

BOB D. CAMPBELL & CO.

Structural Engineers Since 1957

4338 Belleview Ave. 816.531.4144

Kansas City, MO 64111 www.bdc-engrs.com

STRUCTURAL CALCULATIONS

FOR

DOUGLAS STATION APARTMENTS

NW SLOAN & NE SYCAMORE ST
LEE'S SUMMIT, MO 64086

PREPARED BY

BRANDON M. FORD, P.E.

OF

BOB D. CAMPBELL & COMPANY, INC.
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FOR

NSPJ ARCHITECTS
3515 W. 75 TH STREET, SUITE 201
PRAIRIE VILLAGE, KANSAS 66208
Ph.# (913) 831-1415

AUGUST 30, 2024



Building Codes and Amendments

NOTICE: the City of Lee's Summit adopted the following 2018 Codes, which go into effect on April 1, 2019. All projects received after this date will be subject to the applicable 2018 Codes.

On January 8, 2019, the Lee's Summit City Council adopted new building code regulations ([Ordinance #8536](#)) and a new fire code ([Ordinance #8537](#)). These ordinances adopt provisions from the following nationally published construction codes:

- 2018 International Building Code
- 2018 International Plumbing Code
- 2018 International Mechanical Code
- 2018 International Fuel Gas Code
- 2018 International Residential Code
- 2018 International Fire Code
- 2017 National Electrical Code
- ICC/ANSI A117.1-2009, Accessible and Usable Buildings and Facilities

These codes can be purchased on-line at the [ICC Store](#), or by calling the International Code Council Store at 1.800.786.4452.

Contact the Development Services Department for any questions related to the building related regulations at 816.969.1200 or the Fire Department at 816.969.1300 with any International Fire Code questions.

Structural Design Criteria

Building Code:

International Building Code (IBC 2018)

1605.2.1 Basic load combinations (Strength Design)

1.4D
1.2D + 1.6L
1.2D + 1.6L + 0.5(Lr or S or R)
1.2D + 1.0(W or E) + L + 0.5(Lr or S or R)
0.9D + W
0.9D + E

1605.3.1 Basic load combinations (Allowable Stress Design)

D
D + L
D + 0.75L + 0.75(Lr or S or R)
D + 0.75(0.6W or 0.7E) + 0.75L + 0.75(Lr or S or R)
0.6D + 0.6W
0.6D + 0.7E

Structural Design Loads

Roof:

Self weight	5 psf	D
Roofing & insulation	7 psf	D
Suspended mech & elec	5 psf	D
Ceilings	3 psf	D
	20 psf	D
Ground Snow Load	20 psf	S
Flat Roof Snow	20 psf	S
Rain on Snow	0.00 psf	R
	20 psf	
Roof Live Load	20 psf	L

Floor:

Floor/Ceiling Dead Load	20 psf	D
Partition	15 psf	D
Floor Live Load	40 psf	L

Wall:

Wood	10 psf	D
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Materials

Steel:	Beams & Columns:	ASTM A992, Grade 50
	Miscellaneous steel:	ASTM A36
	Tubes & Pipes:	ASTM A500, Grade B
Wood:	DF No. 2 Grade	Fb = 900 psi E = 1,600,000 psi
Concrete:	3500 psi (footings, grade beams, interior slab)	
	3500 psi (Structural Slabs)	
	4500 psi w/ 6% +/- 1% air entrainment (exterior flatwork)	
Reinf. Steel:	ASTM A615 or A706 Grade 60 steel	

ASCE Hazards Report

Address:

NW Sloan St & NE Sycamore St
Lees Summit, Missouri
64086

Standard:

ASCE/SEI 7-16

Risk Category: II**Soil Class:**

D - Stiff Soil

Latitude:

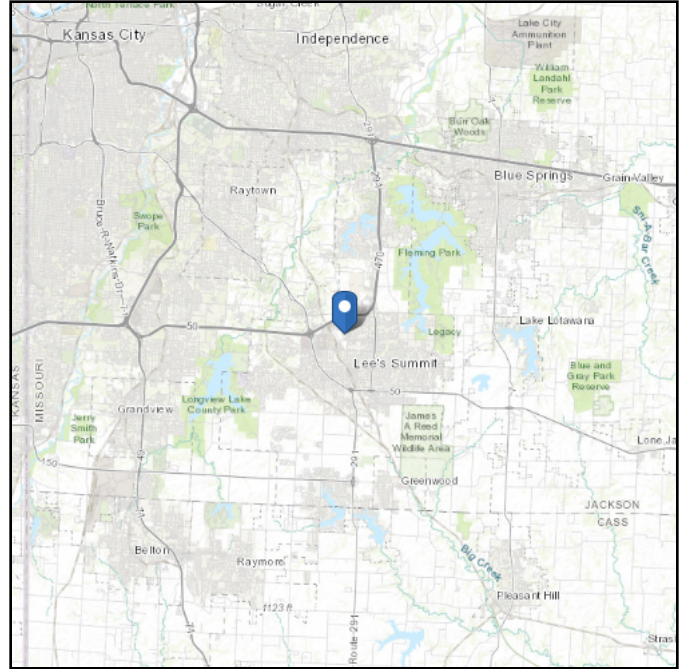
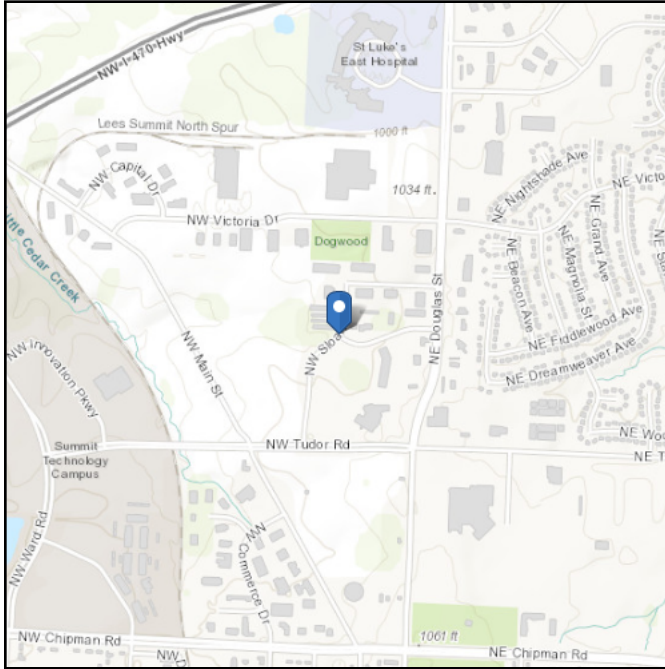
38.933797

Longitude:

-94.382192

Elevation:

982.654332645725 ft (NAVD 88)



Wind

Results:

Wind Speed	109 Vmph
10-year MRI	76 Vmph
25-year MRI	83 Vmph
50-year MRI	88 Vmph
100-year MRI	94 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:

Tue Sep 03 2024

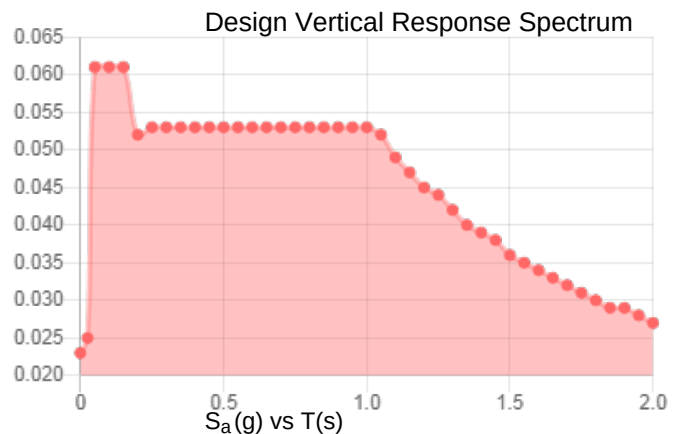
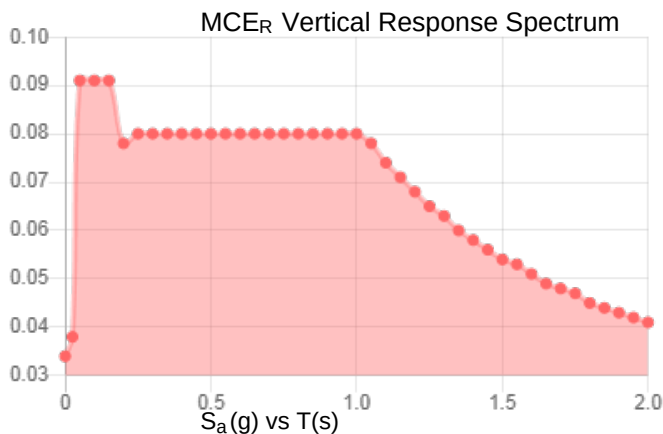
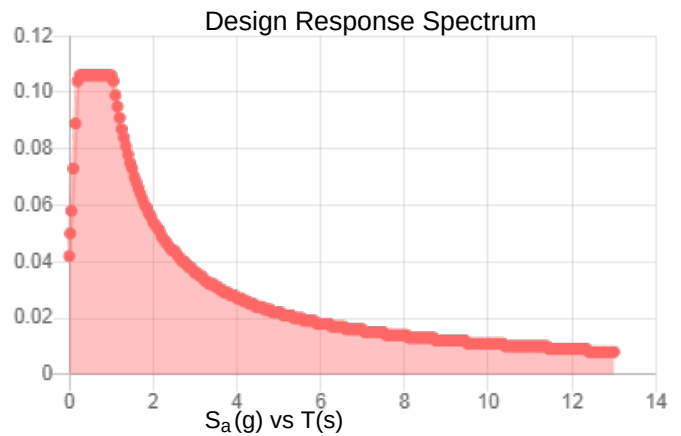
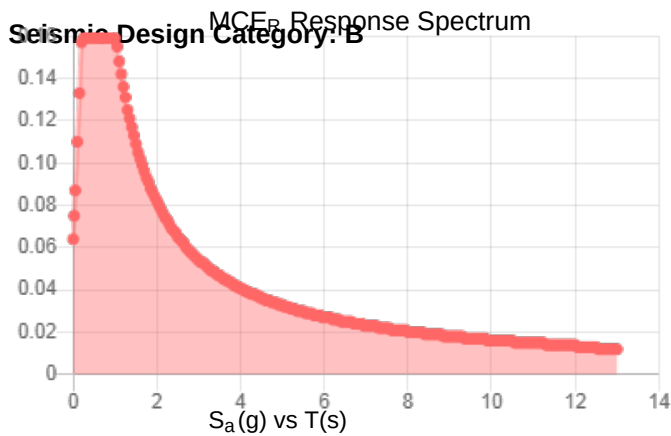
Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance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

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

Site Soil Class: D - Stiff Soil

Results:

S_S :	0.099	S_{D1} :	0.109
S_1 :	0.068	T_L :	12
F_a :	1.6	PGA :	0.047
F_v :	2.4	PGA _M :	0.075
S_{MS} :	0.159	F_{PGA} :	1.6
S_{M1} :	0.163	I_e :	1
S_{DS} :	0.106	C_v :	0.7



Data Accessed: Tue Sep 03 2024

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

Results:

Ground Snow Load, p_g : 20 lb/ft²

Mapped Elevation: 982.7 ft

Data Source: ASCE/SEI 7-16, Table 7.2-8

Date Accessed: Tue Sep 03 2024

Values provided are ground snow loads. In areas designated "case study required," extreme local variations in ground snow loads preclude mapping at this scale. Site-specific case studies are required to establish ground snow loads at elevations not covered.

Snow load values are mapped to a 0.5 mile resolution. This resolution can create a mismatch between the mapped elevation and the site-specific elevation in topographically complex areas. Engineers should consult the local authority having jurisdiction in locations where the reported 'elevation' and 'mapped elevation' differ significantly from each other.

Rain

Results:

15-minute Precipitation Intensity: 7.49 in./h

60-minute Precipitation Intensity: 3.52 in./h

Data Source: NOAA National Weather Service, Precipitation Frequency Data Server, Atlas 14
(<https://www.nws.noaa.gov/oh/hdsc/>)

Date Accessed: Tue Sep 03 2024

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

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Snow Loads

ASCE 7-16

Ground snow load, P_g	20.00 psf
Exposure factor, C_e	1.0
Terrain Category	B
Thermal Factor, C_t	1.0
Importance Factor, I_s	1.0
Flat roof snow load, $P_f = 0.7C_eC_tI_sP_g$	14.00 psf
Slope Factor, C_s	1.0
Roof slope	0.25 in. Per Foot
Flat Roof Snow Minimum, $P_f = I_sP_g$	20.00 psf
Sloped roof snow load, P_s	20.00 psf
Balanced roof snow load (P_f or P_s)	20.00 psf
Rain on snow surcharge (if slope is less than 1/4" per foot)	0.00 psf
Total balanced load on roof	20.00 psf

Snow Drift

superimposed on balanced snow load

Length of roof upwind of parapet (25 ft minimum)

Leeward Drift

Drift height, h_d

Drift width, w_d

Maximum intensity of drift surcharge, P_d

25 ft	50 ft	100 ft	200 ft	400 ft
1.4 ft	2.2 ft	3.2 ft	4.4 ft	5.9 ft
5.8 ft	8.8 ft	12.7 ft	17.5 ft	23.7 ft
23.95 psf	36.64 psf	52.64 psf	72.79 psf	98.19 psf

Windward Drift

Drift height for parapet wall = $0.75h_d$

Drift width, w_d

Maximum intensity of drift surcharge, P_d

1.1 ft	1.7 ft	2.4 ft	3.3 ft	4.4 ft
4.3 ft	6.6 ft	9.5 ft	13.2 ft	17.7 ft
17.96 psf	27.48 psf	39.48 psf	54.60 psf	73.64 psf

MFWRs Wind Pressures (Per 10' Building Length)

Kzt= 1.0
 Kd= 0.85
 V= 110 mph
 I= 1.00
 Exposure C
 Roof Ht. 36
 Leeward Kh= 1.02
 G= 0.85
 Windward Cp= 0.8
 Leeward Cp= -0.5
 Side Wall Cp= -0.7
 qh= 26.8

Roof Slope= 23°
 Building h/L (Length)= 0.51
 Building h/L (Width)= 0.24
 Windward Roof Truss= 0.3
 Leeward Roof Truss= -0.6
 Roof Pres. on Vert. Projection = 9.4

Height (ft.)	Kz	qz (psf)	Windward Pressure (psf)	Leeward Pressure (psf)	Total Pressure (psf)
15	0.85	22.4	15.2	-11.4	26.6
20	0.9	23.7	16.1	-11.4	27.5
25	0.94	24.7	16.8	-11.4	28.2
30	0.98	25.8	17.5	-11.4	28.9
40	1.04	27.4	18.6	-11.4	30.0
50	1.09	28.7	19.5	-11.4	30.9
60	1.13	29.8	20.2	-11.4	31.6
70	1.17	30.8	20.9	-11.4	32.3
80	1.21	31.9	21.7	-11.4	33.0
90	1.24	32.6	22.2	-11.4	33.6
100	1.26	33.2	22.6	-11.4	33.9
120	1.31	34.5	23.5	-11.4	34.8
140	1.36	35.8	24.3	-11.4	35.7
160	1.39	36.6	24.9	-11.4	36.3

Side Wall Pressure (psf)
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9

Wind Load Per Floor

Floor	Elev.	TTL P.	Bldg Length	Load to FLR	Total Load	Bldg Width	Load to FLR	Total Load
T/ Trusses	41	9.4	10	0.89 k	0.89 k	70	6.26 k	6.26 k
Roof	31.5	29.1	10	1.53 k	2.42 k	70	10.69 k	16.94 k
3rd	21	27.6	10	2.90 k	5.32 k	70	20.31 k	37.25 k
2nd	10.5	26.6	10	2.79 k	8.11 k	70	19.54 k	56.79 k
1st	0	26.6						

Comp. and Clad. Wind Pressures

Roof Ht. $h \leq 60\text{ft.}$ w/ Gable/Hip Roof

Kzt=	1.0	Leeward Kh=	1.02	Building Dimensions	
Kd=	0.85	G=	0.85	Length	200 ft
V=	110.0 mph	qh=	16.1	Width	70 ft
ASD Factor=	0.60	GCpi +/-=	0.18	a	7.0 ft
Exposure	C	Roof θ	23.00		
Roof Ht.	36.0	(Reduce Wall Pressures by 10% if $\theta < 10^\circ$)			

Controlling Negative Wind Pressures (psf)

Ae (ft ²)	Roofs			Walls	
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
10	-17.33	-30.17	-44.62	-20.54	-25.36
20	-16.85	-27.77	-41.41	-19.74	-23.75
50	-16.21	-24.56	-38.20	-18.94	-21.35
100	-15.73	-22.15	-34.99	-18.14	-19.74
200	-15.73	-22.15	-34.99	-17.33	-18.14
500	-15.73	-22.15	-34.99	-15.73	-15.73
1000	-15.73	-22.15	-34.99	-15.73	-15.73

Earthquake Loads

ASCE 7-16

Ss	9.9 %g
S1	6.8 %g
Site Class (per soil report or assume D)	D
Site Coefficient, Fa	1.60
Site Coefficient, Fv	2.40
Occupancy Category	II
Importance Factor, Ie	1.00

1615.1.2 Site coefficients and adjusted maximum considered earthquake response acceleration parameters

for short periods, $S_{ms} = F_a \cdot S_s$	0.158
at 1-second period, $S_{m1} = F_v \cdot S_1$	0.1632

1615.1.3 Design spectral response acceleration parameters

$S_{ds} = (2/3) \cdot S_{ms}$	0.106
$S_{d1} = (2/3) \cdot S_{m1}$	0.109

Seismic Design Category	B
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Equivalent Lateral Force Procedure

Response Modification Factor, R	2.0
$C_s = S_{ds} / (R/I)$	0.053
$C_s, \min$	0.010
Building Height, $h_n =$	36 ft
$C_t =$	0.02
$x =$	0.75
Approximate Fundamental Period, T_a	0.294
$C_s, \max = S_{d1} / (T_a \cdot R/I)$	0.185
Cs Controlling	0.053

Values of Approximate Perior Parameters Ct and x

Structure Type	Ct	x
Moment resisting frame systems in which the frames resist 100% of the required seismic force and are not enclosed or adjoined by components that are more rigid and will prevent the frames from deflecting where subjected to seismic forces:		
Steel moment-resisting frames	0.028	0.8
Concrete moment-resisting frames	0.016	0.9
Steel eccentrically braced frames in accordance with Table 12.2-1 lines B1 or D1	0.03	0.75
Steel buckling-restrained braced frames	0.03	0.75
All other structural systems	0.02	0.75

GRAVITY DESIGN

Power Beam® Design Properties

Allowable Design Stresses (psi)

	Flexural Stress** F_b	Tension Parallel to Grain F_t	Compression Perpendicular to Grain $F_{c\perp}$	Horizontal Shear F_v	Modulus of Elasticity E
3-1/2" & 5-1/2"	3000	1350	805	300	2,100,000
7"	2800	1300	805	300	2,100,000

Power Beam® Section Properties and Allowable Capacities

3-1/2" BEAM WIDTH

Depth (in)	7 1/4	9 1/4	9 1/2	11 1/4	11 7/8	14	16	18
Weight* (lbs/ft)	6.9	8.8	9.0	10.7	11.3	13.3	15.2	17.1
C_{db} Factor ($L=21'$)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.999
I (in ⁴)	111	231	250	415	489	800	1195	1701
Moment Capacity (lbs-ft)	7665	12478	13161	18457	20582	28583	37333	47193
Shear Capacity (lbs)	5075	6475	6650	7875	8316	9800	11200	12600

5-1/2" BEAM WIDTH

Depth (in)	7 1/4	9 1/4	9 1/2	11 1/4	11 7/8	14	16	18
Weight* (lbs/ft)	10.8	13.8	14.2	16.8	17.7	20.9	23.8	26.8
C_{db} Factor ($L=21'$)	1.00	1.00	1.00	0.997	0.989	0.989	0.982	0.976
I (in ⁴)	175	363	393	653	768	1258	1877	2673
Moment Capacity (lbs-ft)	12046	19608	20682	28916	32246	44415	57625	72503
Shear Capacity (lbs)	7975	10175	10450	12375	13068	15400	17600	19800

7" BEAM WIDTH

Depth (in)	7 1/4	9 1/4	9 1/2	11 1/4	11 7/8	14	16	18
Weight* (lbs/ft)	13.7	17.5	18.0	21.3	22.5	26.5	30.3	34.1
C_{db} Factor ($L=21'$)	1.00	0.997	0.996	0.988	0.985	0.977	0.970	0.965
I (in ⁴)	222	462	500	831	978	1601	2389	3402
Moment Capacity (lbs-ft)	14309	23232	24472	34030	37845	52127	67631	85093
Shear Capacity (lbs)	10150	12950	13300	15750	16632	19600	22400	25200

7" BEAM WIDTH

Depth (in)	19 1/4	20 5/8	22	23 3/8	24 3/4	26 1/8	27 1/2	28 7/8
Weight* (lbs/ft)	36.5	39.1	41.7	44.3	46.9	49.5	52.1	54.7
C_{db} Factor ($L=21'$)	0.962	0.958	0.955	0.952	0.950	0.947	0.945	0.942
I (in ⁴)	4161	5118	6211	7450	8844	10401	12132	14044
Moment Capacity (lbs-ft)	96996	110964	125845	141637	158338	175943	194451	213860
Shear Capacity (lbs)	26950	28875	30800	32725	34650	36575	38500	40425

* Beam Weights are based on 40 pcf.

