BALANCED ACOUSTICS

HRC HIGH RECYCLED CONTENT

AIR AIRCARE™

PB Plant-Based Binder

ECOBLUEPRINT

Declare.

UL Classified

Product	Edge	Panel Size	Fire Rating	Item No.	NRC	CAC Min.	LR[2]	Color	Grid Options	VOC Emissions	Anti-Mold & Mildew/Sag Resistance	Recycled Content[1]	Panel Cost
USG MARS™ HEALTHCARE HIGH-NRC PANELS 85/35 Plant-Based Binder[6]	SQ	**2'x2'x7/8"**	Class A	**86256**	0.85	35	0.90	White	A,B,C,D,E,F	Low		70%	**$$**
		2'x4'x7/8"	Class A	**88256**	0.85	35	0.90	White	A,B,D,E,F	Low		70%	**$$**
	SLT	**2'x2'x7/8"**	Class A	**86257**	0.85	35	0.90	White	G,H,I,J	Low		70%	**$$**
	FLB	**2'x2'x7/8"**	Class A	**86258**	0.85	35	0.90	White	K,L,M,N	Low		70%	**$$**
USG MARS™ HEALTHCARE HIGH-NRC/ HIGH-CAC PANELS 80/40 Plant-Based Binder[6]	SQ	**2'x2'x1"**	Class A	**86115**	0.80	40	0.90	White	A,B,C,D,E,F	Low		71%	**$$**
		2'x4'x1"	Class A	**88115**	0.80	40	0.90	White	A,B,D,E,F	Low		71%	**$$**
	SLT	**2'x2'x1"**	Class A	**86343**	0.80	40	0.90	White	G,H,I,J	Low		71%	**$$**
		2'x4'x1"	Class A	**88343**	0.80	40	0.90	White	G,H,I,J	Low		71%	**$$**
	FLB	**2'x2'x1"**	Class A	**86344**	0.80	40	0.90	White	K,L,M,N	Low		71%	**$$**
		2'x4'x1"	Class A	**88344**	0.80	40	0.90	White	K,L,M,N	Low		71%	**$$**
USG MARS™ HEALTHCARE HIGH-NRC PANELS 80/35 Plant-Based Binder[6]	SQ	**2'x2'x7/8"**	Class A	**86152**	0.80	35	0.90	White	A,B,C,D,E,F	Low		70%	**$$**
		2'x4'x7/8"	Class A	**86340**	0.80	35	0.90	White	A,B,D,E,F	Low		70%	**$$**
	SLT	**2'x2'x7/8"**	Class A	**86470**	0.80	35	0.90	White	G,H,I,J	Low		70%	**$$**
	FLB	**2'x2'x7/8"**	Class A	**86750**	0.80	35	0.90	White	K,L,M,N	Low		70%	**$$**
USG MARS™ HEALTHCARE PANELS 75/35	SQ	**2'x2'x3/4"**	Class A	**86169**	0.75	35	0.90	White	A,B,C,D,E,F	Low		69%	**$$**
		2'x4'x3/4"	Class A	**88189**	0.75	35	0.90	White	A,B,D,E,F	Low		69%	**$$**
	SLT	**2'x2'x3/4"**	Class A	**86684**	0.75	35	0.90	White	G,H,I,J	Low		69%	**$$**
		2'x4'x3/4"	Class A	**88683**	0.75	35	0.90	White	G,H,I,J	Low		69%	**$$**
	FLB	**2'x2'x3/4"**	Class A	**86984**	0.75	35	0.90	White	K,L,M,N	Low		69%	**$$**
		2'x4'x3/4"	Class A	**88983**	0.75	35	0.90	White	K,L,M,N	Low		69%	**$$**
USG MARS™ HEALTHCARE HIGH-CAC PANELS 60/40	SQ	**2'x2'x3/4"**	Class A	**86270**	0.60	40	0.90	White	A,B,C,D,E,F	Low		71%	**$$**
		2'x4'x3/4"	Class A	**88271**	0.60	40	0.90	White	A,B,D,E,F	Low		71%	**$$**
	SLT	**2'x2'x3/4"**	Class A	**86272**	0.60	40	0.90	White	G,H,I,J	Low		71%	**$$**
	FLB	**2'x2'x3/4"**	Class A	**86273**	0.60	40	0.90	White	K,L,M,N	Low		71%	**$$**
		2'x4'x3/4"	Class A	**88273**	0.60	40	0.90	White	K,L,M,N	Low		71%	**$$**