** Flexural Stress, F_b , shall be modified by Volume Factor, C_v , as outlined in ICC ESR-1940, APA Product Report-L263 and APA-EWS Y 117 where;

$$C_v = K_L \times [(21/L)^{0.05} \times (12/d)^{0.05} \times (5.125/b)^{0.05}] \leq 1.0$$

where:

K_L = loading coefficient (1.0 for uniformly distributed)

L = length of bending member between points of zero moment, ft.

d = depth of bending member, in.

b = width of bending member, in.

Tabulated Moment Capacities are based on a span of 21 feet and modified for other spans. Width and depth portions of Volume Factor, C_v , are incorporated in tabulated Moment Capacities using C_{db} Factor.

Note: Allowable design properties and load capacities are based on a load duration of 100 percent and dry use conditions.

DESIGN PROPERTIES

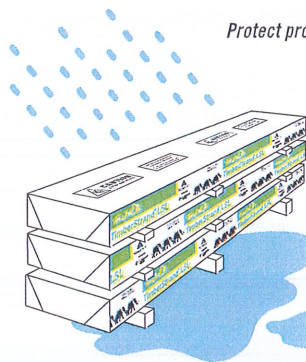
Allowable Design Properties⁽¹⁾ (100% Load Duration)

Grade	Width	Design Property	Depth												
			4⅜"	5½"	5½" Plank Orientation	7¼"	8⅝"	9¼"	9½"	11¼"	11⅞"	14"	16"	18"	20"
TimberStrand® LSL															
1.3E	3½"	Moment (ft-lbs)	1,735	2,685	1,780	4,550	6,335	7,240		10,520					
		Shear (lbs)	4,340	5,455	1,925	7,190	8,555	9,175		11,155					
		Moment of Inertia (in.⁴)	24	49	20	111	187	231		415					
		Weight (plf)	4.5	5.6	5.6	7.4	8.8	9.4		11.5					
1.55E	1¾"	Moment (ft-lbs)						4,950	5,210	7,195	7,975	10,920	14,090		
		Shear (lbs)						3,345	3,435	4,070	4,295	5,065	5,785		
		Moment of Inertia (in.⁴)						115	125	208	244	400	597		
		Weight (plf)						5.1	5.2	6.2	6.5	7.7	8.8		
	3½"	Moment (ft-lbs)						9,905	10,420	14,390	15,955	21,840	28,180		
		Shear (lbs)						6,690	6,870	8,140	8,590	10,125	11,575		
		Moment of Inertia (in.⁴)						231	250	415	488	800	1,195		
		Weight (plf)						10.1	10.4	12.3	13	15.3	17.5		
Microllam® LVL															
2.0E	1¾"	Moment (ft-lbs)		2,125		3,555		5,600	5,885	8,070	8,925	12,130	15,555	19,375	23,580
		Shear (lbs)		1,830		2,410		3,075	3,160	3,740	3,950	4,655	5,320	5,985	6,650
		Moment of Inertia (in.⁴)		24		56		115	125	208	244	400	597	851	1,167
		Weight (plf)		2.8		3.7		4.7	4.8	5.7	6.1	7.1	8.2	9.2	10.2
Parallam® PSL															
2.0E	3½"	Moment (ft-lbs)						12,415	13,055	17,970	19,900	27,160	34,955	43,665	
		Shear (lbs)						6,260	6,430	7,615	8,035	9,475	10,825	12,180	
		Moment of Inertia (in.⁴)						231	250	415	488	800	1,195	1,701	
		Weight (plf)						10.1	10.4	12.3	13.0	15.3	17.5	19.7	
	5¼"	Moment (ft-lbs)						18,625	19,585	26,955	29,855	40,740	52,430	65,495	
		Shear (lbs)						9,390	9,645	11,420	12,055	14,210	16,240	18,270	
		Moment of Inertia (in.⁴)						346	375	623	733	1,201	1,792	2,552	
		Weight (plf)						15.2	15.6	18.5	19.5	23.0	26.3	29.5	
	7"	Moment (ft-lbs)						24,830	26,115	35,940	39,805	54,325	69,905	87,325	
		Shear (lbs)						12,520	12,855	15,225	16,070	18,945	21,655	24,360	
		Moment of Inertia (in.⁴)						462	500	831	977	1,601	2,389	3,402	
		Weight (plf)						20.2	20.8	24.6	26.0	30.6	35.0	39.4	

(1) For product in beam orientation, unless otherwise noted.

Some sizes may not be available in your region.

PRODUCT STORAGE



Protect product from sun and water

CAUTION:
Wrap is slippery when wet or icy

Align stickers (2x3 or larger)
directly over support blocks

Use support blocks (6x6 or larger)
at 10' on-center to keep bundles
out of mud and water

DESIGN PROPERTIES

Design Stresses⁽¹⁾ (100% Load Duration)

Grade	Orientation	G Shear Modulus of Elasticity (psi)	E Modulus of Elasticity (psi)	E _{min} Adjusted Modulus of Elasticity ⁽²⁾ (psi)	F _b Flexural Stress ⁽³⁾ (psi)	F _t Tension Stress ⁽⁴⁾ (psi)	F _{cL} Compression Perpendicular to Grain ⁽⁵⁾ (psi)	F _{cH} Compression Parallel to Grain (psi)	F _v Horizontal Shear Parallel to Grain (psi)	SG Equivalent Specific Gravity ⁽⁶⁾
TimberStrand® LSL										
1.3E	Beam/Column	81,250	1.3 x 10 ⁶	660,750	1,700	1,075	710	1,835	425	0.50 ⁽⁷⁾
	Plank	81,250	1.3 x 10 ⁶	660,750	1,900 ⁽⁸⁾	1,075	635 ⁽⁹⁾	1,835	150	0.50 ⁽⁷⁾
1.55E	Beam	96,875	1.55 x 10 ⁶	787,815	2,325	1,070 ⁽¹⁰⁾	900	2,170	310 ⁽¹⁰⁾	0.50 ⁽⁷⁾
MicroIam® LVL										
2.0E	Beam	125,000	2.0 x 10 ⁶	1,016,535	2,600	1,555	750	2,510	285	0.50
Parallam® PSL										
1.8E	Column	112,500	1.8 x 10 ⁶	914,880	2,400 ⁽¹¹⁾	1,755	425 ⁽¹¹⁾	2,500	190 ⁽¹¹⁾	0.50
2.0E	Beam	125,000	2.0 x 10 ⁶	1,016,535	2,900	2,025	750	2,900 ⁽¹²⁾	290	0.50

(1) Unless otherwise noted, adjustment to the design stresses for duration of load are permitted in accordance with the applicable code.

(2) Reference modulus of elasticity for beam and column stability calculations, per NDS®.

(3) For 12" depth. For other depths, multiply F_b by the appropriate factor as follows:

– For TimberStrand® LSL, multiply by $\left[\frac{12}{d}\right]^{0.092}$

– For MicroIam® LVL, multiply by $\left[\frac{12}{d}\right]^{0.136}$

– For Parallam® PSL, multiply by $\left[\frac{12}{d}\right]^{0.111}$

(4) F_t has been adjusted to reflect the volume effects for most standard applications.

(5) F_{cL} may not be increased for duration of load.

(6) For lateral connection design only.

(7) Specific gravity of 0.58 may be used for bolts installed perpendicular to face and loaded perpendicular to grain.

(8) Values are for thickness up to 3½".

(9) For members less than 1¾" thick and in plank orientation, use F_{cL} of 670 psi. NDS® bearing area factor C_b = 1.0.

(10) Value accounts for large hole capabilities. See Allowable Holes on page 36.

(11) Value shown is for plank orientation.

(12) For column applications, use F_{cH} of 500 psi.

General Assumptions for Trus Joist® Beams

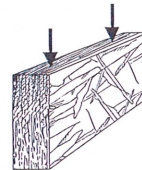
- Lateral support is required at bearing and along the span at 24" on-center, maximum.
- Bearing lengths are based on each product's bearing stress for applicable grade and orientation.
- All members 7¼" and less in depth are restricted to a maximum deflection of ¼".
- Beams that are 1¾" x 16" and deeper require multiple plies.
- No camber.
- Beams and columns must remain straight to within 5L/4608 (in.) of true alignment. L is the unrestrained length of the member in feet.
- Tables on pages 8–15 include load reductions applied in accordance with code.

For applications not covered in this brochure, contact your Weyerhaeuser representative.

See pages 38 and 39 for multiple-member beam connections.

TimberStrand® LSL, MicroIam® LVL, and untreated Parallam® PSL are intended for dry-use applications

Beam Orientation



Column Orientation



Plank Orientation

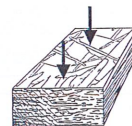


Table 4A Reference Design Values for Visually Graded Dimension Lumber (2" - 4" thick)^{1,2,3}

(All species except Southern Pine—see Table 4B) (Tabulated design values are for normal load duration and dry service conditions. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

USE WITH TABLE 4A ADJUSTMENT FACTORS

Species and commercial grade	Size classification	Design values in pounds per square inch (psi)							Specific Gravity ⁴	Grading Rules Agency
		Bending F _b	Tension parallel to grain F _t	Shear parallel to grain F _v	Compression perpendicular to grain F _{c⊥}	Compression parallel to grain F _c	Modulus of Elasticity			
							E	E _{min}		
BEECH-BIRCH-HICKORY										
Select Structural	2" & wider	1,450	850	195	715	1,200	1,700,000	620,000	0.71	NELMA
No. 1		1,050	600	195	715	950	1,600,000	580,000		
No. 2		1,000	600	195	715	750	1,500,000	550,000		
No. 3		575	350	195	715	425	1,300,000	470,000		
Stud	2" & wider	775	450	195	715	475	1,300,000	470,000		
Construction	2" - 4" wide	1,150	675	195	715	1,000	1,400,000	510,000		
Standard		650	375	195	715	775	1,300,000	470,000		
Utility		300	175	195	715	500	1,200,000	440,000		
COAST SITKA SPRUCE										
Select Structural	2" & wider	1300	950	125	455	1200	1,700,000	620,000	0.43	NLGA
No. 1/ No. 2		925	550	125	455	1100	1,500,000	550,000		
No. 3		525	325	125	455	625	1,400,000	510,000		
Stud		2" & wider	725	450	125	455	675	1,400,000		
Construction	2" - 4" wide	1050	650	125	455	1300	1,400,000	510,000		
Standard		600	350	125	455	1100	1,300,000	470,000		
Utility		275	175	125	455	725	1,200,000	440,000		
COTTONWOOD										
Select Structural	2" & wider	875	525	125	320	775	1,200,000	440,000	0.41	NSLB
No. 1		625	375	125	320	625	1,200,000	440,000		
No. 2		625	350	125	320	475	1,100,000	400,000		
No. 3		350	200	125	320	275	1,000,000	370,000		
Stud	2" & wider	475	275	125	320	300	1,000,000	370,000		
Construction	2" - 4" wide	700	400	125	320	650	1,000,000	370,000		
Standard		400	225	125	320	500	900,000	330,000		
Utility		175	100	125	320	325	900,000	330,000		
DOUGLAS FIR-LARCH										
Select Structural	2" & wider	1,500	1,000	180	625	1,700	1,900,000	690,000	0.50	WCLIB WWPA
No. 1 & Btr		1,200	800	180	625	1,550	1,800,000	660,000		
No. 1		1,000	675	180	625	1,500	1,700,000	620,000		
No. 2		900	575	180	625	1,350	1,600,000	580,000		
No. 3	525	325	180	625	775	1,400,000	510,000			
Stud	2" & wider	700	450	180	625	850	1,400,000	510,000		
Construction	2" - 4" wide	1,000	650	180	625	1,650	1,500,000	550,000		
Standard		575	375	180	625	1,400	1,400,000	510,000		
Utility		275	175	180	625	900	1,300,000	470,000		
DOUGLAS FIR-LARCH (NORTH)										
Select Structural	2" & wider	1,350	825	180	625	1,900	1,900,000	690,000	0.49	NLGA
No. 1 & Btr		1,150	750	180	625	1,800	1,800,000	660,000		
No. 1/ No. 2		850	500	180	625	1,400	1,600,000	580,000		
No. 3		475	300	180	625	825	1,400,000	510,000		
Stud	2" & wider	650	400	180	625	900	1,400,000	510,000		
Construction	2" - 4" wide	950	575	180	625	1,800	1,500,000	550,000		
Standard		525	325	180	625	1,450	1,400,000	510,000		
Utility		250	150	180	625	950	1,300,000	470,000		
DOUGLAS FIR-SOUTH										
Select Structural	2" & wider	1,350	900	180	520	1,600	1,400,000	510,000	0.46	WWPA
No. 1		925	600	180	520	1,450	1,300,000	470,000		
No. 2		850	525	180	520	1,350	1,200,000	440,000		
No. 3		500	300	180	520	775	1,100,000	400,000		
Stud	2" & wider	675	425	180	520	850	1,100,000	400,000		
Construction	2" - 4" wide	975	600	180	520	1,650	1,200,000	440,000		
Standard		550	350	180	520	1,400	1,100,000	400,000		
Utility		250	150	180	520	900	1,000,000	370,000		

NEW WOOD CONSTRUCTION MATERIAL
VALUES (Dimensional Lumber)

Strong-Drive® SDS

Heavy-Duty Connector Screw

The Simpson Strong-Tie® Strong-Drive® SDS Heavy-Duty Connector screw is a 1/4" diameter structural wood screw ideal for various connector installations as well as wood-to-wood applications. It installs with no predrilling and has been extensively tested in various applications. The SDS Heavy-Duty Connector screw is improved with a patented easy-driving 4CUT™ point and a corrosion resistant double-barrier coating.

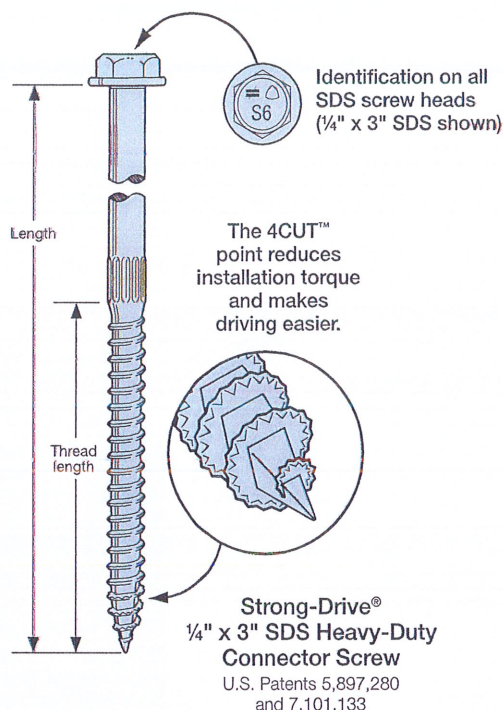
Features:

- The patented 4CUT point has a square core and serrated threads to reduce installation torque and make driving easier with no predrilling and minimal wood splitting.
- Available with a double-barrier coating or in Type 316 stainless steel. Carbon steel loads apply to corresponding stainless steel models.
- 5/8" hex washer head is stamped with the No-Equal sign and fastener length for easy identification after installation.
- For the 5/8" hex head driver bit, order model no. DB6H1.75.

Material: Heat-treated carbon steel, Type 316 stainless steel

Finish: Double Barrier (all lengths); Type-316 Stainless Steel (1 1/2" thru 3 1/2" lengths)

Codes: See p. 14 for Code Reference Key Chart



These products are available with additional corrosion protection. For more information, see p. 18.

Strong-Drive® SDS Heavy-Duty Connector Screw

	Size (in.)	Model No.	Thread Length (in.)	Fasteners per Carton ⁶	DF/SP Allowable Loads ⁴						SPF/HF Allowable Loads ⁴						Code Ref.
					Shear (100) ¹					Withdrawal ⁵ (100)	Shear (100)					Withdrawal ⁵ (100)	
					Wood Side Plate ³		Steel Side Plate				Wood Side Plate ³		Steel Side Plate				
					1½"	1¾" SCL	16 ga.	14 ga. and 12 ga.	10 ga. or Greater		Wood or Steel Side Plate	1½"	1¾" SPF LVL	16 ga.	14 ga. and 12 ga.		
SS	¼ x 1½	SDS25112	1	1,500	—	—	250	250	250	170	—	—	180	180	180	120	I5, L1, FL
SS	¼ x 2	SDS25200	1¼	1,300	—	—	250	290	290	215	—	—	180	210	210	150	
SS	¼ x 2½	SDS25212	1½	1,100	190	—	250	390	420	255	135	—	180	280	300	180	
SS	¼ x 3	SDS25300	2	950	280	—	250	420	420	345	200	—	180	300	300	240	
SS	¼ x 3½	SDS25312	2¼	900	340	340	250	420	420	385	245	245	180	300	300	270	
FL	¼ x 4½	SDS25412	2¾	800	350	340	250	420	420	475	250	245	180	300	300	330	
FL	¼ x 5	SDS25500	2¾	500	350	340	250	420	420	475	250	245	180	300	300	330	
FL	¼ x 6	SDS25600	3¼	600	350	340	250	420	420	560	250	245	180	300	300	395	
FL	¼ x 8	SDS25800	3¼	400	350	340	250	420	420	560	250	245	180	300	300	395	

1. Screws may be provided with the 4CUT or Type-17 point.
2. Strong-Drive® SDS Heavy-Duty Connector screws install best with a low-speed 1/2" drill with a 5/8" hex-head driver.
3. Shear values are valid for connections between two members with full thread penetration into the main member. For other wood side plate values, see *Fastening Systems* catalog (C-F-2017) at strongtie.com.
4. Allowable loads are shown at the wood load duration factor of $C_D = 1.00$. Loads may be increased for load duration per the building code up to a $C_D = 1.60$.
5. Withdrawal loads shown are in pounds (lb.) and are based on the entire threaded section installed into the main member. If thread penetration into the main member is less than the Thread Length as shown in the table for DF/SP, reduce allowable load by 172 lb./in. of thread not in main member. Use 121 lb./in. for SPF/HF.

6. Fasteners per Carton represent the quantity of screws that are available in bulk packaging. Screws are also available in mini bulk and retail packs. Refer to Simpson Strong-Tie® *Fastening Systems* catalog (C-F-2017) at strongtie.com.
7. LSL wood-to-wood applications that require 4 1/2", 5", 6" or 8" SDS Heavy-Duty Connector screws are limited to interior-dry use only.
8. Where predrilling is required for Strong-Drive® SDS Heavy-Duty Connector screws, predrill diameter is 5/32".
9. Minimum spacing, edge, and end spacing distance requirements are listed in ICC-ES ESR-2236. For smaller spacing, please contact Simpson Strong-Tie Engineering.

Strong-Drive® SDWS/SDWH

Timber Screws (cont.)

Strong-Drive® SDWS Timber Screw

Allowable Shear Loads – Douglas Fir-Larch and Southern Pine

Size Dia. x L (in.)	Model No.	Thread Length TL (in.)	DF/SP Allowable Loads										Code Ref.
			Shear (100)										
			Wood Side Member Thickness (in.)										
			1.5	2	2.5	3	3.5	4	4.5	6	8		
0.220 x 3	SDWS22300DB	1½	255	—	—	—	—	—	—	—	—	IP4, FL, L23	
0.220 x 4	SDWS22400DB	2¾	405	405	305	—	—	—	—	—	—		
0.220 x 5	SDWS22500DB	2¾	405	405	360	360	325	—	—	—	—		
0.220 x 6	SDWS22600DB	2¾	405	405	405	405	365	365	355	—	—		
0.220 x 8	SDWS22800DB	2¾	405	405	405	405	395	395	395	395	—		
0.220 x 10	SDWS221000DB	2¾	405	405	405	405	395	395	395	395	395		

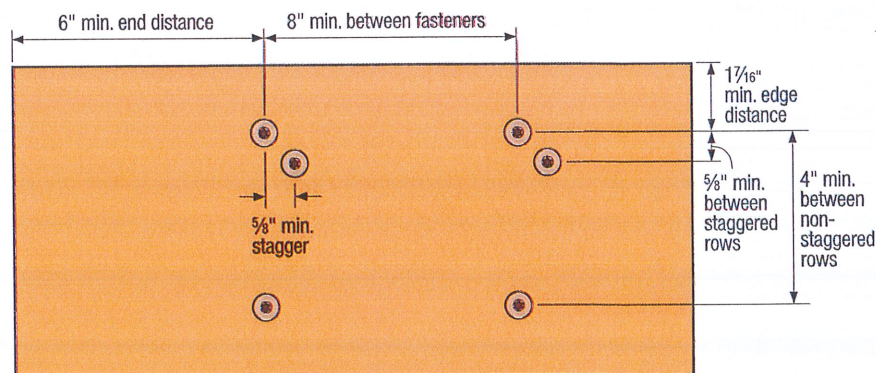
See footnotes below.

Strong-Drive® SDWS Timber Screw

Allowable Shear Loads – Spruce-Pine-Fir and Hem-Fir

Size Dia. x L (in.)	Model No.	Thread Length TL (in.)	SPF/HF Allowable Loads										Code Ref.
			Shear (100)										
			Wood Side Member Thickness (in.)										
			1.5	2	2.5	3	3.5	4	4.5	6	8		
0.220 x 3	SDWS22300DB	1½	190	—	—	—	—	—	—	—	—	IP4, FL, L23	
0.220 x 4	SDWS22400DB	2¾	385	285	215	—	—	—	—	—	—		
0.220 x 5	SDWS22500DB	2¾	405	290	290	290	195	—	—	—	—		
0.220 x 6	SDWS22600DB	2¾	405	365	365	365	310	310	210	—	—		
0.220 x 8	SDWS22800DB	2¾	405	365	365	365	310	310	280	280	—		
0.220 x 10	SDWS221000DB	2¾	405	365	365	365	310	310	280	280	280		

1. All applications are based on full penetration into the main member. Full penetration is the screw length minus the side member thickness.
2. Allowable loads are shown at the wood load duration factor of $C_D = 1.0$. Loads may be increased for load duration per the building code up to a $C_D = 1.6$. Tabulated values must be multiplied by all applicable adjustment factors per the NDS.
3. Minimum fastener spacing requirements to achieve table loads: 6" end distance, 17/16" edge distance, 5/8" between staggered rows of fasteners, 4" between non-staggered rows of fasteners and 8" between fasteners in a row.
4. For in-service moisture content greater than 19%, use $C_M = 0.7$.



Strong-Drive® SDWS Timber Spacing Requirements

Stud Wall Design

Level Loadings

Type	DL	LL	TL
Roof Sloped	25 psf	20 psf	45 psf
Roof Flat	20 psf	25 psf	45 psf
Floor	35 psf	40 psf	75 psf
Public Flr (Stairs)	25 psf	100 psf	125 psf
Public Patio (Conc.)	55 psf	100 psf	155 psf
Private Deck	55 psf	60 psf	115 psf
Attic No Storage	35 psf	10 psf	45 psf
Storage	40 psf	100 psf	140 psf

Wood Properties

Grade	Fb	Fc
Stud	700	850
No. 2	900	1350
No. 1	1000	1500
Sel. Struct.	1500	1700

Built-up Column Design (L=10')

(2) 2x4 @ 16"oc (Lu = 60")	5 psf	2514 plf
(2) 2x4 @ 16"oc w/ ADDTL @ 32" (Lu = 60")	5 psf	3235 plf
(3) 2x4 @ 16"oc (Lu = 60")	5 psf	3956 plf
(3) 2x4 @ 16"oc w/ ADDTL @ 32" (Lu = 60")	5 psf	4688 plf
(4) 2x4 @ 16"oc (Lu = 60")	5 psf	5420 plf
(4) 2x4 @ 16"oc (Lu = 12")	20 psf	1777 plf
(3) 2x4 @ 16"oc (Lu = 12")	20 psf	3094 plf
(2) 2x4 @ 24"oc (Lu = 12")	5 psf	1569 plf
(3) 2x4 @ 24"oc (Lu = 12")	5 psf	2509 plf
(4) 2x4 @ 24"oc (Lu = 12")	5 psf	3466 plf

Bearing

Allowable Bearing Stress	565 psi
Number of Truss Verticals	2

Rim Board Check

Rim Board Width	1.25 in.
Rim Board Depth	18 in.
Allowable Uniform Load	4340 plf
Allowable Bearing Stress	710 psi

REVIEWED	1 - Exterior Wall - Non-Floor Bearing																			Wood Stud Properties										Rim Board Unity Checks				Truss	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Truss Spacing	Squash Blocks	Check												
Roof Sloped	25 psf	20 psf	45 psf	18.0 ft	0 plf	810 plf	1.0	2x6	16.0 in.	130.9 psi	No. 2	12 in.	12 ft	20 psf	30.00 plf	2010 plf	40%	OK																		
Floor	35 psf	40 psf	75 psf	2.0 ft	300 plf	1260 plf	1.0	2x6	16.0 in.	203.6 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	29%	OK	Yes		0.19	0.27	24 in.	0	0.15											
Floor	35 psf	40 psf	75 psf	2.0 ft	300 plf	1710 plf	1.0	2x6	16.0 in.	276.4 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	39%	OK	Yes		0.29	0.42	24 in.	0	0.15											

REVIEWED	1 - Exterior Wall - Floor Bearing																			Wood Stud Properties														Rim Board Unity Checks				Truss Spacing	Additional Squash Blocks	Truss Bearing Check
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	24 in.	0	0.12																
Roof Sloped	25 psf	20 psf	45 psf	8.0 ft	0 plf	360 plf	1.0	2x6	16.0 in.	58.2 psi	No. 2	12 in.	12 ft	20 psf	30.00 plf	2010 plf	18%	OK				24 in.	0	0.12																
Floor	35 psf	40 psf	75 psf	8.0 ft	300 plf	1260 plf	1.0	2x6	16.0 in.	203.6 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	29%	OK	Yes		0.08	0.12	24 in.	0	0.30															
Floor	35 psf	40 psf	75 psf	8.0 ft	300 plf	2160 plf	1.0	2x6	16.0 in.	349.1 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	49%	OK	Yes		0.29	0.42	24 in.	0	0.30															

REVIEWED	1 - Exterior Wall - Balcony																			Wood Stud Properties														Rim Board Unity Checks				Truss	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Spacing	Squash Blocks	Check																
Roof Sloped	25 psf	20 psf	45 psf	18.0 ft	0 plf	810 plf	1.0	2x6	16.0 in.	130.9 psi	No. 2	12 in.	12 ft	20 psf	30.00 plf	2010 plf	40%	OK																						
Private Deck	55 psf	60 psf	115 psf	3.0 ft	300 plf	1455 plf	1.0	2x6	16.0 in.	235.2 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	33%	OK	Yes		0.19	0.27	24 in.	0	0.22															
Private Deck	55 psf	60 psf	115 psf	3.0 ft	300 plf	2100 plf	1.0	2x6	16.0 in.	339.4 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	48%	OK	Yes		0.34	0.49	24 in.	0	0.22															

REVIEWED	1 - Exterior Wall - Floor Bearing																			Wood Stud Properties														Rim Board Unity Checks				Truss	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Truss Spacing	Squash Blocks	Check																
Roof Sloped	25 psf	20 psf	45 psf	7.0 ft	0 plf	315 plf	1.0	2x6	16.0 in.	50.9 psi	No. 2	12 in.	12 ft	20 psf	30.00 plf	2010 plf	16%	OK				24 in.	0	0.11																
Floor	35 psf	40 psf	75 psf	7.0 ft	300 plf	1140 plf	1.0	2x6	16.0 in.	184.2 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	26%	OK	Yes		0.07	0.11	24 in.	0	0.28															
Floor	35 psf	40 psf	75 psf	7.0 ft	300 plf	1965 plf	1.0	2x6	16.0 in.	317.6 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	45%	OK	Yes		0.26	0.38	24 in.	0	0.28															

REVIEWED	2 - Exterior Wall - 7' Floor, 6' Breezeway																			Wood Stud Properties														Rim Board Unity Checks				Truss	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Truss Spacing	Squash Blocks	Check																
Roof Sloped	25 psf	20 psf	45 psf	12.0 ft	0 plf	540 plf	1.0	2x6	16.0 in.	87.3 psi	No. 2	12 in.	12 ft	20 psf	30.00 plf	2010 plf	27%	OK				24 in.	0	0.18																
Private Deck	55 psf	60 psf	115 psf	6.0 ft	550 plf	1780 plf	1.0	2x6	16.0 in.	287.7 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	41%	OK	Yes		0.12	0.18	24 in.	0	0.42															
Private Deck	55 psf	60 psf	115 psf	6.0 ft	550 plf	3020 plf	1.0	2x6	16.0 in.	488.1 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	69%	OK	Yes		0.41	0.59	24 in.	0	0.42															

REVIEWED	1 - Exterior Wall - TW = 30' Roof																			Wood Stud Properties											Rim Board Unity Checks				Truss	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Truss Spacing	Squash Blocks	Check													
Roof Sloped	25 psf	20 psf	45 psf	30.0 ft	0 plf	1350 plf	1.0	2x6	16.0 in.	218.2 psi	No. 2	12 in.	12 ft	20 psf	30.00 plf	2010 plf	67%	OK				24 in.	0	0.46													
Floor	35 psf	40 psf	75 psf	2.0 ft	150 plf	1650 plf	1.0	2x6	16.0 in.	266.7 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	38%	OK	Yes		0.31	0.45	24 in.	0	0.10												
Floor	35 psf	40 psf	75 psf	2.0 ft	150 plf	1950 plf	1.0	2x6	16.0 in.	315.2 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	4370 plf	45%	OK	Yes		0.38	0.55	24 in.	0	0.10												

REVIEWED	3 - 2x4 Demising Wall - Roof Bearing																			Wood Stud Properties											Rim Board Unity Checks				Truss Spacing	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Squash Blocks	Check														
Roof Flat	20 psf	25 psf	45 psf	15.0 ft	0 plf	675 plf	1.0	2x4	16.0 in.	171.4 psi	No. 2	60 in.	9 ft	5 psf	7.50 plf	993 plf	68%	OK				24 in.	0	0.23													
Floor	35 psf	40 psf	75 psf	2.0 ft	150 plf	975 plf	1.5	2x4	16.0 in.	165.1 psi	No. 2	60 in.	9 ft	5 psf	7.50 plf	2288 plf	43%	OK	Yes		0.16	0.23	24 in.	0	0.10												
Floor	35 psf	40 psf	75 psf	2.0 ft	150 plf	1275 plf	1.5	2x4	16.0 in.	215.9 psi	No. 2	60 in.	9 ft	5 psf	7.50 plf	2288 plf	56%	OK	Yes		0.22	0.28	24 in.	0	0.10												

REVIEWED	4 - 2x4 Demising Wall - Non Bearing																			Wood Stud Properties				Rim Board Unity Checks				Truss	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Spacing	Squash Blocks	Check						
Roof Flat	20 psf	25 psf	45 psf	2.0 ft	0 plf	90 plf	1.0	2x4	16.0 in.	22.9 psi	No. 2	12 in.	12 ft	5 psf	7.50 plf	705 plf	13%	OK				24 in.	0	0.03						
Floor	35 psf	40 psf	75 psf	2.0 ft	150 plf	390 plf	1.0	2x4	16.0 in.	99.0 psi	No. 2	12 in.	9 ft	5 psf	7.50 plf	1429 plf	27%	OK	Yes		0.02	0.03	24 in.	0	0.10					
Floor	35 psf	40 psf	75 psf	2.0 ft	150 plf	690 plf	1.0	2x4	16.0 in.	175.2 psi	No. 2	12 in.	9 ft	5 psf	7.50 plf	1429 plf	48%	OK	Yes		0.09	0.13	24 in.	0	0.10					

REVIEWED	5 - 2x4 Unit Wall - TW = 14'																			Wood Stud Properties														Rim Board Unity Checks				Truss	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Spacing	Squash Blocks	Check																
Roof Flat	20 psf	25 psf	45 psf	2.0 ft	100 plf	190 plf	1.0	2x4	16.0 in.	48.3 psi	No. 2	12 in.	12 ft	5 psf	7.50 plf	705 plf	27%	OK				24 in.	0	0.06																
Floor	35 psf	40 psf	75 psf	14.0 ft	150 plf	1390 plf	1.5	2x4	16.0 in.	235.3 psi	No. 2	12 in.	9 ft	5 psf	7.50 plf	2293 plf	61%	OK	Yes		0.04	0.06	24 in.	0	0.40															
Floor	35 psf	40 psf	75 psf	14.0 ft	150 plf	2590 plf	2.0	2x4	16.0 in.	328.9 psi	No. 2	12 in.	9 ft	5 psf	7.50 plf	3172 plf	82%	OK	Yes		0.32	0.40	24 in.	0	0.40															

REVIEWED	5 - 2x6 Unit Wall - TW = 14'																			Wood Stud Properties														Rim Board Unity Checks				Truss	Additional	Truss Bearing
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load	Truss Spacing	Squash Blocks	Check																
Roof Flat	20 psf	25 psf	45 psf	2.0 ft	100 plf	190 plf	1.0	2x6	16.0 in.	30.7 psi	No. 2	12 in.	12 ft	5 psf	7.50 plf	3178 plf	6%	OK				24 in.	0	0.06																
Floor	35 psf	40 psf	75 psf	14.0 ft	150 plf	1390 plf	1.0	2x6	16.0 in.	224.6 psi	No. 2	12 in.	9 ft	5 psf	7.50 plf	4370 plf	32%	OK	Yes		0.04	0.06	24 in.	0	0.40															
Floor	35 psf	40 psf	75 psf	14.0 ft	150 plf	2590 plf	1.0	2x6	16.0 in.	418.6 psi	No. 2	12 in.	9 ft	5 psf	7.50 plf	4370 plf	59%	OK	Yes		0.32	0.46	24 in.	0	0.40															

REVIEWED	6 - 2x4 Unit Wall - TW =
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Floor	35 psf	40 psf	75 psf	14.0 ft	100 plf	3210 plf	1.0	2x6	16.0 in.	518.8 psi	No. 2	12 in.	9 ft	5 psf	7.50 plf	4370 plf	73%	OK	Yes	0.47	0.69	24 in.	0	0.39
REVIEWED	7 - Int Demising Wall - 7' Floor, 2' Roof																			Rim Board Unity Checks		Truss Spacing	Additional Squash Blocks	Truss Bearing Check
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load			
Roof Sloped	25 psf	20 psf	45 psf	2.0 ft	0 plf	90 plf	1.0	2x4	16.0 in.	22.9 psi	No. 2	12 in.	12 ft	20 psf	30.00 plf	142 plf	64%	OK				24 in.	0	0.03
Floor	35 psf	40 psf	75 psf	7.0 ft	100 plf	715 plf	1.0	2x4	16.0 in.	181.6 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	811 plf	88%	OK	Yes	0.02	0.03	24 in.	0	0.21
Floor	35 psf	40 psf	75 psf	7.0 ft	100 plf	1340 plf	1.5	2x4	16.0 in.	226.9 psi	No. 2	12 in.	9 ft	20 psf	30.00 plf	1589 plf	84%	OK	Yes	0.16	0.24	24 in.	0	0.21
REVIEWED	Clubhouse																			Rim Board Unity Checks		Truss Spacing	Additional Squash Blocks	Truss Bearing Check
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load			
Roof Sloped	25 psf	20 psf	45 psf	20.0 ft	0 plf	900 plf	1.0	2x6	16.0 in.	145.5 psi	No. 2	12 in.	12 ft	20 psf	30.00 plf	2010 plf	45%	OK				24 in.	0	0.30
REVIEWED	Clubhouse																			Rim Board Unity Checks		Truss Spacing	Additional Squash Blocks	Truss Bearing Check
Level	DL	LL	TL	TW	Adt'l Ld	TL	Number	Size	Spacing	Brg Stress	Grade	Lu (in.)	Height	Wind Pressure	Lateral Force	P allow.	Unity	Check	Has Rim Board	Uniform Load	Concentrated Load			
Roof Sloped	25 psf	20 psf	45 psf	16.0 ft	0 plf	720 plf	1.0	2x6	16.0 in.	116.4 psi	No. 2	12 in.	15 ft	20 psf	30.00 plf	837 plf	86%	OK				24 in.	0	0.24

Stud Design Axial Wall Loads (plf)

Load Duration Factor	Wind	1.60	Stud	2 x 4	Adjustment Factors			
	Snow	1.15	Fb	900	$I_1 =$	12 in.	C_F (Bending) =	1.50
	Live	1.00	Fc	1350	$I_2 =$	Height	C_F (Compression) =	1.15
	Dead	0.9	Fv	180	$I_U =$	12 in.	Cr (Bending) =	1.00
			E	1.60E+06	psi			

		Dead	Live	Snow	Wind										
Stud Height	# Studs	0 plf	0 plf	0 plf	5.00 plf	7.50 plf	10.00 plf	15.00 plf	20.00 plf	25.00 plf	30.00 plf	35.00 plf	40.00 plf	45.00 plf	50.00 plf
8 ft	1.0	2952	3000	3054	2637	2493	2369	2151	1959	1782	1615	1454	1297	1142	987
	1.5	4428	4500	4582	4128	3957	3810	3556	3334	3132	2944	2766	2595	2430	2268
	2.0	5904	6000	6109	5636	5444	5278	4991	4743	4518	4310	4114	3928	3748	3575
	2.5	7380	7500	7636	7156	6944	6761	6447	6175	5929	5703	5490	5289	5096	4910
	3.0	8856	9000	9163	8684	8454	8256	7916	7622	7358	7115	6887	6671	6465	6268
	3.5	10332	10500	10690	10218	9972	9761	9397	9083	8801	8542	8300	8071	7853	7644
	4.0	11808	12000	12217	11756	11496	11272	10887	10554	10256	9982	9726	9485	9255	9035
9 ft	1.0	2411	2438	2470	2037	1905	1790	1589	1409	1242	1082	925	769	611	447
	1.5	3616	3658	3705	3214	3057	2922	2688	2483	2295	2119	1950	1788	1629	1472
	2.0	4821	4877	4940	4407	4230	4077	3815	3586	3378	3185	3002	2827	2658	2494
	2.5	6027	6096	6175	5610	5415	5247	4959	4709	4483	4273	4076	3888	3708	3534
	3.0	7232	7315	7410	6821	6610	6428	6116	5846	5603	5379	5168	4968	4777	4593
	3.5	8437	8534	8645	8038	7812	7617	7284	6996	6737	6498	6275	6063	5861	5667
	4.0	9642	9754	9879	9260	9019	8813	8459	8154	7880	7628	7393	7171	6958	6755
10 ft	1.0	1995	2012	2031	1606	1484	1377	1189	1018	857	700	542	380	207	14
	1.5	2992	3018	3047	2554	2410	2286	2068	1876	1699	1532	1371	1213	1056	900
	2.0	3989	4024	4063	3518	3355	3215	2972	2759	2565	2384	2211	2045	1883	1724
	2.5	4987	5030	5078	4491	4312	4157	3891	3659	3449	3254	3069	2893	2722	2556
	3.0	5984	6036	6094	5472	5277	5110	4822	4573	4347	4139	3942	3755	3576	3402
	3.5	6982	7042	7110	6457	6249	6070	5762	5497	5257	5036	4828	4631	4442	4260
	4.0	7979	8048	8125	7447	7226	7036	6710	6429	6176	5943	5724	5517	5320	5129
11 ft	1.0	1673	1684	1697	1287	1174	1074	895	731	573	415	249	65	0	0
	1.5	2509	2526	2545	2066	1932	1816	1613	1432	1263	1102	944	787	629	466
	2.0	3346	3368	3393	2858	2708	2577	2351	2152	1969	1796	1631	1471	1313	1156
	2.5	4182	4210	4242	3660	3494	3351	3103	2887	2690	2506	2331	2162	1999	1839
	3.0	5019	5052	5090	4468	4288	4133	3866	3634	3423	3228	3043	2866	2695	2529
	3.5	5855	5894	5938	5281	5088	4922	4637	4390	4167	3960	3765	3579	3401	3228
	4.0	6691	6736	6787	6097	5892	5717	5415	5154	4919	4701	4497	4303	4116	3937
12 ft	1.0	1420	1428	1437	1046	939	845	674	514	356	189	0	0	0	0
	1.5	2131	2142	2155	1695	1571	1462	1270	1097	934	776	619	458	290	108
	2.0	2841	2856	2873	2357	2217	2095	1882	1694	1520	1354	1194	1036	880	721
	2.5	3551	3570	3592	3027	2873	2739	2508	2304	2118	1943	1775	1613	1453	1296
	3.0	4261	4284	4310	3703	3536	3392	3142	2925	2726	2541	2365	2196	2032	1871
	3.5	4972	4998	5028	4384	4205	4050	3785	3554	3344	3149	2964	2788	2617	2451
	4.0	5682	5712	5747	5068	4878	4714	4433	4189	3969	3764	3571	3387	3210	3039
13 ft	1.0	1220	1225	1231	860	759	669	504	345	180	0	0	0	0	0
	1.5	1830	1838	1847	1408	1291	1188	1005	839	680	522	361	189	0	0
	2.0	2440	2450	2463	1968	1837	1722	1521	1342	1174	1013	856	698	538	371
	2.5	3050	3063	3078	2536	2391	2266	2048	1855	1677	1509	1347	1188	1031	873
	3.0	3659	3675	3694	3109	2953	2817	2583	2378	2189	2012	1844	1680	1520	1362
	3.5	4269	4288	4309	3687	3519	3375	3125	2908	2709	2524	2348	2178	2014	1852
	4.0	4879	4901	4925	4267	4090	3937	3673	3444	3235	3042	2858	2682	2513	2347
14 ft	1.0	1058	1062	1066	713	617	530	369	208	28	0	0	0	0	0
	1.5	1587	1593	1600	1182	1071	973	798	636	478	317	144	0	0	0
	2.0	2116	2124	2133	1661	1537	1429	1237	1065	902	744	586	425	255	68
	2.5	2645	2655	2666	2148	2012	1893	1686	1502	1331	1168	1009	852	694	532
	3.0	3174	3186	3199	2639	2492	2365	2143	1948	1768	1597	1434	1274	1116	959
	3.5	3703	3717	3732	3134	2977	2841	2606	2399	2210	2033	1863	1699	1539	1381
	4.0	4232	4248	4265	3633	3466	3322	3074	2857	2659	2474	2298	2129	1965	1804
15 ft	1.0	926	929	932	596	504	420	260	92	0	0	0	0	0	0
	1.5	1389	1393	1398	1000	895	802	632	473	314	144	0	0	0	0
	2.0	1852	1858	1864	1415	1297	1194	1011	844	684	527	365	194	0	0
	2.5	2315	2322	2330	1836	1707	1595	1398	1221	1055	895	738	579	415	243
	3.0	2778	2787	2797	2261	2122	2002	1791	1604	1431	1266	1106	948	790	630
	3.5	3241	3251	3263	2690	2542	2414	2190	1993	1812	1641	1477	1316	1158	1000
	4.0	3704	3716	3729	3123	2965	2829	2594	2388	2199	2021	1851	1687	1527	1368