Low Emissions (VOC)
Third party (GREENGUARD Gold) certified for low-emitting performance, meets California Department of Public Health's (CDPH) Standard Method v1.2 - 2017 (CA Section 01350). 'Certificates of Compliance' for Low VOC Emissions are available on usg.com and at spot.ul.com.

ClimaPlus™ Warranty Performance[3]
Contains a broad-spectrum antimicrobial additive on the face and back of the panel that provides resistance against the growth of mold and mildew. Includes sag-resistance performance.

High Recycled Content
USG classifies High Recycled Content as greater than 50%. Total recycled content is based on product composition of postconsumer and preconsumer (postindustrial) recycled content per FTC guidelines.

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BA BALANCED ACOUSTICS

HRC HIGH RECYCLED CONTENT

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Product	Edge	Panel Size	Fire Rating	Item No.	NRC	CAC Min.	LR[2]	Color	Grid Options	VOC Emissions	Anti-Mold & Mildew/Sag Resistance	Recycled Content[1]	Panel Cost
USG MARS™ HEALTHCARE WITH AIRCARE™ COATING[4] 75/35	SQ	2'x2'x3/4"	Class A	86169AIR	0.75	35	0.90	White	A,B,C,D,E,F	Low	✓	69%	$$
		2'x4'x3/4"	Class A	88189AIR	0.75	35	0.90	White	A,B,D,E,F	Low	✓	69%	$$
	SLT	2'x2'x3/4"	Class A	86684AIR	0.75	35	0.90	White	G,H,I,J	Low	✓	69%	$$
		2'x4'x3/4"	Class A	88683AIR	0.75	35	0.90	White	G,H,I,J	Low	✓	69%	$$
	FLB	2'x2'x3/4"	Class A	86984AIR	0.75	35	0.90	White	K,L,M,N	Low	✓	69%	$$
		2'x4'x3/4"	Class A	88983AIR	0.75	35	0.90	White	K,L,M,N	Low	✓	69%	$$
USG MARS™ HEALTHCARE CLEAN ROOM PANELS 75/35	SQ	2'x2'x3/4"	Class A	86169CR	0.75	35	0.90	White	O	Low	✓	68%	$$
		2'x4'x3/4"	Class A	88189CR	0.75	35	0.90	White	O	Low	✓	68%	$$
	SLT	2'x2'x3/4"	Class A	86684CR	0.75	35	0.90	White	P	Low	✓	68%	$$
		2'x4'x3/4"	Class A	88683CR	0.75	35	0.90	White	P	Low	✓	68%	$$

Low Emissions (VOC)
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ClimaPlus™ Warranty Performance[3]
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HRC HIGH RECYCLED CONTENT

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GRID PROFILE OPTIONS

A
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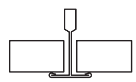

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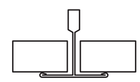
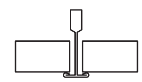


C[5]
USG Centricitee™ DXT™



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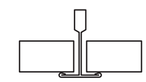

E
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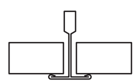

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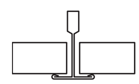
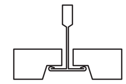


G
USG DX®



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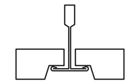
USG DXLA™



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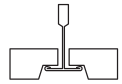
USG ZXLA™



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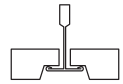

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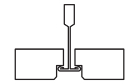

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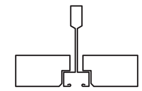
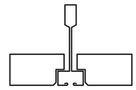
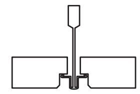


M
USG Fineline® 1/8 DXFF™



N
USG Identitee® DXI™



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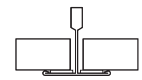
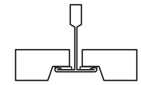
USG CE™



P
USG DXCE™



PHYSICAL DATA/ FOOTNOTES

Product literature
Data sheet: SC2585

ASTM E1264 classification
ASTM E1264-22 Type IV, Form 1 & 2, Pattern E & G
ASTM E1264-23 Type A, Form A2.1, Pattern E & G

ASTM E84 and CAN/ULC S102 surface-burning characteristics Class A
Flame spread: 25 or less
Smoke developed: 50 or less

Weight
1.03-1.24 lb./sq. ft.