Stud Design Axial Wall Loads (plf)

Load Duration Factor	Wind	1.60	Stud	2 x 4	Adjustment Factors		
	Snow	1.15	Fb	900.0	I1 =	60 in.	CF (Bending) = 1.50
	Live	1.00	Fc	1350.0	I2 =	Height	CF (Compression) = 1.15
	Dead	.90	Fv	180.0	IU =	60 in.	Cr (Bending) = 1.15
			E	1.60E+06 psi			

		Dead	Live	Snow	Wind										
Stud Height	# Studs	0 plf	0 plf	0 plf	5.00 plf	7.50 plf	10.00 plf	15.00 plf	20.00 plf	25.00 plf	30.00 plf	35.00 plf	40.00 plf	45.00 plf	50.00 plf
8 ft	1.0	1498	1507	1516	1441	1395	1351	1262	1175	1088	1001	913	823	731	635
	1.5	4428	4500	4582	4122	3951	3802	3546	3322	3118	2928	2748	2576	2409	2246
	2.0	5601	5835	6108	5633	5440	5273	4986	4736	4511	4302	4105	3918	3738	3564
	2.5	7380	7500	7636	7154	6941	6758	6442	6169	5923	5696	5483	5280	5087	4901
	3.0	8856	9000	9163	8681	8450	8252	7910	7615	7350	7105	6877	6660	6453	6255
	3.5	10332	10500	10690	10213	9967	9754	9389	9074	8791	8530	8287	8057	7838	7628
	4.0	11808	12000	12217	11751	11490	11264	10877	10543	10243	9968	9710	9468	9237	9016
	1.0	1498	1507	1516	1390	1324	1261	1140	1024	911	798	683	565	441	305
	1.5	3616	3658	3705	3209	3051	2915	2679	2472	2282	2104	1934	1769	1608	1450
	2.0	4821	4877	4940	4404	4226	4073	3810	3580	3371	3177	2993	2817	2648	2482
	2.5	6027	6096	6175	5608	5412	5244	4955	4704	4477	4267	4069	3881	3700	3525
	3.0	7232	7315	7410	6818	6606	6424	6111	5840	5596	5370	5159	4958	4766	4581
	3.5	8437	8534	8645	8034	7807	7611	7276	6987	6727	6487	6263	6050	5847	5652
	4.0	9642	9754	9879	9255	9013	8806	8450	8144	7868	7615	7378	7155	6941	6737
	1.0	1498	1507	1516	1311	1222	1140	989	848	711	574	433	282	110	0
	1.5	2992	3018	3047	2550	2405	2279	2060	1866	1687	1518	1355	1195	1036	877
	2.0	3989	4024	4063	3515	3352	3211	2967	2754	2559	2376	2203	2035	1873	1713
	2.5	4987	5030	5078	4489	4309	4154	3887	3655	3444	3248	3063	2885	2714	2548
	3.0	5984	6036	6094	5469	5273	5106	4817	4567	4340	4131	3934	3746	3565	3391
	3.5	6982	7042	7110	6454	6244	6064	5756	5489	5248	5026	4817	4619	4429	4246
	4.0	7979	8048	8125	7443	7220	7029	6702	6419	6165	5930	5711	5503	5304	5112
	1.0	1498	1507	1516	1197	1090	995	824	664	509	349	176	0	0	0
	1.5	2509	2526	2545	2062	1927	1810	1605	1422	1251	1088	928	769	608	442
	2.0	3346	3368	3393	2856	2705	2574	2347	2146	1963	1789	1623	1462	1303	1145
	2.5	4182	4210	4242	3658	3491	3348	3100	2883	2685	2500	2325	2156	1991	1831
	3.0	5019	5052	5090	4465	4285	4129	3861	3628	3417	3220	3034	2857	2685	2518
	3.5	5855	5894	5938	5277	5084	4917	4631	4383	4159	3951	3755	3568	3389	3215
	4.0	6691	6736	6787	6093	5887	5711	5407	5145	4909	4690	4484	4289	4101	3920
	1.0	1420	1428	1437	1033	923	825	647	479	311	129	0	0	0	0
	1.5	2131	2142	2155	1691	1566	1456	1262	1087	923	762	603	439	268	79
	2.0	2841	2856	2873	2355	2214	2092	1878	1689	1514	1348	1186	1028	870	710
	2.5	3551	3570	3592	3026	2871	2737	2504	2300	2113	1937	1769	1606	1446	1288
	3.0	4261	4284	4310	3701	3533	3388	3138	2919	2720	2534	2357	2187	2022	1860
	3.5	4972	4998	5028	4381	4201	4046	3779	3547	3336	3140	2954	2777	2605	2438
	4.0	5682	5712	5747	5064	4873	4709	4426	4181	3959	3753	3559	3374	3196	3023
	1.0	1220	1225	1231	848	743	650	477	309	131	0	0	0	0	0
	1.5	1830	1838	1847	1405	1286	1183	998	830	668	508	344	168	0	0
	2.0	2440	2450	2463	1966	1834	1719	1517	1337	1168	1007	848	689	528	360
	2.5	3050	3063	3078	2534	2389	2264	2045	1851	1673	1504	1341	1181	1023	865
	3.0	3659	3675	3694	3107	2950	2814	2579	2373	2183	2006	1836	1672	1511	1352
	3.5	4269	4288	4309	3684	3515	3370	3120	2901	2702	2515	2338	2168	2002	1840
	4.0	4879	4901	4925	4264	4085	3931	3666	3436	3226	3031	2847	2670	2499	2332
1.0	1058	1062	1066	702	602	512	343	171	0	0	0	0	0	0	
	1.5	1587	1593	1600	1178	1067	968	791	627	467	303	126	0	0	0
	2.0	2116	2124	2133	1659	1535	1426	1234	1060	897	738	579	416	244	54
	2.5	2645	2655	2666	2146	2010	1891	1683	1499	1327	1163	1004	845	686	523
	3.0	3174	3186	3199	2637	2489	2361	2139	1943	1762	1591	1426	1266	1107	949
	3.5	3703	3717	3732	3132	2974	2837	2601	2393	2203	2025	1854	1689	1528	1368
	4.0	4232	4248	4265	3630	3462	3317	3068	2849	2650	2464	2287	2117	1951	1789
1.0	926	929	932	585	489	402	234	51	0	0	0	0	0	0	
	1.5	1389	1393	1398	997	891	796	625	464	302	128	0	0	0	0
	2.0	1852	1858	1864	1413	1295	1191	1007	839	679	520	357	184	0	0
	2.5	2315	2322	2330	1834	1705	1593	1395	1217	1051	890	732	572	408	233
	3.0	2778	2787	2797	2259	2120	1999	1787	1600	1425	1260	1099	940	781	619
	3.5	3241	3251	3263	2688	2539	2410	2185	1988	1805	1633	1468	1306	1147	988
	4.0	3704	3716	3729	3119	2961	2825	2588	2380	2190	2012	1841	1675	1514	1354

Load Duration Factor

Wind	1.60
Snow	1.15
Live	1.00
Dead	.90

Stud	2 x 6
Fb	900.0
Fc	1350.0
Fv	180.0
E	1.60E+06 psi

$I_1 = 12 \text{ in.}$
 $I_2 = \text{Height}$
 $I_U = 12 \text{ in.}$

Adjustment Factors

CF (Bending) =	1.30
CF (Compression) =	1.10
Cr (Bending) =	1.15

		Dead	Live	Snow	Wind										
Stud Height	# Studs	0 plf	0 plf	0 plf	5.00 plf	7.50 plf	10.00 plf	15.00 plf	20.00 plf	25.00 plf	30.00 plf	35.00 plf	40.00 plf	45.00 plf	50.00 plf
8 ft	1.0	5827	5827	5827	5827	5827	5827	5827	5827	5827	5827	5827	5827	5827	5827
	1.5	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157
	2.0	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488
	2.5	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818
	3.0	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149
	3.5	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480
	4.0	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810
9 ft	1.0	5827	5827	5827	5827	5827	5827	5827	5827	5827	5827	5661	5359	5067	4783
	1.5	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157	8157
	2.0	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488
	2.5	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818
	3.0	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149
	3.5	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480
	4.0	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810
10 ft	1.0	5827	5827	5827	5827	5827	5827	5606	5232	4890	4570	4265	3972	3686	3407
	1.5	8157	8157	8157	8157	8157	8157	8157	8157	8157	7863	7518	7190	6874	6568
	2.0	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10488	10143	9809
	2.5	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818
	3.0	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149
	3.5	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480
	4.0	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810
11 ft	1.0	5673	5821	5827	5397	5130	4898	4494	4138	3810	3502	3207	2920	2640	2362
	1.5	8157	8157	8157	8157	8101	7828	7356	6944	6569	6220	5890	5575	5271	4975
	2.0	10488	10488	10488	10488	10488	10488	10273	9812	9394	9008	8644	8299	7967	7648
	2.5	12818	12818	12818	12818	12818	12818	12818	12722	12267	11846	11451	11078	10720	10376
	3.0	15149	15149	15149	15149	15149	15149	15149	15149	15149	14721	14298	13898	13516	13150
	3.5	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17176	16751	16346	15959
	4.0	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19630	19203	18795
12 ft	1.0	4964	5064	5176	4490	4238	4018	3634	3293	2979	2681	2393	2111	1831	1550
	1.5	7446	7595	7764	7039	6741	6482	6035	5643	5286	4953	4637	4333	4039	3751
	2.0	9928	10127	10352	9618	9281	8990	8487	8050	7653	7286	6939	6609	6292	5984
	2.5	12410	12659	12818	12216	11846	11526	10975	10496	10064	9665	9290	8934	8593	8264
	3.0	14892	15149	15149	14828	14429	14083	13487	12972	12507	12078	11677	11296	10933	10584
	3.5	17374	17480	17480	17450	17024	16655	16019	15469	14974	14518	14092	13689	13305	12936
	4.0	19810	19810	19810	19810	19629	19238	18566	17984	17461	16979	16530	16105	15701	15313
13 ft	1.0	4354	4423	4500	3773	3534	3325	2960	2633	2330	2039	1755	1474	1189	896
	1.5	6531	6634	6750	5948	5665	5421	4996	4623	4282	3963	3658	3363	3076	2793
	2.0	8708	8845	9000	8151	7832	7556	7080	6665	6288	5937	5606	5289	4983	4685
	2.5	10885	11057	11250	10374	10022	9718	9196	8742	8332	7953	7596	7256	6929	6614
	3.0	13062	13268	13500	12609	12228	11900	11336	10847	10407	10000	9618	9256	8910	8576
	3.5	15239	15479	15750	14855	14448	14097	13494	12973	12504	12072	11667	11284	10919	10567
	4.0	17416	17691	18000	17108	16677	16305	15667	15115	14620	14164	13737	13334	12950	12581
14 ft	1.0	3835	3884	3939	3200	2973	2774	2425	2110	1815	1529	1246	959	660	341
	1.5	5753	5826	5908	5073	4805	4573	4169	3813	3486	3178	2882	2594	2311	2029
	2.0	7670	7767	7877	6973	6670	6409	5957	5562	5202	4867	4548	4242	3945	3655
	2.5	9588	9709	9847	8891	8557	8270	7775	7344	6954	6592	6250	5924	5610	5305
	3.0	11506	11651	11816	10822	10461	10150	9615	9151	8733	8346	7982	7636	7304	6983
	3.5	13423	13593	13785	12763	12376	12043	11472	10978	10533	10123	9737	9372	9023	8686
	4.0	15341	15535	15754	14711	14301	13948	13343	12820	12351	11918	11512	11129	10762	10410
15 ft	1.0	3395	3430	3470	2736	2520	2330	1994	1690	1400	1116	828	527	198	0
	1.5	5093	5146	5206	4363	4108	3888	3503	3161	2846	2547	2257	1973	1691	1406
	2.0	6790	6861	6941	6015	5728	5480	5050	4673	4328	4005	3698	3400	3111	2826
	2.5	8488	8576	8676	7685	7369	7096	6625	6215	5843	5496	5168	4853	4549	4253
	3.0	10185	10291	10411	9367	9024	8729	8222	7781	7382	7012	6664	6332	6012	5703
	3.5	11883	12006	12146	11059	10692	10376	9834	9365	8941	8550	8182	7832	7497	7173
	4.0	13580	13722	13882	12757	12368	12033	11459	10963	10516	10104	9717	9351	9000	8662

Stud Design Axial Wall Loads (plf)

			Stud 2 x 6		Adjustment Factors		
Load Duration Factor	Wind	1.60	Fb	900.0	/1 = 60 in.	CF (Bending) =	1.30
	Snow	1.15	Fc	1350.0	/2 = Height	CF (Compression) =	1.10
	Live	1.00	Fv	180.0	/U = 60 in.	Cr (Bending) =	1.15
	Dead	.90	E	1.60E+06 psi			

Stud Height	# Studs	Dead	Live	Snow	Wind									
		0 plf	0 plf	0 plf	5.00 plf	7.50 plf	10.00 plf	15.00 plf	20.00 plf	25.00 plf	30.00 plf	35.00 plf	40.00 plf	50.00 plf
8 ft	1.0	2348	2362	2378	2357	2332	2306	2255	2203	2150	2096	2041	1986	1872
	1.5	7230	7367	7522	7660	7595	7530	7400	7271	7142	7014	6886	6758	6502
	2.0	8635	9018	9469	10156	10093	10030	9904	9778	9653	9528	9403	9278	9030
	2.5	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818
	3.0	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149
	3.5	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480
9 ft	4.0	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810
	1.0	2348	2362	2378	2340	2306	2271	2202	2131	2060	1987	1913	1838	1681
	1.5	7230	7367	7522	7592	7494	7398	7207	7020	6836	6655	6475	6298	5948
	2.0	8635	9018	9469	10090	9995	9900	9714	9530	9348	9169	8991	8816	8469
	2.5	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818
	3.0	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149
10 ft	3.5	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480
	4.0	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810
	1.0	2348	2362	2378	2318	2272	2227	2135	2042	1948	1852	1754	1654	1551
	1.5	7230	7367	7522	7478	7330	7187	6913	6653	6403	6161	5926	5697	5472
	2.0	8635	9018	9469	9978	9833	9691	9417	9154	8899	8653	8413	8179	7724
	2.5	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12818	12788
11 ft	3.0	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149	15149
	3.5	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480
	4.0	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810
	1.0	2348	2362	2378	2289	2230	2171	2052	1932	1811	1687	1561	1431	1156
	1.5	7230	7367	7522	7269	7050	6847	6478	6143	5830	5535	5252	4979	4453
	2.0	8635	9018	9469	9768	9544	9335	8949	8595	8265	7952	7654	7367	6819
12 ft	2.5	12818	12818	12818	12818	12818	12818	12818	12710	12253	11831	11434	11059	10355
	3.0	15149	15149	15149	15149	15149	15149	15149	15149	15149	14710	14286	13885	13135
	3.5	17480	17480	17480	17480	17480	17480	17480	17480	17480	17480	17167	16741	15947
	4.0	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19810	19619	18784
	1.0	2348	2362	2378	2252	2176	2100	1949	1798	1646	1492	1334	1170	812
	1.5	7230	7367	7522	6878	6589	6336	5896	5509	5156	4825	4511	4209	3628
13 ft	2.0	8635	9018	9469	9338	9022	8746	8264	7841	7457	7100	6763	6441	5830
	2.5	12410	12659	12818	12211	11840	11519	10965	10485	10051	9650	9274	8916	8244
	3.0	14892	15149	15149	14824	14424	14077	13481	12963	12497	12068	11665	11284	10570
	3.5	17374	17480	17480	17447	17020	16651	16014	15463	14967	14510	14083	13679	12925
	4.0	19810	19810	19810	19810	19625	19234	18560	17977	17453	16971	16521	16095	15302
	1.0	2348	2362	2378	2204	2107	2011	1824	1640	1455	1268	1075	872	399
14 ft	1.5	6531	6634	6750	5933	5646	5398	4967	4588	4242	3916	3606	3306	2723
	2.0	8635	8845	9000	8144	7822	7545	7065	6647	6268	5915	5581	5261	4653
	2.5	10885	11057	11250	10369	10016	9711	9187	8732	8320	7939	7580	7239	6594
	3.0	13062	13268	13500	12606	12224	11895	11330	10840	10398	9990	9608	9244	8562
	3.5	15239	15479	15750	14852	14444	14093	13489	12967	12498	12065	11659	11275	10557
	4.0	17416	17691	18000	17105	16673	16301	15661	15109	14613	14156	13729	13325	12571
15 ft	1.0	2348	2362	2378	2059	1912	1773	1514	1265	1018	763	486	162	0
	1.5	5093	5146	5206	4349	4091	3867	3476	3129	2808	2503	2208	1917	1335
	2.0	6790	6861	6941	6008	5719	5470	5037	4657	4310	3985	3674	3375	2795
	2.5	8488	8576	8676	7681	7363	7089	6617	6206	5831	5483	5153	4838	4235
	3.0	10185	10291	10411	9364	9020	8725	8216	7774	7374	7003	6654	6321	5690
	3.5	11883	12006	12146	11056	10689	10372	9830	9360	8935	8543	8174	7824	7164
16 ft	4.0	13580	13722	13882	12755	12364	12029	11454	10957	10510	10097	9710	9342	8653

Headers/Jamb

Level Loadings

Type	DL	LL	TL
Roof Sloped	25 psf	20 psf	45 psf
Roof Flat	20 psf	25 psf	45 psf
Floor	35 psf	40 psf	75 psf
Public Floor	40 psf	100 psf	140 psf
Public Patio	55 psf	100 psf	155 psf
Storage	40 psf	100 psf	140 psf
Private Deck	55 psf	60 psf	115 psf

Header Grade	Fb
Stud	700
No. 2	900
No. 1	1000
LVL	2600
PSL	2900

Jamb Grade	Fc
Stud	850
No. 2	1350
No. 1	1500
Sel. Struct.	1700

Note: Jack Studs assumed to be braced at 24"oc (weak axis) and L = Stud Height - 1 ft

TL Deflection Criteria

L/ 360

Interior WL 5 psf
Exterior WL 20 psf

*Refer to Forte reports for additional calcs on specified members

Exterior

REVIEWED	C1: 6' Span, TW=16' Roof						Header										Jamb Size						Jack				King					
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity
Roof Sloped	25 psf	20 psf	45 psf	16.0 ft	100 plf	2.0 ft	6 ft	820 plf	(3) 2x	2 x 10	No. 2	Span	1171 plf	0.70	885 plf	No. 2	2x6	Exterior	70 plf	16 in. oc	8 ft	2656 lb	0.79	1	4661 lb	0.57	9 ft	590 lb	60 in.	1	1201 lb	0.49
Floor	35 psf	40 psf	75 psf	1.0 ft	150 plf	2.0 ft	6 ft	225 plf	(3) 2x	2 x 8	No. 2	Span	786 plf	0.29	232 plf	No. 2	2x6	Exterior	70 plf	16 in. oc	8 ft	695 lb	0.22	1	4661 lb	0.15	9 ft	155 lb	60 in.	1	1201 lb	0.13
Floor	35 psf	40 psf	75 psf	1.0 ft	150 plf	2.0 ft	6 ft	225 plf	(3) 2x	2 x 8	No. 2	Span	786 plf	0.29	232 plf	No. 2	2x6	Exterior	70 plf	16 in. oc	8 ft	695 lb	0.22	1	4661 lb	0.15	9 ft	285 lb	60 in.	1	1201 lb	0.24

REVIEWED	C1: 3' Span, TW=7'						Header										Jamb Size						Jack						King					
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity		
Roof Sloped	25 psf	20 psf	45 psf	8.0 ft	100 plf	2.0 ft	3 ft	580 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.22	598 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	898 lb	0.28	1	4661 lb	0.19	9 ft	399 lb	60 in.	1	1772 lb	0.23		
Floor	35 psf	40 psf	75 psf	7.0 ft	150 plf	2.0 ft	3 ft	850 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.33	877 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	1315 lb	0.41	1	4661 lb	0.28	9 ft	585 lb	60 in.	1	1772 lb	0.33		
Floor	35 psf	40 psf	75 psf	7.0 ft	150 plf	2.0 ft	3 ft	850 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.33	877 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	1315 lb	0.41	1	4661 lb	0.28	9 ft	585 lb	60 in.	1	1772 lb	0.33		