Thermal resistance
R-2.2

Maximum backloading
See *USG 30-Year Limited System Warranty Commercial Applications* (SC2102).

Online tools
usgdesignstudio.com or cgcdesignstudio.com

ASTM D2486 scrubbability test
(standard test)

ASTM D4828 washability test
(modified test)

Water repellency
Cobb method (Tappi T441 om-84) Water Drop Test

WEIGHT FOR 88189CR IS THE LOWER END SINCE IT'S 3/4" THICK AS OPPOSED TO THE UPPER END BEING 7/8".

****Maintenance**
To clean panel, use a clean, white cloth with water or a mild detergent and wipe surface. To disinfect panel, lightly spray surface and wipe clean with a clean, white cloth. Acceptable colorless disinfectants include:
- Hydrogen peroxide
- Isopropyl alcohol
- Quaternary ammonium
- Sodium hypochlorite

Do not mix cleaners. Follow cleaner manufacturer's recommendations.

USG Mars™ Healthcare Clean Room
- Field-cut edges of USG Mars™ Healthcare Clean Room panels may be sealed with white latex paint. Use square edge panels for all lay-in field-cut perimeter panels.
- Clean Room-rated applications require a suspension system with gasketed tee flanges such as USG Donn® Brand CE™.
- Tested to ISO Class 5 particle emissions, per ISO 14644, by UL Environment. Rating may decrease to ISO Class 7 or greater with airflow above 1 ACH, pressure fluctuations, or vibrations in the ceiling system.
- For more information, please reference test report from UL Environment.

Metric sizes available
Contact sales for minimum quantities and lead times.

Footnotes
1. For details, see USG Sustainability tool at usgdesignstudio.com or cgcdesignstudio.com.
2. LR values are shown as averages.
3. Panel face and back surfaces treated with a proprietary broad-spectrum antimicrobial standard formulation that inhibits and retards the growth of mold and mildew. For details, see *USG 30-Year Limited System Warranty Commercial Applications* (SC2102).
4. AirCare™ coating removes formaldehyde by an average of 75% over 10 years at an average indoor concentration of 13 ppb.
5. Maximum 2'x2' with SQ edge panels.
6. All USG Mars™ High NRC Acoustical Panels with a "plant-based binder" label contain up to 65% plant-based material in the binder. For more information please refer to the USG Mars™ Acoustical Panels Health Product Declaration, available at www.usg.com

Notice
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SC2585/rev.10-23

Manufactured by
USG Interiors, LLC
550 West Adams Street
Chicago, IL 60661

Safety First! Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.

USG CGC

PRCTI20240333

USG Ceiling Solutions

USG DONN® BRAND ADVANCESPAN™

USG DONN® BRAND DXAS™ AND DXTAS™ PROFILES

USG Donn® Brand DXAS™ AdvanceSpan™ Main Tees/ USG Mars™ Square Edge Panels

FEATURES AND BENEFITS

- Spans up to 8′ with no hanger wires.
- Ideal for healthcare, hospitality and multifamily applications with crowded plenum spaces.
- Seismic installation designs validated in ICC-ES Evaluation Report ESR-5136.
- Approved by OSHPD/HCAi for seismic applications.
- USG Donn® Brand DX®-15/16″ and USG Donn® Brand Centricitee™ DXT™-9/16″ face profiles available.
- Reversible structural wall channel works with both USG DX® and DXT™ profiles.
- Compatible with all standard USG DX® and DXT™ cross tees.
- Available with End Splice detail to speed up installation.
- USG Donn® Brand AdvanceSpan™ Suspension System is part of the Ecoblueprint™ portfolio — meeting today's sustainability standards. For sustainability documentation go to USG.com or CGCInc.com.