REVIEWED	C2: 7' Span Bay Window						Header										Jamb Size						Jack						King					
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity		
Roof Sloped	25 psf	20 psf	45 psf	2.0 ft	100 plf	2.0 ft	7 ft	203 plf	(3) 2x	2 x 8	No. 2	Span	577 plf	0.35	208 plf	No. 2	2x6	Exterior	80 plf	16 in. oc	8 ft	728 lb	0.23	1	4661 lb	0.16	9 ft	139 lb	60 in.	1	971 lb	0.14		
Floor	35 psf	40 psf	75 psf	4.0 ft	100 plf	2.0 ft	7 ft	443 plf	(3) 2x	2 x 8	No. 2	Span	577 plf	0.77	460 plf	No. 2	2x6	Exterior	80 plf	16 in. oc	8 ft	1610 lb	0.50	1	4661 lb	0.35	9 ft	307 lb	60 in.	1	971 lb	0.32		
Floor	35 psf	40 psf	75 psf	4.0 ft	100 plf	2.0 ft	7 ft	443 plf	(3) 2x	2 x 8	No. 2	Span	577 plf	0.77	460 plf	No. 2	2x6	Exterior	80 plf	16 in. oc	8 ft	1610 lb	0.50	1	4661 lb	0.35	9 ft	307 lb	60 in.	1	971 lb	0.32		

REVIEWED	C2: 5' Span Bay Window, TW = 7'						Header										Jamb Size						Jack				King					
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity
Roof Sloped	25 psf	20 psf	45 psf	2.0 ft	100 plf	2.0 ft	5 ft	208 plf	(3) 2x	2 x 8	No. 2	Span	1132 plf	0.18	214 plf	No. 2	2x6	Exterior	60 plf	16 in. oc	8 ft	534 lb	0.17	1	4661 lb	0.11	9 ft	142 lb	60 in.	1	1406 lb	0.10
Floor	35 psf	40 psf	75 psf	7.0 ft	100 plf	2.0 ft	5 ft	730 plf	(3) 2x	2 x 8	No. 2	Span	1132 plf	0.64	763 plf	No. 2	2x6	Exterior	60 plf	16 in. oc	8 ft	1908 lb	0.59	1	4661 lb	0.41	9 ft	509 lb	60 in.	1	1406 lb	0.36
Floor	35 psf	40 psf	75 psf	7.0 ft	100 plf	2.0 ft	5 ft	730 plf	(3) 2x	2 x 8	No. 2	Span	1132 plf	0.64	763 plf	No. 2	2x6	Exterior	60 plf	16 in. oc	8 ft	1908 lb	0.59	1	4661 lb	0.41	9 ft	849 lb	60 in.	1	1406 lb	0.60

REVIEWED	C2 : 3' Span, TW=6' Breez, 6' Floor						Header										Jamb Size						Jack						King					
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity		
Roof Sloped	25 psf	20 psf	45 psf	12.0 ft	100 plf	2.0 ft	3 ft	820 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.31	848 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	1272 lb	0.40	1	4661 lb	0.27	9 ft	565 lb	60 in.	1	1772 lb	0.32		
Private Deck	55 psf	60 psf	115 psf	6.0 ft	580 plf	2.0 ft	3 ft	1500 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.57	1535 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	2303 lb	0.72	1	4661 lb	0.49	9 ft	1024 lb	60 in.	1	1772 lb	0.58		
Private Deck	55 psf	60 psf	115 psf	6.0 ft	580 plf	2.0 ft	3 ft	1500 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.57	1535 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	2303 lb	0.72	1	4661 lb	0.49	9 ft	3829 lb	60 in.	2	11602 lb	0.33		

REVIEWED	C3 : 3' Span, TW=7'						Header										Jamb Size						Jack						King					
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity		
Roof Sloped	25 psf	20 psf	45 psf	12.0 ft	100 plf	2.0 ft	3 ft	820 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.31	848 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	1272 lb	0.40	1	4661 lb	0.27	9 ft	565 lb	60 in.	1	1772 lb	0.32		
Floor	35 psf	40 psf	75 psf	7.0 ft	100 plf	2.0 ft	3 ft	800 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.31	827 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	1240 lb	0.39	1	4661 lb	0.27	9 ft	551 lb	60 in.	1	1772 lb	0.31		
Floor	35 psf	40 psf	75 psf	7.0 ft	100 plf	2.0 ft	3 ft	800 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.31	827 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	1240 lb	0.39	1	4661 lb	0.27	9 ft	759 lb	60 in.	1	1772 lb	0.43		

REVIEWED	C4 : 6' Span						Header										Jamb Size						Jack						King					
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity		
Roof Sloped	25 psf	20 psf	45 psf	16.0 ft	100 plf	2.0 ft	6 ft	820 plf	(3) 2x	2 x 10	No. 2	Span	1171 plf	0.70	885 plf	No. 2	2x6	Exterior	70 plf	16 in. oc	8 ft	2656 lb	0.79	1	4661 lb	0.57	9 ft	590 lb	60 in.	1	1201 lb	0.49		
Private Deck	55 psf	60 psf	115 psf	3.0 ft	100 plf	2.0 ft	6 ft	445 plf	(3) 2x	2 x 8	No. 2	Span	786 plf	0.57	476 plf	No. 2	2x6	Exterior	70 plf	16 in. oc	8 ft	1429 lb	0.43	1	4661 lb	0.31	9 ft	332 lb	60 in.	1	1201 lb	0.28		
Private Deck	55 psf	60 psf	115 psf	3.0 ft	100 plf	2.0 ft	6 ft	445 plf	(3) 2x	2 x 8	No. 2	Span	786 plf	0.57	476 plf	No. 2	2x6	Exterior	70 plf	16 in. oc	8 ft	1429 lb	0.43	1	4661 lb	0.31	9 ft	2079 lb	60 in.	2	10524 lb	0.20		

REVIEWED	C5 : 3' Span, TW=9' Breez, 8' Floor						Header										Jamb Size						Jack						King					
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity		
Roof Sloped	25 psf	20 psf	45 psf	12.0 ft	100 plf	2.0 ft	3 ft	820 plf	(3) 2x	2 x 8	No. 2	Span	2610 plf	0.31	848 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	1272 lb	0.40	1	4661 lb	0.27	9 ft	565 lb	60 in.	1	1772 lb	0.32		
Private Deck	55 psf	60 psf	115 psf	9.0 ft	790 plf	2.0 ft	3 ft	2170 plf	(3) 2x	2 x 10	No. 2	Span	3330 plf	0.65	2223 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	3335 lb	1.05	1	4661 lb	0.72	9 ft	1992 lb	60 in.	2	11602 lb	0.17		
Private Deck	55 psf	60 psf	115 psf	9.0 ft	790 plf	2.0 ft	3 ft	2170 plf	(3) 2x	2 x 10	No. 2	Span	3330 plf	0.65	2223 plf	No. 2	2x6	Exterior	40 plf	16 in. oc	8 ft	3335 lb	1.05	1	4661 lb	0.72	9 ft	6809 lb	60 in.	2	11602 lb	0.59		

Exterior Decks

REVIEWED		F1 : 12' Span, TW=6'					Header								Jamb Size					Jack					King							
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity
Roof Sloped	25 psf	20 psf	45 psf	5.5 ft	50 plf	2.0 ft	11 ft	320 plf	(3) 2x	2 x 10	No. 2	Span	347 plf	0.92	331 plf	No. 2	2x6	Open	5 plf	16 in. oc	8 ft	1820 lb	0.57	3	13984 lb	0.13	9 ft	221 lb	Span	1	733 lb	0.30
Private Deck	55 psf	60 psf	115 psf	5.5 ft	50 plf	1.3 ft	11 ft	738 plf	5.25" PSL	11.25	PSL	24 in.	1387 plf	0.53	732 plf	No. 2	2x6	Open	5 plf	16 in. oc	8 ft	4026 lb	1.31	3	13984 lb	0.29	9 ft	488 lb	Span	1	733 lb	0.67
Private Deck	55 psf	60 psf	115 psf	5.5 ft	50 plf	1.3 ft	11 ft	738 plf	5.25" PSL	11.25	PSL	24 in.	1387 plf	0.53	732 plf	No. 2	2x6	Open	5 plf	16 in. oc	8 ft	4026 lb	1.31	3	13984 lb	0.29	9 ft	488 lb	Span	1	733 lb	0.67

REVIEWED		F2 : 18' Span, TW=6'					Header								Jamb Size					Jack					King							
Level	DL	LL	TL	TW	Adt'l Ld	Truss Spcg	Length	WTTL	Type	Size	Grade	Lu	Wallow	Unity	WTTL	Grade	Jamb Size	Int or Ext	WL	Stud Spcg	HT	Pactual	BRG W Req'd	Jack	Pallow	Unity	HT	Pactual	Lu	King	Pallow	Unity
Roof Sloped	25 psf	20 psf	45 psf	0.0 ft	50 plf	2.0 ft	18 ft	50 plf	3 LVL	14	LVL	24 in.	579 plf	0.09	50 plf	No. 2	2x6	Open	5 plf	16 in. oc	8 ft	450 lb	0.14	3	13984 lb	0.03	9 ft	33 lb	60 in.	1	2333 lb	0.01
Private Deck	55 psf	60 psf	115 psf	5.5 ft	50 plf	2.0 ft	18 ft	683 plf	5.25" PSL	16	PSL	Span	910 plf	0.75	704 plf	No. 2	2x6	Open	5 plf	16 in. oc	8 ft	6339 lb	1.98	3	13984 lb	0.45	9 ft	470 lb	60 in.	1	2333 lb	0.20
Private Deck	55 psf	60 psf	115 psf	5.5 ft	50 plf	2.0 ft	18 ft	683 plf	5.25" PSL	16	PSL	Span	910 plf	0.75	704 plf	No. 2	2x6	Open	5 plf	16 in. oc	8 ft	6339 lb	1.98	3	13984 lb	0.45	9 ft	470 lb	Span	2	5757 lb	0.08

Beam Design Chart Allowable Distributed Loads (plf)

Design Properties

Simple span - Uniformly distributed load

Fb 900 psi

Adjustment Factors

Fc 1350 psi

Repetitive Member No

Fv 180 psi

Load Duration Factor Ten Years (Live) 1

E 1.60E+06 psi

Bending Unbraced Len 24 in.

Plies 2

Size Factor, CF = Used

Δ TL Max L / 360

Δ LL Max L / 480

		Joist Size					
Span	Deflection	(2) 2 x 4	(2) 2 x 6	(2) 2 x 8	(2) 2 x 10	(2) 2 x 12	(2) 2 x 14
3 ft	L / 360	611	1307	1740	2220	2700	3180
	L / 480						
4 ft	L / 360	344	735	1179	1665	2025	2385
	L / 480	298					
5 ft	L / 360	203	471	754	1125	1512	1887
	L / 480	152					
6 ft	L / 360	118	327	524	781	1050	1311
	L / 480	88					
7 ft	L / 360	74	240	385	574	772	963
	L / 480	56	216				
8 ft	L / 360	50	184	295	439	591	737
	L / 480	37	144				
9 ft	L / 360	35	135	233	347	467	583
	L / 480	26	101	232			
10 ft	L / 360	25	99	189	281	378	472
	L / 480	19	74	169			
11 ft	L / 360	19	74	156	232	312	390
	L / 480	14	56	127			
12 ft	L / 360	15	57	131	195	263	328
	L / 480	11	43	98			
13 ft	L / 360	12	45	103	166	224	279
	L / 480	9	34	77	160		
14 ft	L / 360	9	36	82	144	193	241
	L / 480	7	27	62	128		
15 ft	L / 360	8	29	67	125	168	210
	L / 480	6	22	50	104		
16 ft	L / 360	6	24	55	110	148	184
	L / 480	5	18	41	86		
17 ft	L / 360	5	20	46	95	131	163
	L / 480	4	15	34	72	129	
18 ft	L / 360	4	17	39	80	117	146
	L / 480	3	13	29	60	109	
19 ft	L / 360	4	14	33	68	105	131
	L / 480	3	11	25	51	92	
20 ft	L / 360	3	12	28	59	95	118
	L / 480	2	9	21	44	79	

Beam Design Chart Allowable Distributed Loads (plf)

Design Properties

Simple span - midspan load, no support

Adjustment Factors

Repetitive Member No
Load Duration Factor Ten Years (Live) 1
Bending Unbraced Length Span
Size Factor, CF = Used

Fb 900 psi
Fc 1350 psi
Fv 180 psi
E 1.60E+06 psi
Plies 2
Δ TL Max L / 360
Δ LL Max L / 480

		Joist Size					
		(2) 2 x 4	(2) 2 x 6	(2) 2 x 8	(2) 2 x 10	(2) 2 x 12	(2) 2 x 14
3 ft	L / 360	611	1306	1740	2220	2700	3180
	L / 480						
4 ft	L / 360	343	734	1176	1665	2025	2385
	L / 480	298					
5 ft	L / 360	203	469	751	1119	1503	1875
	L / 480	152					
6 ft	L / 360	118	326	521	776	1041	1299
	L / 480	88					
7 ft	L / 360	74	239	382	569	763	951
	L / 480	56	216				
8 ft	L / 360	50	183	292	435	583	726
	L / 480	37	144				
9 ft	L / 360	35	135	231	343	460	572
	L / 480	26	101				
10 ft	L / 360	25	99	186	277	371	462
	L / 480	19	74	169			
11 ft	L / 360	19	74	154	229	306	381
	L / 480	14	56	127			
12 ft	L / 360	15	57	129	192	256	319
	L / 480	11	43	98			
13 ft	L / 360	12	45	103	163	218	271
	L / 480	9	34	77	160		
14 ft	L / 360	9	36	82	140	187	233
	L / 480	7	27	62	128		
15 ft	L / 360	8	29	67	122	163	202
	L / 480	6	22	50	104		
16 ft	L / 360	6	24	55	107	142	177
	L / 480	5	18	41	86		
17 ft	L / 360	5	20	46	94	126	156
	L / 480	4	15	34	72		
18 ft	L / 360	4	17	39	80	112	138
	L / 480	3	13	29	60	109	
19 ft	L / 360	4	14	33	68	100	123
	L / 480	3	11	25	51	92	
20 ft	L / 360	3	12	28	59	90	111
	L / 480	2	9	21	44	79	

Beam Design Chart Allowable Distributed Loads (plf)

Design Properties

Simple span - Uniformly distributed load

Fb 900 psi

Adjustment Factors

Fc 1350 psi

Repetitive Member No

Fv 180 psi

Load Duration Factor Ten Years (Live) 1

E 1.60E+06 psi

Bending Unbraced Len 24 in.

Plies 3

Size Factor, CF = Used

Δ TL Max L / 360

Δ LL Max L / 480

Span	Deflection	Joist Size					
		(3) 2 x 4	(3) 2 x 6	(3) 2 x 8	(3) 2 x 10	(3) 2 x 12	(3) 2 x 14
3 ft	L / 360	918	1965	2610	3330	4050	4770
	L / 480						
4 ft	L / 360	517	1105	1772	2498	3038	3578
	L / 480	447					
5 ft	L / 360	305	707	1134	1692	2275	2840
	L / 480	229					
6 ft	L / 360	176	491	788	1175	1580	1973
	L / 480	132					
7 ft	L / 360	111	361	579	863	1161	1449
	L / 480	83	323				
8 ft	L / 360	74	276	443	661	889	1110
	L / 480	56	217				
9 ft	L / 360	52	203	350	522	702	877
	L / 480	39	152	348			
10 ft	L / 360	38	148	284	423	569	710
	L / 480	29	111	254			
11 ft	L / 360	29	111	234	350	470	587
	L / 480	21	83	191			
12 ft	L / 360	22	86	196	294	395	493
	L / 480	17	64	147			
13 ft	L / 360	17	67	154	250	337	420
	L / 480	13	50	116	240		
14 ft	L / 360	14	54	123	216	290	362
	L / 480	10	40	93	192		
15 ft	L / 360	11	44	100	188	253	316
	L / 480	8	33	75	156		
16 ft	L / 360	9	36	83	165	222	277
	L / 480	7	27	62	129		
17 ft	L / 360	8	30	69	143	197	246
	L / 480	6	23	52	107	193	
18 ft	L / 360	7	25	58	121	176	219
	L / 480	5	19	44	90	163	
19 ft	L / 360	6	22	49	103	158	197
	L / 480	4	16	37	77	138	
20 ft	L / 360	5	18	42	88	142	178
	L / 480	4	14	32	66	119	

Beam Design Chart Allowable Distributed Loads (plf)

Design Properties

Simple span - midspan load, no support

Adjustment Factors

Repetitive Member No
Load Duration Factor Ten Years (Live) 1
Bending Unbraced Len Span
Size Factor, CF = Used

Fb 900 psi
Fc 1350 psi
Fv 180 psi
E 1.60E+06 psi
Plies 3
Δ TL Max L / 360
Δ LL Max L / 480

Span	Deflection	Joist Size					
		(3) 2 x 4	(3) 2 x 6	(3) 2 x 8	(3) 2 x 10	(3) 2 x 12	(3) 2 x 14
3 ft	L / 360	918	1963	2610	3330	4050	4770
	L / 480						
4 ft	L / 360	516	1104	1770	2498	3038	3578
	L / 480	447					
5 ft	L / 360	305	706	1132	1688	2269	2832
	L / 480	229					
6 ft	L / 360	176	490	786	1171	1574	1964
	L / 480	132					
7 ft	L / 360	111	360	577	860	1156	1442
	L / 480	83	323				
8 ft	L / 360	74	276	441	658	884	1103
	L / 480	56	217				
9 ft	L / 360	52	203	349	520	698	871
	L / 480	39	152	348			
10 ft	L / 360	38	148	282	421	565	705
	L / 480	29	111	254			
11 ft	L / 360	29	111	233	347	467	582
	L / 480	21	83	191			
12 ft	L / 360	22	86	196	292	392	489
	L / 480	17	64	147			
13 ft	L / 360	17	67	154	248	333	416
	L / 480	13	50	116	240		
14 ft	L / 360	14	54	123	214	287	358
	L / 480	10	40	93	192		
15 ft	L / 360	11	44	100	186	250	312
	L / 480	8	33	75	156		
16 ft	L / 360	9	36	83	164	220	274
	L / 480	7	27	62	129		
17 ft	L / 360	8	30	69	143	194	242
	L / 480	6	23	52	107	193	
18 ft	L / 360	7	25	58	121	173	216
	L / 480	5	19	44	90	163	
19 ft	L / 360	6	22	49	103	155	194
	L / 480	4	16	37	77	138	
20 ft	L / 360	5	18	42	88	140	174
	L / 480	4	14	32	66	119	

LVL Beam Design Chart

Allowable Distributed Loads (plf)

Design Properties

Simple span - Uniformly distributed load

Adjustment Factors

Repetitive Member No
Load Duration Factor Ten Years (Live) 1
Bending Unbraced Len 24 in.
Size Factor, CF = Used

Fb 2600 psi
Fc 2510 psi
Fv 285 psi
E 1.90E+06 psi
Plies 2
Δ TL Max L / 360
Δ LL Max L / 480

		LVL Depth									
Span	Deflection	(2) 5.50 in.	(2) 7.25 in.	(2) 9.25 in.	(2) 9.50 in.	(2) 11.25 in.	(2) 11.875 in.	(2) 14.00 in.	(2) 16.00 in.	(2) 18.00 in.	(2) 20.00 in.
3 ft	L / 360	2438	3214	4101	4212	4988	5265	6207	7093	7980	8867
	L / 480										
4 ft	L / 360	1829	2411	3076	3159	3741	3948	4655	5320	5985	6650
	L / 480										
5 ft	L / 360	1356	1929	2461	2527	2993	3159	3724	4256	4788	5320
	L / 480										
6 ft	L / 360	942	1575	2050	2106	2494	2632	3103	3547	3990	4433
	L / 480										
7 ft	L / 360	533	1157	1758	1805	2138	2256	2660	3040	3420	3800
	L / 480			1421	1539						
8 ft	L / 360	313	716	1269	1375	1870	1974	2328	2660	2993	3325
	L / 480			952	1031	1712					
9 ft	L / 360	195	447	891	966	1585	1752	2069	2364	2660	2956
	L / 480			668	724	1203	1414				
10 ft	L / 360	128	293	650	704	1169	1375	1862	2128	2394	2660
	L / 480			487	528	877	1031	1690			
11 ft	L / 360	87	200	488	529	878	1033	1593	1935	2176	2418
	L / 480			366	397	659	775	1269	1895		
12 ft	L / 360	62	141	376	407	676	796	1304	1715	1995	2217
	L / 480			282	306	507	597	978	1460		
13 ft	L / 360	45	103	296	320	532	626	1025	1461	1818	2046
	L / 480			222	240	399	469	769	1148	1635	
14 ft	L / 360	33	76	237	257	426	501	821	1225	1568	1900
	L / 480			178	192	320	376	616	919	1309	1795
15 ft	L / 360	25	58	193	209	346	407	667	996	1366	1660
	L / 480			144	156	260	306	501	747	1064	1460
16 ft	L / 360	20	45	159	172	285	336	550	821	1169	1459
	L / 480			119	129	214	252	412	616	877	1203
17 ft	L / 360	15	35	132	143	238	280	459	684	975	1293
	L / 480			99	107	178	210	344	513	731	1003
18 ft	L / 360	12	28	111	121	200	236	386	577	821	1126
	L / 480			84	91	150	177	290	432	616	845
19 ft	L / 360	10	23	95	103	170	200	328	490	698	958
	L / 480			71	77	128	150	246	368	524	718
20 ft	L / 360	8	18	81	88	146	172	282	420	599	821
	L / 480			61	66	110	129	211	315	449	616

LVL Beam Design Chart

Allowable Distributed Loads (plf)

Simple span - Uniformly distributed load

Adjustment Factors

Repetitive Member No

Load Duration Factor Ten Years (Live) 1

Bending Unbraced Len Span

Size Factor, CF = Used

Design Properties

Fb 2600 psi

Fc 2510 psi

Fv 285 psi

E 1.90E+06 psi

Plies 2

Δ TL Max L / 360

Δ LL Max L / 480

		LVL Depth									
Span	Deflection	(2) 5.50 in.	(2) 7.25 in.	(2) 9.25 in.	(2) 9.50 in.	(2) 11.25 in.	(2) 11.875 in.	(2) 14.00 in.	(2) 16.00 in.	(2) 18.00 in.	(2) 20.00 in.
3 ft	L / 360	2438	3214	4101	4212	4988	5265	6207	7093	7980	8867
	L / 480										
4 ft	L / 360	1829	2411	3076	3159	3741	3948	4655	5320	5985	6650
	L / 480										
5 ft	L / 360	1351	1929	2461	2527	2993	3159	3724	4256	4788	5320
	L / 480										
6 ft	L / 360	937	1562	2050	2106	2494	2632	3103	3547	3990	4433
	L / 480										
7 ft	L / 360	533	1145	1758	1805	2138	2256	2660	3040	3420	3800
	L / 480			1421	1539						
8 ft	L / 360	313	716	1269	1375	1870	1974	2328	2660	2993	3325
	L / 480			952	1031	1712					
9 ft	L / 360	195	447	891	966	1538	1695	2069	2364	2660	2956
	L / 480			668	724	1203	1414				
10 ft	L / 360	128	293	650	704	1169	1364	1824	2128	2394	2660
	L / 480			487	528	877	1031	1690			
11 ft	L / 360	87	200	488	529	878	1033	1491	1865	2176	2418
	L / 480			366	397	659	775	1269			
12 ft	L / 360	62	141	376	407	676	796	1238	1540	1842	2132
	L / 480			282	306	507	597	978	1460		
13 ft	L / 360	45	103	296	320	532	626	1025	1285	1526	1754
	L / 480			222	240	399	469	769	1148		
14 ft	L / 360	33	76	237	257	426	501	821	1083	1277	1458
	L / 480			178	192	320	376	616	919		
15 ft	L / 360	25	58	193	209	346	407	667	920	1077	1222
	L / 480			144	156	260	306	501	747	1064	
16 ft	L / 360	20	45	159	172	285	336	550	787	915	1033
	L / 480			119	129	214	252	412	616	877	
17 ft	L / 360	15	35	132	143	238	280	459	677	783	881
	L / 480			99	107	178	210	344	513	731	
18 ft	L / 360	12	28	111	121	200	236	386	577	674	756
	L / 480			84	91	150	177	290	432	616	
19 ft	L / 360	10	23	95	103	170	200	328	490	584	653
	L / 480			71	77	128	150	246	368	524	
20 ft	L / 360	8	18	81	88	146	172	282	420	509	568
	L / 480			61	66	110	129	211	315	449	

LVL Beam Design Chart

Allowable Distributed Loads (plf)

Design Properties

Simple span - Uniformly distributed load

Adjustment Factors

Repetitive Member No
Load Duration Factor Ten Years (Live) 1
Bending Unbraced Len 24 in.
Size Factor, CF = Used

Fb 2600 psi
Fc 2510 psi
Fv 285 psi
E 1.90E+06 psi
Plies 3
 Δ TL Max L / 360
 Δ LL Max L / 480

		LVL Depth									
Span	Deflection	(3) 5.50 in.	(3) 7.25 in.	(3) 9.25 in.	(3) 9.50 in.	(3) 11.25 in.	(3) 11.875 in.	(3) 14.00 in.	(3) 16.00 in.	(3) 18.00 in.	(3) 20.00 in.
3 ft	L / 360	3658	4821	6151	6318	7481	7897	9310	10640	11970	13300
	L / 480										
4 ft	L / 360	2743	3616	4613	4738	5611	5923	6983	7980	8978	9975
	L / 480										
5 ft	L / 360	2038	2893	3691	3791	4489	4738	5586	6384	7182	7980
	L / 480										
6 ft	L / 360	1415	2368	3076	3159	3741	3948	4655	5320	5985	6650
	L / 480										
7 ft	L / 360	800	1740	2636	2708	3206	3384	3990	4560	5130	5700
	L / 480			2131	2309						
8 ft	L / 360	469	1074	1904	2062	2805	2961	3491	3990	4489	4988
	L / 480			1428	1547	2568					
9 ft	L / 360	293	671	1337	1448	2385	2632	3103	3547	3990	4433
	L / 480			1003	1086	1804	2122				
10 ft	L / 360	192	440	975	1056	1753	2062	2793	3192	3591	3990
	L / 480			731	792	1315	1547	2534			
11 ft	L / 360	131	300	732	793	1317	1549	2399	2902	3265	3627
	L / 480			549	595	988	1162	1904	2842		
12 ft	L / 360	93	212	564	611	1015	1193	1956	2584	2993	3325
	L / 480			423	458	761	895	1467	2189		
13 ft	L / 360	67	154	444	481	798	939	1538	2202	2742	3069
	L / 480			333	360	599	704	1154	1722	2452	
14 ft	L / 360	50	115	355	385	639	752	1231	1838	2364	2850
	L / 480			266	289	479	564	924	1379	1963	2693
15 ft	L / 360	38	87	289	313	520	611	1001	1495	2059	2505
	L / 480			217	235	390	458	751	1121	1596	2189
16 ft	L / 360	29	67	238	258	428	503	825	1231	1753	2202
	L / 480			178	193	321	378	619	924	1315	1804
17 ft	L / 360	23	53	198	215	357	420	688	1027	1462	1950
	L / 480			149	161	268	315	516	770	1096	1504
18 ft	L / 360	18	42	167	181	301	354	579	865	1231	1689
	L / 480			125	136	225	265	435	649	924	1267
19 ft	L / 360	15	34	142	154	256	301	493	735	1047	1436
	L / 480			107	115	192	225	369	552	785	1077
20 ft	L / 360	12	27	122	132	219	258	422	631	898	1231
	L / 480			91	99	164	193	317	473	673	924

LVL Beam Design Chart

Allowable Distributed Loads (plf)

Design Properties

Simple span - Uniformly distributed load

Fb 2600 psi

Adjustment Factors

Fc 2510 psi

Repetitive Member No

Fv 285 psi

Load Duration Factor Ten Years (Live) 1

E 1.90E+06 psi

Bending Unbraced Len Span

Plies 3

Size Factor, CF = Used

Δ TL Max L / 360

Δ LL Max L / 480

		LVL Depth									
Span	Deflection	(3) 5.50 in.	(3) 7.25 in.	(3) 9.25 in.	(3) 9.50 in.	(3) 11.25 in.	(3) 11.875 in.	(3) 14.00 in.	(3) 16.00 in.	(3) 18.00 in.	(3) 20.00 in.
3 ft	L / 360	3658	4821	6151	6318	7481	7897	9310	10640	11970	13300
	L / 480										
4 ft	L / 360	2743	3616	4613	4738	5611	5923	6983	7980	8978	9975
	L / 480										
5 ft	L / 360	2034	2893	3691	3791	4489	4738	5586	6384	7182	7980
	L / 480										
6 ft	L / 360	1412	2360	3076	3159	3741	3948	4655	5320	5985	6650
	L / 480										
7 ft	L / 360	800	1733	2636	2708	3206	3384	3990	4560	5130	5700
	L / 480			2131	2309						
8 ft	L / 360	469	1074	1904	2062	2805	2961	3491	3990	4489	4988
	L / 480			1428	1547	2568					
9 ft	L / 360	293	671	1337	1448	2363	2611	3103	3547	3990	4433
	L / 480			1003	1086	1804	2122				
10 ft	L / 360	192	440	975	1056	1753	2062	2793	3192	3591	3990
	L / 480			731	792	1315	1547	2534			
11 ft	L / 360	131	300	732	793	1317	1549	2359	2902	3265	3627
	L / 480			549	595	988	1162	1904	2842		
12 ft	L / 360	93	212	564	611	1015	1193	1956	2526	2993	3325
	L / 480			423	458	761	895	1467	2189		
13 ft	L / 360	67	154	444	481	798	939	1538	2147	2658	3069
	L / 480			333	360	599	704	1154	1722	2452	
14 ft	L / 360	50	115	355	385	639	752	1231	1838	2284	2758
	L / 480			266	289	479	564	924	1379	1963	2693
15 ft	L / 360	38	87	289	313	520	611	1001	1495	1982	2391
	L / 480			217	235	390	458	751	1121	1596	2189
16 ft	L / 360	29	67	238	258	428	503	825	1231	1734	2090
	L / 480			178	193	321	378	619	924	1315	1804
17 ft	L / 360	23	53	198	215	357	420	688	1027	1462	1841
	L / 480			149	161	268	315	516	770	1096	1504
18 ft	L / 360	18	42	167	181	301	354	579	865	1231	1632
	L / 480			125	136	225	265	435	649	924	1267
19 ft	L / 360	15	34	142	154	256	301	493	735	1047	1436
	L / 480			107	115	192	225	369	552	785	1077
20 ft	L / 360	12	27	122	132	219	258	422	631	898	1231
	L / 480			91	99	164	193	317	473	673	924

King studs

Stud Post Design Axial Load (lbs)

			Stud	2 x 6	Adjustment Factors				
Load Duration Factor	Wind	1.60	Fb	900	/1 =	60 in.	CF (Bending) =	1.30	
	Snow	1.15	Fc	1350	/2 =	Height	CF (Compression) =	1.10	
	Live	1.00	Fv	180	/U =	60 in.	Cr (Bending) =	1.00	
	Dead	0.9	E	1.60E+06 psi					

		Dead	Live	Snow	Wind								
Stud Height	# Studs	0 plf	0 plf	0 plf	5 plf	10 plf	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf
8 ft	1	2348	2362	2378	2352	2295	2180	2061	1938	1810	1675	1534	1382
	2	11602	11602	11602	11602	11602	11602	11602	11602	11602	11602	11602	11602
	3	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758
	4	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914
	5	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070
9 ft	1	2348	2362	2378	2333	2257	2101	1940	1772	1595	1406	1201	971
	2	11602	11602	11602	11602	11602	11602	11602	11602	11602	11202	10524	9870
	3	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758
	4	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914
	5	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070
10 ft	1	2348	2362	2378	2308	2208	2003	1790	1567	1327	1063	757	357
	2	11602	11602	11602	11602	11602	11602	10866	10048	9297	8590	7914	7260
	3	16758	16758	16758	16758	16758	16758	16758	16758	15904	15103	14347	13624
	4	21914	21914	21914	21914	21914	21914	21914	21914	21914	21773	20939	20146
	5	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	26787
11 ft	1	2348	2362	2378	2277	2146	1881	1607	1318	998	620	58	0
	2	11346	11602	11602	11342	10624	9540	8658	7876	7155	6471	5812	5167
	3	16758	16758	16758	16758	16629	15357	14330	13430	12610	11845	11119	10422
	4	21914	21914	21914	21914	21914	21267	20116	19111	18201	17356	16560	15801
	5	27070	27070	27070	27070	27070	27070	25976	24878	23885	22966	22104	21285
12 ft	1	2348	2362	2378	2236	2068	1734	1392	1024	594	0	0	0
	2	9928	10127	10352	9504	8820	7792	6952	6204	5508	4842	4193	3549
	3	14892	15191	15527	14697	13888	12680	11706	10851	10069	9335	8636	7961
	4	19856	20254	20703	19933	19020	17658	16566	15613	14748	13943	13182	12454
	5	24820	25318	25879	25195	24192	22695	21496	20455	19513	18640	17819	17037
13 ft	1	2348	2362	2378	2183	1971	1562	1146	686	53	0	0	0
	2	8708	8845	9000	8043	7394	6419	5618	4898	4222	3567	2919	2262
	3	13062	13268	13500	12485	11716	10571	9647	8831	8082	7375	6697	6038
	4	17416	17691	18000	16968	16098	14807	13772	12867	12042	11273	10542	9841
	5	21770	22113	22500	21478	20518	19098	17963	16975	16080	15248	14464	13716
14 ft	1	2348	2362	2378	2115	1854	1369	877	293	0	0	0	0
	2	7670	7767	7877	6870	6255	5328	4560	3863	3200	2548	1888	1197
	3	11506	11651	11816	10704	9975	8889	8009	7229	6507	5822	5159	4509
	4	15341	15535	15754	14578	13751	12528	11545	10683	9894	9155	8450	7770
	5	19176	19419	19693	18477	17565	16218	15142	14203	13350	12555	11803	11082
15 ft	1	2348	2362	2378	2027	1717	1161	590	0	0	0	0	0
	2	6790	6861	6941	5918	5334	4449	3709	3030	2374	1714	1022	254
	3	10185	10291	10411	9255	8563	7531	6690	5940	5241	4572	3918	3268
	4	13580	13722	13882	12631	11846	10685	9749	8924	8166	7453	6768	6103
	5	16976	17152	17352	16031	15164	13887	12863	11968	11151	10388	9663	8965

KING STUDS

Stud Post Design Axial Load (lbs)

Load Duration Factor	Wind	1.60	Stud	2 x 6	Adjustment Factors			
	Snow	1.15	Fb	900	I1 =	180 in.	CF (Bending) =	1.30
	Live	1.00	Fc	1350	I2 =	Height	CF (Compression) =	1.10
	Dead	0.9	Fv	180	IU =	180 in.	Cr (Bending) =	1.00
			E	1.60E+06 psi				

		Dead	Live	Snow	Wind								
Stud Height	# Studs	0 plf	0 plf	0 plf	5 plf	10 plf	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf
8 ft	1	949	951	953	934	910	861	810	755	697	634	566	489
	2	7068	7146	7235	7302	7212	7032	6851	6669	6485	6299	6112	5922
	3	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758	16758
	4	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914
	5	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070
9 ft	1	753	754	755	733	707	653	594	530	459	376	273	110
	2	5712	5757	5809	5811	5720	5536	5351	5164	4975	4784	4589	4392
	3	16758	16758	16758	16758	16758	16758	16758	16365	15811	15275	14752	14242
	4	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914	21914
	5	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070
10 ft	1	612	612	613	588	559	499	431	352	254	94	0	0
	2	4696	4724	4757	4723	4630	4444	4255	4064	3870	3672	3470	3263
	3	14460	14734	15044	15223	14879	14232	13625	13049	12496	11963	11443	10936
	4	21914	21914	21914	21914	21914	21914	21914	21914	21914	21757	20922	20127
	5	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	27070	26760
11 ft	1	506	507	508	479	448	380	298	190	0	0	0	0
	2	3921	3940	3961	3907	3813	3624	3432	3237	3038	2833	2621	2402
	3	12339	12515	12713	12689	12339	11688	11083	10513	9967	9441	8928	8426
	4	21914	21914	21914	21914	21914	21258	20104	19097	18184	17337	16539	15779
	5	27070	27070	27070	27070	27070	27070	25959	24858	23862	22940	22075	21253
12 ft	1	426	427	427	396	362	283	178	0	0	0	0	0
	2	3320	3333	3347	3280	3185	2994	2799	2599	2393	2179	1956	1719
	3	10601	10719	10852	10707	10354	9705	9108	8546	8010	7491	6986	6488
	4	19856	20254	20703	19929	19013	17648	16553	15597	14729	13922	13159	12429
	5	24820	25318	25879	25188	24182	22680	21477	20432	19487	18611	17786	17002
13 ft	1	364	364	364	330	293	200	0	0	0	0	0	0
	2	2845	2854	2864	2788	2693	2499	2300	2095	1882	1657	1415	1149
	3	9180	9261	9354	9133	8780	8137	7550	6999	6472	5961	5460	4964
	4	17416	17691	18000	16963	16090	14796	13757	12849	12022	11250	10517	9813
	5	21770	22113	22500	21470	20507	19081	17942	16950	16051	15216	14428	13676
14 ft	1	314	314	314	278	236	121	0	0	0	0	0	0
	2	2464	2470	2478	2396	2299	2103	1901	1690	1466	1225	955	634
	3	8011	8070	8136	7866	7515	6880	6304	5763	5245	4739	4241	3741
	4	15341	15535	15754	14572	13743	12516	11529	10664	9872	9130	8422	7739
	5	19176	19419	19693	18469	17553	16200	15119	14176	13319	12520	11764	11039
15 ft	1	274	274	274	234	188	0	0	0	0	0	0	0
	2	2153	2158	2164	2078	1981	1782	1575	1356	1119	853	529	13
	3	7044	7086	7135	6833	6484	5860	5295	4763	4252	3749	3248	2739
	4	13580	13722	13882	12625	11838	10672	9732	8904	8143	7425	6737	6068
	5	16976	17152	17352	16022	15151	13868	12839	11939	11118	10350	9620	8918

KING STUDS

Stud Post Design Axial Load (lbs)

			Stud	2 x 4	Adjustment Factors				
Load Duration Factor	Wind	1.60	Fb	900	/1 =	60 in.	CF (Bending) =	1.50	
	Snow	1.15	Fc	1350	/2 =	Height	CF (Compression) =	1.15	
	Live	1.00	Fv	180	/U =	60 in.	Cr (Bending) =	1.00	
	Dead	0.9	E	1.60E+06 psi					

Stud Height	# Studs	Dead	Live	Snow	Wind								
		0 plf	0 plf	0 plf	5 plf	10 plf	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf
8 ft	1	899	904	910	806	685	404	0	0	0	0	0	0
	2	5601	5835	6108	5498	5073	4434	3910	3441	3002	2580	2164	1747
	3	8856	9000	9163	8608	8144	7455	6901	6415	5972	5558	5163	4783
	4	11808	12000	12217	11669	11142	10362	9738	9195	8703	8246	7814	7401
	5	14760	15001	15272	14746	14166	13305	12619	12024	11487	10989	10522	10078
9 ft	1	899	904	910	761	596	176	0	0	0	0	0	0
	2	4821	4877	4940	4280	3889	3300	2810	2366	1941	1523	1096	646
	3	7232	7315	7410	6751	6325	5692	5181	4731	4316	3925	3550	3184
	4	9642	9754	9879	9179	8694	7978	7404	6903	6446	6020	5615	5225
	5	12053	12192	12349	11622	11085	10295	9666	9118	8622	8161	7725	7310
10 ft	1	899	904	910	705	488	0	0	0	0	0	0	0
	2	3989	4024	4063	3401	3041	2492	2029	1599	1178	745	271	0
	3	5984	6036	6094	5407	5014	4430	3955	3532	3139	2765	2400	2040
	4	7979	8048	8125	7373	6926	6266	5735	5268	4840	4437	4052	3678
	5	9974	10059	10157	9353	8858	8131	7549	7041	6578	6146	5736	5343
11 ft	1	899	904	910	635	363	0	0	0	0	0	0	0
	2	3346	3368	3393	2751	2416	1899	1455	1032	598	112	0	0
	3	5019	5052	5090	4408	4045	3501	3054	2653	2276	1911	1549	1182
	4	6691	6736	6787	6028	5615	5003	4507	4068	3662	3277	2905	2540
	5	8364	8420	8483	7662	7205	6531	5989	5514	5078	4669	4278	3900
12 ft	1	899	904	910	555	224	0	0	0	0	0	0	0
	2	2841	2856	2873	2257	1943	1453	1022	593	116	0	0	0
	3	4261	4284	4310	3648	3309	2799	2376	1991	1624	1261	890	498
	4	5682	5712	5747	5004	4620	4047	3580	3164	2775	2402	2037	1673
	5	7102	7140	7183	6373	5948	5319	4811	4363	3949	3557	3180	2811
13 ft	1	899	904	910	467	71	0	0	0	0	0	0	0
	2	2440	2450	2463	1874	1579	1110	683	232	0	0	0	0
	3	3659	3675	3694	3057	2740	2258	1854	1481	1117	746	349	0
	4	4879	4901	4925	4207	3848	3310	2867	2468	2092	1725	1360	986
	5	6099	6126	6156	5369	4972	4382	3903	3476	3079	2701	2332	1966
14 ft	1	899	904	910	378	0	0	0	0	0	0	0	0
	2	2116	2124	2133	1573	1292	839	409	0	0	0	0	0
	3	3174	3186	3199	2590	2292	1834	1444	1077	709	316	0	0
	4	4232	4248	4265	3577	3239	2730	2307	1921	1553	1187	812	412
	5	5290	5310	5332	4574	4201	3645	3189	2780	2396	2026	1659	1290
15 ft	1	899	904	910	292	0	0	0	0	0	0	0	0
	2	1852	1858	1864	1331	1064	622	176	0	0	0	0	0
	3	2778	2787	2797	2215	1932	1495	1116	751	368	0	0	0
	4	3704	3716	3729	3070	2751	2266	1860	1484	1118	745	346	0
	5	4630	4644	4661	3934	3583	3055	2619	2224	1850	1483	1113	729

KING STUDS

Stud Post Design Axial Load (lbs)

Load Duration Factor	Wind	1.60	Stud	2 x 4	Adjustment Factors			
	Snow	1.15	Fb	900	/1 =	Height	CF (Bending) =	1.50
	Live	1.00	Fc	1350	/2 =	Height	CF (Compression) =	1.15
	Dead	0.9	Fv	180	/U =	Height	Cr (Bending) =	1.00
			E	1.60E+06 psi				