APPLICATIONS

- Hospitals
- Multifamily dwellings
- Hotels
- Schools
- General interior use applications

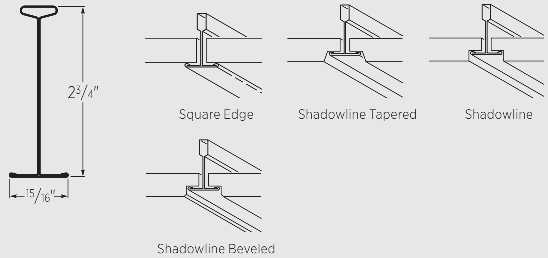
TO ORDER SAMPLES, GO TO USG.COM OR CGCINC.COM

STANDARD COLOR

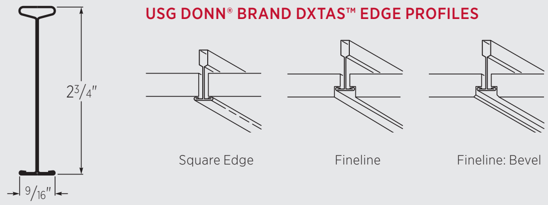
Flat White
050

PROFILE

USG DONN® BRAND DXAS™ EDGE PROFILES



USG DONN® BRAND DXTAS™ EDGE PROFILES



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IT'S YOUR WORLD. BUILD IT.™

PRCTI20240333

USG DONN® BRAND ADVANCESPAN™

USG DONN® BRAND DXAS™ AND DXTAS™ PROFILES

ORDER SAMPLES/LITERATURE
USG: usg.com or samplit@usg.com
CGC: contact Sales Representative

TECHNICAL SERVICES
800 USG.4YOU (874-4968)

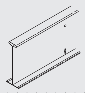
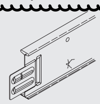
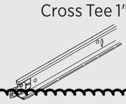
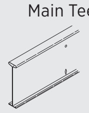
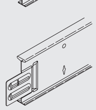
FOR MOST UP-TO-DATE TECHNICAL INFORMATION AND LEED REPORT TOOL
usgdesignstudio.com
cgcdesignstudio.com

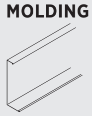
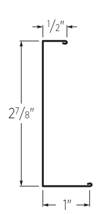
30 YEAR LIMITED SYSTEM WARRANTY
• No Visible Sag
• Mold/Mildew Protection

HRC HIGH RECYCLED CONTENT

ECOBLUEPRINT

Declare. Declare® Labels on select finishes, see usg.com for more details and documentation.

	Item No	Length	Height	Face Profile	Fire Rating	Recycled Content	Color	Max Unsupported Span at Rated Load: Intermediate Duty (12 lb./LF)	Heavy Duty (16 lb./LF)
15/16" TEE SYSTEM Main Tee 	**DXAS**	8'-6" 10'-6" 12'-6"	2-3/4"	15/16"	Class A	HRC	Flat White 050	8'-0"	7'-0"
	**DXAS-ES**	10'-0" 12'-0"	2-3/4"	15/16"	Class A	HRC	Flat White 050	8'-0"	7'-0"
Cross Tee 1" 	**DX216**	**2'** 600 mm	**1"** (25 mm)	15/16"	Class A		Flat White 050		
Cross Tee 1-1/2" 	**DXL424**	**4'** 1200 mm	**1-1/2"** (38 mm)	15/16"			Flat White 050		
	DXL424HRC			15/16"		HRC	Flat White 050		
	DX422			15/16"	Class A		Flat White 050		
	DX422HRC			15/16"	Class A	HRC	Flat White 050		
	DX426HD			15/16"	Class A		Flat White 050		
9/16" TEE SYSTEM Main Tee 	**DXTAS**	8'-6" 10'-6" 12'-6"	2-3/4"	9/16"	Class A	HRC	Flat White 050	8'-0"	7'-0"
	**DXTAS-ES**	10'-0" 12'-0"	2-3/4"	9/16"	Class A	HRC	Flat White 050	8'-0"	7'-0"
Cross Tee 1-1/2" 	**DXT222**	**2'** 600 mm	**1-1/2"** (38 mm)	9/16"	Class A		Flat White 050		
	DXT222HRC			9/16"	Class A	HRC	Flat White 050		
	DXLT222			9/16"			Flat White 050		
	DXT422	**4'** 1200 mm	**1-1/2"** (38 mm)	9/16"	Class A		Flat White 050		
	DXT424			9/16"	Class A		Flat White 050		
	DXT424HRC			9/16"	Class A	HRC	Flat White 050		
	DXLT424			9/16"			Flat White 050		
	DXT426			9/16"	Class A		Flat White 050		