Stud Height	# Studs	Dead	Live	Snow	Wind								
		0 plf	0 plf	0 plf	5 plf	10 plf	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf
8 ft	1	363	363	364	325	280	163	0	0	0	0	0	0
	2	2712	2740	2772	2724	2622	2419	2219	2019	1816	1608	1393	1166
	3	7757	8027	8338	8254	7836	7194	6669	6207	5783	5385	5006	4640
	4	11808	12000	12217	11665	11136	10353	9727	9182	8687	8228	7794	7380
	5	14760	15001	15272	14739	14156	13291	12601	12003	11462	10962	10492	10045
9 ft	1	288	288	289	246	196	3	0	0	0	0	0	0
	2	2189	2205	2224	2151	2048	1843	1640	1434	1223	1000	757	477
	3	6572	6733	6915	6556	6154	5547	5053	4615	4212	3831	3465	3107
	4	9642	9754	9879	9173	8686	7966	7389	6885	6426	5997	5589	5197
	5	12053	12192	12349	11614	11073	10277	9643	9091	8590	8125	7686	7267
10 ft	1	234	234	234	189	132	0	0	0	0	0	0	0
	2	1798	1808	1820	1734	1629	1423	1217	1005	779	525	204	0
	3	5567	5666	5777	5288	4909	4340	3875	3460	3075	2706	2347	1991
	4	7979	8048	8125	7366	6916	6252	5717	5246	4815	4409	4020	3643
	5	9974	10059	10157	9343	8843	8109	7521	7007	6540	6103	5688	5289
11 ft	1	193	194	194	145	74	0	0	0	0	0	0	0
	2	1500	1507	1515	1421	1316	1109	898	675	420	71	0	0
	3	4741	4804	4875	4329	3974	3439	2999	2603	2230	1868	1509	1143
	4	6691	6736	6787	6021	5604	4986	4486	4042	3632	3243	2866	2496
	5	8364	8420	8483	7650	7187	6505	5956	5474	5032	4617	4219	3834
12 ft	1	163	163	163	109	0	0	0	0	0	0	0	0
	2	1270	1274	1280	1181	1075	867	650	407	75	0	0	0
	3	4068	4110	4158	3592	3259	2754	2335	1953	1587	1225	853	458
	4	5682	5712	5747	4996	4608	4029	3557	3135	2741	2362	1991	1620
	5	7102	7140	7183	6359	5928	5289	4773	4316	3895	3495	3110	2732
13 ft	1	139	139	139	79	0	0	0	0	0	0	0	0
	2	1088	1091	1095	993	887	676	450	165	0	0	0	0
	3	3519	3548	3581	3015	2701	2223	1821	1448	1083	710	307	0
	4	4879	4901	4925	4198	3834	3289	2840	2435	2051	1678	1304	920
	5	6099	6126	6156	5354	4950	4349	3859	3423	3016	2628	2248	1870
14 ft	1	120	120	120	52	0	0	0	0	0	0	0	0
	2	942	944	947	843	737	523	279	0	0	0	0	0
	3	3069	3090	3114	2557	2260	1804	1415	1047	676	275	0	0
	4	4232	4248	4265	3567	3224	2707	2276	1883	1506	1131	743	325
	5	5290	5310	5332	4557	4176	3607	3139	2719	2323	1940	1559	1173
15 ft	1	104	105	105	20	0	0	0	0	0	0	0	0
	2	823	825	827	721	615	396	120	0	0	0	0	0
	3	2697	2712	2730	2188	1906	1468	1088	720	330	0	0	0
	4	3704	3716	3729	3059	2734	2241	1825	1441	1064	677	257	0
	5	4630	4644	4661	3915	3555	3012	2563	2154	1765	1382	992	581

JACK STUDS

Stud Post Design Axial Load (lbs)

Load Duration Factor	Wind	1.60	Stud 2 x 4	Fb	900	I1 = 24 in.	Adjustment Factors	
	Snow	1.15		Fc	1350		CF (Bending) =	1.50
	Live	1.00		Fv	180		CF (Compression) =	1.15
	Dead	0.9		E	1.60E+06 psi		Cr (Bending) =	1.00

Stud Height	# Studs	Dead	Live	Snow	Wind								
		0 plf	0 plf	0 plf	5 plf	10 plf	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf
7 ft	1	2966	2966	2966	2966	2966	2639	2233	1861	1505	1150	784	389
	2	5933	5933	5933	5933	5933	5933	5751	5298	4883	4493	4119	3757
	3	8899	8899	8899	8899	8899	8899	8899	8870	8392	7948	7528	7127
	4	11865	11865	11865	11865	11865	11865	11865	11865	11865	11499	11035	10594
	5	14831	14831	14831	14831	14831	14831	14831	14831	14831	14831	14611	14133
8 ft	1	2952	2966	2966	2589	2296	1846	1462	1101	738	351	0	0
	2	5904	5933	5933	5574	5185	4604	4131	3711	3322	2951	2591	2236
	3	8856	8899	8899	8610	8147	7459	6907	6423	5981	5567	5174	4795
	4	11808	11865	11865	11672	11147	10370	9748	9207	8716	8260	7830	7420
	5	14760	14831	14831	14751	14173	13316	12633	12041	11506	11011	10546	10103
9 ft	1	2411	2438	2470	1993	1723	1302	932	568	168	0	0	0
	2	4821	4877	4940	4350	3993	3458	3018	2623	2251	1891	1533	1171
	3	7232	7315	7410	6753	6328	5696	5187	4737	4324	3934	3560	3195
	4	9642	9754	9879	9182	8698	7985	7413	6914	6459	6034	5630	5243
	5	12053	12192	12349	11627	11092	10306	9679	9134	8639	8181	7748	7334
10 ft	1	1995	2012	2031	1565	1315	916	550	158	0	0	0	0
	2	3989	4024	4063	3465	3137	2640	2226	1849	1487	1127	756	357
	3	5984	6036	6094	5409	5017	4434	3960	3538	3147	2774	2410	2051
	4	7979	8048	8125	7376	6930	6272	5743	5278	4851	4450	4067	3695
	5	9974	10059	10157	9357	8865	8140	7561	7055	6595	6165	5757	5366
11 ft	1	1673	1684	1697	1249	1015	631	257	0	0	0	0	0
	2	3346	3368	3393	2810	2505	2039	1646	1279	918	543	125	0
	3	5019	5052	5090	4410	4047	3504	3059	2659	2283	1920	1559	1194
	4	6691	6736	6787	6031	5619	5009	4514	4077	3673	3290	2919	2556
	5	8364	8420	8483	7666	7211	6540	6000	5527	5094	4687	4298	3922
12 ft	1	1420	1428	1437	1010	789	414	8	0	0	0	0	0
	2	2841	2856	2873	2312	2027	1587	1208	846	473	51	0	0
	3	4261	4284	4310	3649	3312	2803	2381	1997	1631	1269	901	511
	4	5682	5712	5747	5006	4623	4053	3588	3173	2786	2415	2052	1690
	5	7102	7140	7183	6376	5953	5327	4822	4375	3964	3574	3199	2833
13 ft	1	1220	1225	1231	826	615	242	0	0	0	0	0	0
	2	2440	2450	2463	1926	1658	1239	870	503	95	0	0	0
	3	3659	3675	3694	3059	2742	2262	1859	1486	1124	755	360	0
	4	4879	4901	4925	4210	3852	3315	2874	2477	2102	1738	1374	1003
	5	6099	6126	6156	5373	4977	4390	3913	3488	3094	2717	2351	1988
14 ft	1	1058	1062	1066	681	478	98	0	0	0	0	0	0
	2	2116	2124	2133	1621	1368	966	601	217	0	0	0	0
	3	3174	3186	3199	2592	2294	1837	1449	1083	717	326	0	0
	4	4232	4248	4265	3579	3242	2735	2313	1930	1563	1199	827	431
	5	5290	5310	5332	4577	4206	3652	3198	2792	2410	2042	1679	1312

JACIE STROS

Stud Post Design Axial Load (lbs)

			Stud 2 x 6		Adjustment Factors		
Load Duration Factor	Wind	1.60	Fb	900	I1 = 24 in.	CF (Bending) =	1.30
	Snow	1.15	Fc	1350	I2 = Height	CF (Compression) =	1.10
	Live	1.00	Fv	180	IU = 24 in.	Cr (Bending) =	1.00
	Dead	0.9	E	1.60E+06 psi			

		Dead	Live	Snow	Wind								
Stud Height	# Studs	0 plf	0 plf	0 plf	5 plf	10 plf	20 plf	30 plf	40 plf	50 plf	60 plf	70 plf	80 plf
7 ft	1	4661	4661	4661	4661	4661	4661	4661	4661	4661	4661	4661	4593
	2	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323
	3	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984
	4	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645
	5	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306
8 ft	1	4661	4661	4661	4661	4661	4661	4661	4661	4661	4350	3923	3491
	2	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323
	3	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984
	4	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645
	5	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306
9 ft	1	4661	4661	4661	4661	4661	4661	4661	4409	3867	3334	2799	2252
	2	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323
	3	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984
	4	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645
	5	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306
10 ft	1	4661	4661	4661	4661	4661	4661	4182	3531	2906	2285	1648	968
	2	9323	9323	9323	9323	9323	9323	9323	9323	9322	8618	7946	7295
	3	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984	13984	13639
	4	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645	18645
	5	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306	23306
11 ft	1	4661	4661	4661	4661	4661	3921	3212	2554	1908	1244	519	0
	2	9323	9323	9323	9323	9323	9323	8675	7897	7179	6499	5843	5203
	3	13984	13984	13984	13984	13984	13984	13984	13439	12621	11857	11132	10436
	4	18645	18645	18645	18645	18645	18645	18645	18645	18209	17365	16570	15812
	5	23306	23306	23306	23306	23306	23306	23306	23306	23306	22979	22118	21300
12 ft	1	4661	4661	4661	4403	3885	3085	2398	1745	1079	344	0	0
	2	9323	9323	9323	9323	8828	7804	6969	6224	5531	4869	4224	3584
	3	13984	13984	13984	13984	13892	12686	11714	10860	10079	9346	8649	7975
	4	18645	18645	18645	18645	18645	17663	16572	15620	14755	13951	13192	12465
	5	23306	23306	23306	23306	23306	22701	21504	20464	19523	18652	17832	17052
13 ft	1	4354	4423	4500	3691	3200	2433	1761	1100	383	0	0	0
	2	8708	8845	9000	8048	7402	6431	5634	4917	4244	3594	2950	2299
	3	13062	13268	13500	12487	11719	10577	9654	8840	8092	7386	6710	6052
	4	17416	17691	18000	16970	16100	14811	13777	12873	12050	11281	10552	9851
	5	21770	22113	22500	21480	20522	19103	17970	16984	16090	15260	14477	13730
14 ft	1	3835	3884	3939	3121	2655	1916	1251	565	0	0	0	0
	2	7670	7767	7877	6875	6263	5339	4575	3882	3223	2575	1920	1236
	3	11506	11651	11816	10706	9978	8894	8015	7236	6516	5833	5171	4522
	4	15341	15535	15754	14579	13754	12532	11550	10689	9901	9163	8459	7780
	5	19176	19419	19693	18480	17569	16224	15149	14212	13360	12566	11815	11096

Stud Post Design Axial Load (lbs)

Bending Member Analysis

Brandon Ford

General Member Specifications

Member Type	Visually Graded	▼
Nominal Size	2 x 8	▼
Species	Southern Pine	▼
Grade	No. 2	▼
Grade -- For C_F	Select, No.1, No.2 or No.3	▼

Custom Breadth	b =	
Depth	d =	
Number of Plies	N =	1 Plies

Load Duration?	Ten Years (Live)	▼
Operating Temperature	T < 100 F	▼
Cross Section Shape	Rectangle	▼
Wet Service?	No	▼
Incising?	No	▼
Flat Use?	No	▼
Repetitive Member?	Yes	▼
Truss Chord?	No	▼

Member Characteristics

Axial Compression Load	P =	0 lb
Applied Bending Moment	M =	7,900 in-lb
Maximum Shear Force	V =	439 lb
Column Unbraced Length (1-1 axis):	$I_1 =$	72.0 in.
Column Unbraced Length (2-2 axis):	$I_2 =$	72.0 in.
End Conditions: for 1-1 axis:	pinned-pinned	▼
for 2-2 axis:	pinned-pinned	▼
Bending Unbraced Length:	$I_u =$	24.0 in.

Bending Support	Simple span - Uniformly distributed load	▼
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Cross-Section Properties

Breadth	b =	1.50 in.
Depth	d =	7.25 in.
Area	A =	10.88 in ²
Section Modulus	S =	13.14 in ³
Size Classification	Dimension Lumber	

Computed Data

Bending Effective Length:	$l_e =$	49.4 in.
Bending Slenderness Ratio:	$R_B =$	12.62
Effective Length Factors:	$K_{e1} =$	1.00
	$K_{e2} =$	1.00
Slenderness Ratios:	$l_{e1}/d_1 =$	48.0
	$l_{e2}/d_2 =$	9.9
max slenderness ratio:	$l_e/d =$	48.0
Applied Compressive Stress:	$f_c =$	0 psi
Applied Bending Stress:	$f_b =$	601 psi
Applied Shear Stress:	$f_v =$	61 psi

Compressive Capacity:	$P_{allowable} =$	1,914 lb
Compression Unity Check:	$f_c / F_c' =$	0.000
Bending Capacity:	$M_{allowable} =$	13,361 in-lb
Bending Unity Check:	$f_b / F_b' =$	0.591
Shear Capacity:	$V_{allowable} =$	1,269 lb
Shear Unity Check:	$f_v / F_v' =$	0.346

Project:

Typical Deck Joist

Units: inches, pounds

Tabulated Design Values

Flexural Strength	$F_b =$	750 psi
Compressive Strength	$F_c =$	1,100 psi
Shear Strength	$F_v =$	175 psi
Modulus of Elasticity	E =	1.40E+06 psi

Adjustment Factors on F_c

Load Duration Factor	$C_D =$	1.00
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Size Factor	$C_F =$	1.05
Incising Factor	$C_i =$	1.00

Adjustment Factors on F_b

Load Duration Factor	$C_D =$	1.00
Size Factor	$C_F =$	1.20
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Flat Use Factor	$C_{fu} =$	1.00
Incising Factor	$C_i =$	1.00
Repetitive Member Factor	$C_r =$	1.15
Form Factor	$C_f =$	1.00

Adjustments for Shear

Load Duration Factor	$C_D =$	1.00
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Incising Factor	$C_i =$	1.00
Shear Stress Factor	$C_H =$	1.00

Adjustment Factors on E

Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Incising Factor	$C_i =$	1.00

Member Strength

Adjusted Shear Strength	$F_v' =$	175 psi
Adjusted Compressive Strength	$F_c' =$	1,155 psi
Adjusted MOE	E' =	1.40E+06 psi
	$K_{CE} =$	.30
Euler Stress	$F_{CE} =$	182 psi
Column Stress Ratio	$F_{CE} / F_c' =$	0.158
Stress-strain Curve Factor	c =	0.80
Column Stability Factor	$C_P =$	0.152
Allowable Compressive Stress	$F_c' =$	176 psi
Adjusted Bending Strength	$F_b' =$	1,035 psi
Lateral Buckling Coefficient	$K_{bE} =$	0.439
Lateral Buckling Stress	$F_{bE} =$	3,858 psi
Bending Stress Ratio	$F_{bE} / F_b' =$	3.728
Beam Stability Factor	$C_L =$	0.982
Allowable Bending Stress	$F_b' =$	1,017 psi

Interaction:

Strong Axis Euler Stress	$F_{cE1} =$	4,259 psi
Moment Magnifier	B =	1.000
Eq. (3.9-3)	I =	0.591

Member Status

OK

Bending Member Analysis

Brandon Ford

General Member Specifications

Member Type	Visually Graded	▼
Nominal Size	2 x 12	▼
Species	Southern Pine	▼
Grade	No. 2	▼
Grade -- For C_F	Select, No.1, No.2 or No.3	▼

Custom Breadth	$b =$	
Depth	$d =$	
Number of Plies	$N =$	1 Plies

Load Duration?	Ten Years (Live)	▼
Operating Temperature	$T < 100$ F	▼
Cross Section Shape	Rectangle	▼
Wet Service?	No	▼
Incising?	No	▼
Flat Use?	No	▼
Repetitive Member?	Yes	▼
Truss Chord?	No	▼

Member Characteristics

Axial Compression Load	$P =$	0 lb
Applied Bending Moment	$M =$	26,553 in-lb
Maximum Shear Force	$V =$	805 lb
Column Unbraced Length (1-1 axis):	$l_1 =$	132.0 in.
Column Unbraced Length (2-2 axis):	$l_2 =$	132.0 in.
End Conditions: for 1-1 axis:	pinned-pinned	▼
for 2-2 axis:	pinned-pinned	▼
Bending Unbraced Length:	$l_u =$	24.0 in.

Bending Support: Simple span - Uniformly distributed load ▼

Cross-Section Properties

Breadth	$b =$	1.50 in.
Depth	$d =$	11.25 in.
Area	$A =$	16.88 in ²
Section Modulus	$S =$	31.64 in ³
Size Classification	Dimension Lumber	

Computed Data

Bending Effective Length:	$l_e =$	49.4 in.
Bending Slenderness Ratio:	$R_B =$	15.72
Effective Length Factors:	$K_{e1} =$	1.00
	$K_{e2} =$	1.00
Slenderness Ratios:	$l_{e1}/d_1 =$	88.0
	$l_{e2}/d_2 =$	11.7
max slenderness ratio:	$l_e/d =$	88.0
Applied Compressive Stress:	$f_c =$	0 psi
Applied Bending Stress:	$f_b =$	839 psi
Applied Shear Stress:	$f_v =$	72 psi

Compressive Capacity:	$P_{allowable} =$	906 lb
Compression Unity Check:	$f_c / F_c' =$	0.000
Bending Capacity:	$M_{allowable} =$	26,610 in-lb
Bending Unity Check:	$f_b / F_b' =$	0.998
Shear Capacity:	$V_{allowable} =$	1,969 lb
Shear Unity Check:	$f_v / F_v' =$	0.409

Project:

2X12 Breezeway Joists (L=11')

Units: inches, pounds

Tabulated Design Values

Flexural Strength	$F_b =$	750 psi
Compressive Strength	$F_c =$	1,100 psi
Shear Strength	$F_v =$	175 psi
Modulus of Elasticity	$E =$	1.40E+06 psi

Adjustment Factors on F_c

Load Duration Factor	$C_D =$	1.00
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Size Factor	$C_F =$	1.00
Incising Factor	$C_i =$	1.00

Adjustment Factors on F_b

Load Duration Factor	$C_D =$	1.00
Size Factor	$C_F =$	1.00
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Flat Use Factor	$C_{fu} =$	1.00
Incising Factor	$C_i =$	1.00
Repetitive Member Factor	$C_r =$	1.15
Form Factor	$C_f =$	1.00

Adjustments for Shear

Load Duration Factor	$C_D =$	1.00
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Incising Factor	$C_i =$	1.00
Shear Stress Factor	$C_H =$	1.00

Adjustment Factors on E

Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Incising Factor	$C_i =$	1.00

Member Strength

Adjusted Shear Strength	$F_v' =$	175 psi
Adjusted Compressive Strength	$F_c' =$	1,100 psi
Adjusted MOE	$E' =$	1.40E+06 psi
	$K_{CE} =$	.30
Euler Stress	$F_{CE} =$	54 psi
Column Stress Ratio	$F_{CE} / F_c' =$	0.049
Stress-strain Curve Factor	$c =$	0.80
Column Stability Factor	$C_P =$	0.049
Allowable Compressive Stress	$F_c' =$	54 psi
Adjusted Bending Strength	$F_b' =$	863 psi
Lateral Buckling Coefficient	$K_{bE} =$	0.439
Lateral Buckling Stress	$F_{bE} =$	2,486 psi
Bending Stress Ratio	$F_{bE} / F_b' =$	2.883
Beam Stability Factor	$C_L =$	0.975
Allowable Bending Stress	$F_b' =$	841 psi

Interaction:

Strong Axis Euler Stress	$F_{cE1} =$	3,051 psi
Moment Magnifier	$B =$	1.000
Eq. (3.9-3)	$I =$	0.998

Member Status

OK

Bending Member Analysis

Brandon Ford

General Member Specifications

Member Type	Visually Graded	▼
Nominal Size	2 x 12	▼
Species	Southern Pine	▼
Grade	No. 2	▼
Grade -- For C_F	Select, No.1, No.2 or No.3	▼

Custom Breadth	$b =$	
Depth	$d =$	
Number of Plies	$N =$	2 Plies

Load Duration?	Ten Years (Live)	▼
Operating Temperature	$T < 100$ F	▼
Cross Section Shape	Rectangle	▼
Wet Service?	No	▼
Incising?	No	▼
Flat Use?	No	▼
Repetitive Member?	Yes	▼
Truss Chord?	No	▼

Member Characteristics

Axial Compression Load	$P =$	1 lb
Applied Bending Moment	$M =$	56,179 in-lb
Maximum Shear Force	$V =$	1,170 lb
Column Unbraced Length (1-1 axis):	$l_1 =$	192.0 in.
Column Unbraced Length (2-2 axis):	$l_2 =$	192.0 in.
End Conditions: for 1-1 axis:	pinned-pinned	▼
for 2-2 axis:	pinned-pinned	▼
Bending Unbraced Length:	$l_u =$	24.0 in.