MOLDING	Channel	Length	Height	Face Profile	Item No	Recycled Content	Color
		**10'**	**2-7/8"**	Reversible for 15/16" or 9/16"	**US44HRC**	HRC	Flat White 050

*Tested in accordance with ASTM C635 modified.

Low Emissions (VOC) CDPH 01350 v1.2-2017 compliance on select finishes, see usg.com for more details and documentation.

High Recycled Content USG classifies High Recycled Content as greater than 50%. Total recycled content is based on product composition of postconsumer and preconsumer (postindustrial) recycled content per FTC guidelines.

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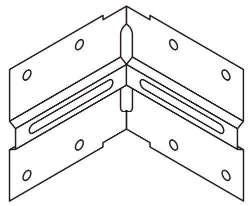
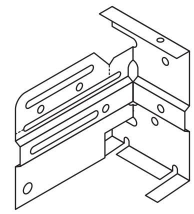
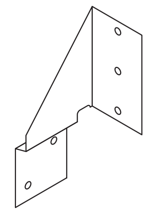
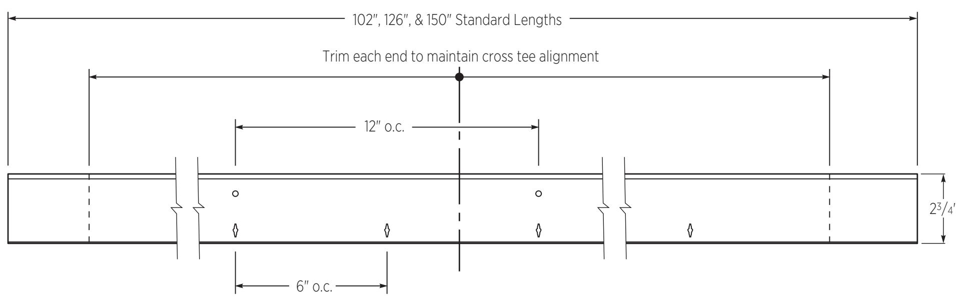
ACCESSORIES

ASMTSP Splice Plate	US44CC Channel Clip	ASCBC Cross Brace Clip
		

USG DONN® BRAND ADVANCESPAN™ MAIN TEE DETAILS



PHYSICAL DATA/ FOOTNOTES

Product literature and samples
Data sheet: AC3324
Installation guide: AC3325
USG DXAS™ sample: 259499
USG DXTAS™ sample: 259500

Material
Min. G30 hot-dipped galvanized steel body and cap. Baked-on polyester paint.

Online tools
usgdesignstudio.com or cgcdesignstudio.com

Compliance
Third-party tested by Progressive Engineering Inc. in accordance with ASTM C635 (modified). Full-scale seismic testing conducted by University of California, Berkeley, Pacific Earthquake Engineering Research Center. Local building codes may vary; check with code official for compliance prior to installing.

Limitations
Interior applications only.

Seismic Compliance
AdvanceSpan™ is OSHPD/HCAi pre-approved per OPM-0462.

ICC Evaluation Service, LLC Report Compliance
For areas under ICC jurisdiction, see ICC-ES Evaluation Report ESR-5136 for allowable values and conditions of use. Reports are subject to reexamination, revision and possible cancellation. Refer to usg.com for most current version.

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AC3324/rev. 10-23

Manufactured by
USG Interiors, LLC
550 West Adams Street
Chicago, IL 60661

Safety First! Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.

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