Bending Support: Simple span - Uniformly distributed load ▼

Cross-Section Properties

Breadth	$b =$	3.00 in.
Depth	$d =$	11.25 in.
Area	$A =$	33.75 in ²
Section Modulus	$S =$	63.28 in ³
Size Classification	Dimension Lumber	

Computed Data

Bending Effective Length:	$l_e =$	49.4 in.
Bending Slenderness Ratio:	$R_B =$	7.86
Effective Length Factors:	$K_{e1} =$	1.00
	$K_{e2} =$	1.00
Slenderness Ratios:	$l_{e1}/d_1 =$	64.0
	$l_{e2}/d_2 =$	17.1
max slenderness ratio:	$l_e/d =$	64.0
Applied Compressive Stress:	$f_c =$	0 psi
Applied Bending Stress:	$f_b =$	888 psi
Applied Shear Stress:	$f_v =$	52 psi

Compressive Capacity:	$P_{allowable} =$	3,392 lb
Compression Unity Check:	$f_c / F_c' =$	0.000
Bending Capacity:	$M_{allowable} =$	54,323 in-lb
Bending Unity Check:	$f_b / F_b' =$	1.034
Shear Capacity:	$V_{allowable} =$	3,938 lb
Shear Unity Check:	$f_v / F_v' =$	0.297

Project:

2X12 Breezeway Joists (L=16')

Units: inches, pounds

Tabulated Design Values

Flexural Strength	$F_b =$	750 psi
Compressive Strength	$F_c =$	1,100 psi
Shear Strength	$F_v =$	175 psi
Modulus of Elasticity	$E =$	1.40E+06 psi

Adjustment Factors on F_c

Load Duration Factor	$C_D =$	1.00
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Size Factor	$C_F =$	1.00
Incising Factor	$C_i =$	1.00

Adjustment Factors on F_b

Load Duration Factor	$C_D =$	1.00
Size Factor	$C_F =$	1.00
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Flat Use Factor	$C_{fu} =$	1.00
Incising Factor	$C_i =$	1.00
Repetitive Member Factor	$C_r =$	1.15
Form Factor	$C_f =$	1.00

Adjustments for Shear

Load Duration Factor	$C_D =$	1.00
Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Incising Factor	$C_i =$	1.00
Shear Stress Factor	$C_H =$	1.00

Adjustment Factors on E

Wet Service Factor	$C_M =$	1.00
Temperature Factor	$C_t =$	1.00
Incising Factor	$C_i =$	1.00

Member Strength

Adjusted Shear Strength	$F_v' =$	175 psi
Adjusted Compressive Strength	$F_c' =$	1,100 psi
Adjusted MOE	$E' =$	1.40E+06 psi
	$K_{CE} =$	.30
Euler Stress	$F_{CE} =$	103 psi
Column Stress Ratio	$F_{CE} / F_c' =$	0.093
Stress-strain Curve Factor	$c =$	0.80
Column Stability Factor	$C_P =$	0.091
Allowable Compressive Stress	$F_c' =$	101 psi
Adjusted Bending Strength	$F_b' =$	863 psi
Lateral Buckling Coefficient	$K_{bE} =$	0.439
Lateral Buckling Stress	$F_{bE} =$	9,945 psi
Bending Stress Ratio	$F_{bE} / F_b' =$	11.530
Beam Stability Factor	$C_L =$	0.995
Allowable Bending Stress	$F_b' =$	858 psi

Interaction:

Strong Axis Euler Stress	$F_{cE1} =$	1,442 psi
Moment Magnifier	$B =$	1.000
Eq. (3.9-3)	$I =$	1.034

Member Status

NG

LATERAL DESIGN

MFWRS Wind Pressures (Per 10' Building Length)

Kzt= 1.0
 Kd= 0.85
 V= 110 mph
 I= 1.00
 Exposure C
 Roof Ht. 36
 Leeward Kh= 1.02
 G= 0.85
 Windward Cp= 0.8
 Leeward Cp= -0.5
 Side Wall Cp= -0.7
 qh= 26.8

Roof Slope= 23°
 Building h/L (Length)= 0.51
 Building h/L (Width)= 0.24
 Windward Roof Truss= 0.3
 Leeward Roof Truss= -0.6
Roof Pres. on Vert. Projection = 9.4

Height (ft.)	Kz	qz (psf)	Windward Pressure (psf)	Leeward Pressure (psf)	Total Pressure (psf)
15	0.85	22.4	15.2	-11.4	26.6
20	0.9	23.7	16.1	-11.4	27.5
25	0.94	24.7	16.8	-11.4	28.2
30	0.98	25.8	17.5	-11.4	28.9
40	1.04	27.4	18.6	-11.4	30.0
50	1.09	28.7	19.5	-11.4	30.9
60	1.13	29.8	20.2	-11.4	31.6
70	1.17	30.8	20.9	-11.4	32.3
80	1.21	31.9	21.7	-11.4	33.0
90	1.24	32.6	22.2	-11.4	33.6
100	1.26	33.2	22.6	-11.4	33.9
120	1.31	34.5	23.5	-11.4	34.8
140	1.36	35.8	24.3	-11.4	35.7
160	1.39	36.6	24.9	-11.4	36.3

Side Wall Pressure (psf)
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9
-15.9

Wind Load Per Floor

Floor	Elev.	TTL P.	Bldg Length	Load to FLR	Total Load	Bldg Width	Load to FLR	Total Load
T/ Trusses	41	9.4	10	0.89 k	0.89 k	70	6.26 k	6.26 k
Roof	31.5	29.1	10	1.53 k	2.42 k	70	10.69 k	16.94 k
3rd	21	27.6	10	2.90 k	5.32 k	70	20.31 k	37.25 k
2nd	10.5	26.6	10	2.79 k	8.11 k	70	19.54 k	56.79 k
1st	0	26.6						

Seismic Load Distribution

R =	2
I =	1
Ct =	0.02
x =	0.75
Ta =	0.294
Sds =	0.106
Sd1 =	0.109
k =	1

Building Height, h_n = 36 ft

Seismic Design Category =

B

Cs
0.053
0.185
0.053

Controls

← Evaluation of controlling Cs

Values of Approximate Perior Parameters Ct and x

Structure Type	Ct	x
Moment resisting frame systems in which the frames resist 100% of the required seismic force and are not enclosed or adjoined by components that are more rigid and will prevent the frames from deflecting where subjected to seismic forces:		
Steel moment-resisting frames	0.028	0.8
Concrete moment-resisting frames	0.016	0.9
Steel eccentrically braced frames in accordance with Table 12.2-1 lines B1 or D1	0.03	0.75
Steel buckling-restrained braced frames	0.03	0.75
All other structural systems	0.02	0.75

Seismic Force Distribution Per 10' of Building Width

Floor	Height	Area	DL (psf)	Weight (k)	WxHx ^k	Cvx	Fx
Roof	36	700	25	17.5	630	0.49	1.5 k
3rd	21	700	30	21	441	0.34	1.1 k
2nd	10.5	700	30	21	220.5	0.17	0.5 k
1st	0	700		0	0	0.00	0.0 k

Total 60 1292 1 3 k Base Shear

Seismic Force Distribution (Building A)

Floor	Height	Area	DL (psf)	Weight (k)	WxHx ^k	Cvx	Fx
Roof	36	8960	25	224	8064	0.49	19.7 k
3rd	21	8960	30	268.8	5644.8	0.34	13.8 k
2nd	10.5	8960	30	268.8	2822.4	0.17	6.9 k
1st	0	8960		0	0	0.00	0.0 k

Total 762 16531 1 40 k Base Shear

Seismic Force Distribution (Building B)

Floor	Height	Area	DL (psf)	Weight (k)	WxHx ^k	Cvx	Fx
Roof	36	11072	25	276.8	9904.8	0.49	24.3 k
3rd	21	11072	30	332.16	6975.36	0.34	17.0 k
2nd	10.5	11072	30	332.16	3487.68	0.17	8.5 k
1st	0	11072		0	0	0.00	0.0 k

Total 941 20428 1 50 k Base Shear

Seismic Force Distribution (Building C)

Floor	Height	Area	DL (psf)	Weight (k)	WxHx ^k	Cvx	Fx
Roof	36	13510	25	337.75	12159	0.60	29.7 k
3rd	21	13510	30	405.3	8511.3	0.42	20.8 k
2nd	10.5	13510	30	405.3	4255.65	0.21	10.4 k
1st	0	13510		0	0	0.00	0.0 k

Total 1148 24926 1 61 k Base Shear

Controlling Lateral Forces

Transverse (per 10' width of Building)

	Wind			Seismic			
	Fx	0.6 Fx	TTL Fx	Fx	0.7 Fx	TTL Fx	
Roof	2.42 k	1.45 k	1.45 k	1.54 k	1.08 k	1.08 k	Wind Controls
3rd	2.90 k	1.74 k	3.19 k	1.08 k	0.75 k	1.83 k	Wind Controls
2nd	2.79 k	1.68 k	4.87 k	0.54 k	0.38 k	2.21 k	Wind Controls
1st	0.00 k	0.00 k	4.87 k	0.00 k	0.00 k	2.21 k	Wind Controls

Longitudinal (Building A)

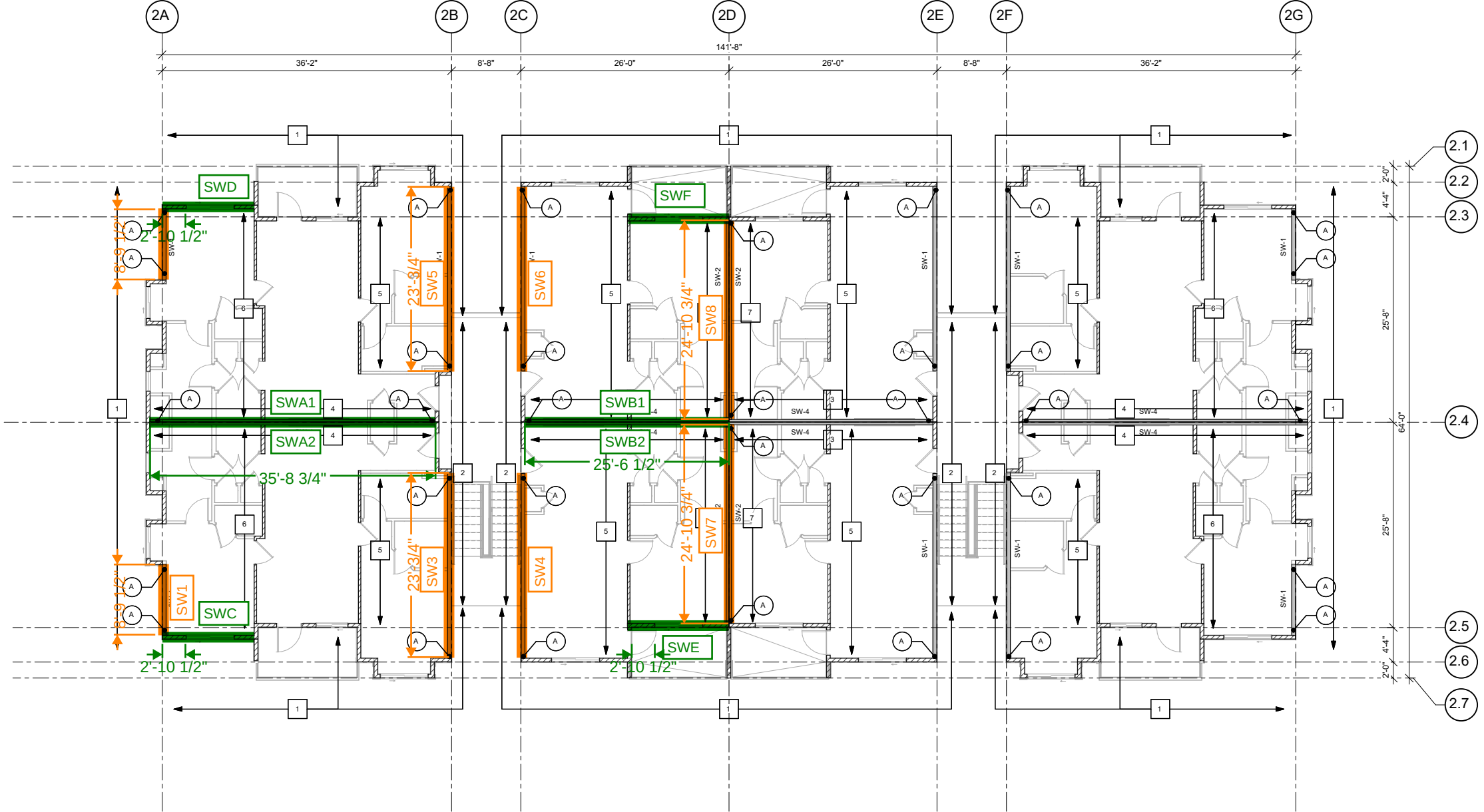
	Wind			Seismic			
	Fx	0.6 Fx	TTL Fx	Fx	0.7 Fx	TTL Fx	
Roof	16.94 k	10.16 k	10.16 k	19.69 k	13.78 k	13.78 k	Seismic Controls
3rd	20.31 k	12.18 k	22.35 k	13.78 k	9.65 k	23.43 k	Seismic Controls
2nd	19.54 k	11.73 k	34.07 k	6.89 k	4.82 k	28.26 k	Wind Controls
1st	0.00 k	0.00 k	34.07 k	0.00 k	0.00 k	28.26 k	Wind Controls

Longitudinal (Building B)

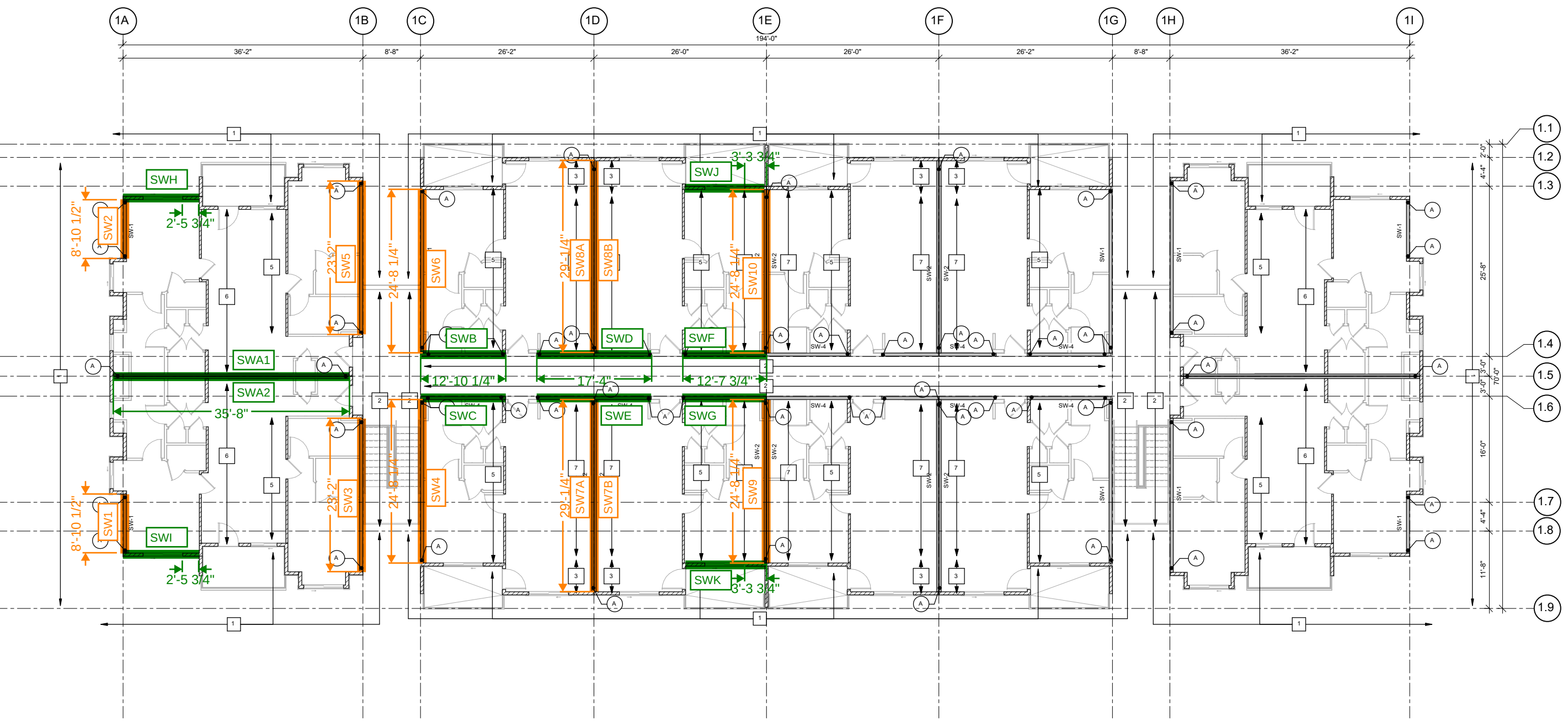
	Wind			Seismic			
	Fx	0.6 Fx	TTL Fx	Fx	0.7 Fx	TTL Fx	
Roof	16.94 k	10.16 k	10.16 k	24.35 k	17.03 k	17.03 k	Seismic Controls
3rd	20.31 k	12.18 k	22.35 k	17.03 k	11.92 k	28.95 k	Seismic Controls
2nd	19.54 k	11.73 k	34.07 k	8.52 k	5.96 k	34.92 k	Seismic Controls
1st	0.00 k	0.00 k	34.07 k	0.00 k	0.00 k	34.92 k	Seismic Controls

Longitudinal (Building C)

	Wind			Seismic			
	Fx	0.6 Fx	TTL Fx	Fx	0.7 Fx	TTL Fx	
Roof	16.94 k	10.16 k	10.16 k	29.69 k	20.78 k	20.78 k	Seismic Controls
3rd	20.31 k	12.18 k	22.35 k	20.78 k	14.55 k	35.33 k	Seismic Controls
2nd	19.54 k	11.73 k	34.07 k	10.39 k	7.27 k	42.60 k	Seismic Controls
1st	0.00 k	0.00 k	34.07 k	0.00 k	0.00 k	42.60 k	Seismic Controls



BUILDING A SHEAR WALL MAP



BUILDING C SHEAR WALL MAP

Bob D. Campbell & Co.

DL _{wall} =	7	psf
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Seismic Controls
Wind Controls
Wind Controls

18.8

Note: V_{allow} loads for APA Rated Sheathing has not been increased by 1.4 for shearwalls used to resist wind loads

Sill Anchor Capacity		
20d Nail	272	lbs
1/4"x4 1/2 sds	350	lbs

$E_{\text{wood}} = 1,600,000 \text{ (psi)}$ DFL- #2

Longitudinal		3.00										18,846			153		Additional DL From Bearing				1,527							1.39							55	
Shear Wall	Level	Trib Width	Length of Shear Wall	Height of Shear Wall	Relative Deflection δ _{rel}	Relative Stiffness, K = 1/δ _{rel}	Load Dist Coeff	V _{Level}	V _{Total}	V _{PLI}	OM _{Ltrib}	Trib Width	DL _{Lfloor}	DL _{Rfloor}	Total DL	DL	RM _{Llevel}	T=C _{Llevel}	T=C _{Total}	Number of Chord Studs Each End of Shearwall		Hold Down	Shear Wall Type	V _{allow}	Deflect on, δ _{wl}	Total Deflection, Σδ _{wl}	Sill Spacing (inches)		Shearwall Sched	Hold-Down Sched	Diaphragm to Shearwall	Unity Checks				
								(lbs)	(lbs)	(plf)	(lb-ft)		(psf)	(psf)	(plf)	(lbs)	(lb-ft)	(lbs)	(lbs)	2x4	2x6				(plf)	(in.)	(in.)	20d Nail				1/4"x4 1/2 sds	(plf)	Sheathing	Holdown	Chord Studs
A1	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.68	0	0	SW4	B	55	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.68	0	0							0.00	#N/A	0.00
	4	35	15.00	0.72	48.75	0.28	1,942	1,942	55	29,131				0	3,675	64,313	-278	-278	2		1/2 HDU2	A	115	0.22	0.68	32	32						50	0.48	-0.18	-0.05
	3	35	10.50	0.39	90.23	0.28	1,733	3,675	105	38,591				0	2,573	45,019	341	62	2		1/2 HDU2	B	145	0.20	0.46	31	32						48	0.72	0.04	0.01
A2	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.68	0	0	SW4	B	55	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.68	0	0							0.00	#N/A	0.00
	4	35	15.00	0.72	48.75	0.28	1,942	1,942	55	29,131				0	3,675	64,313	-278	-278	2		1/2 HDU2	A	115	0.22	0.68	32	32						50	0.48	-0.18	-0.05
	3	35	10.50	0.39	90.23	0.28	1,733	3,675	105	38,591				0	2,573	45,019	341	62	2		1/2 HDU2	B	145	0.20	0.46	31	32						48	0.72	0.04	0.01
B1	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.71	0	0	SW4	B	50	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.71	0	0							0.00	#N/A	0.00
	4	25	15.00	0.80	31.26	0.18	1,245	1,245	50	18,680				0	2,625	32,813	-42	-42	2		1/2 HDU2	A	115	0.23	0.71	32	32						44	0.43	-0.03	-0.01
	3	25	10.50	0.44	57.13	0.18	1,097	2,343	94	24,599				0	1,838	22,969	451	409	2		1/2 HDU2	B	145	0.21	0.47	32	32						42	0.65	0.27	0.07
B2	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.71	0	0	SW4	B	50	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.71	0	0							0.00	#N/A	0.00
	4	25	15.00	0.80	31.26	0.18	1,245	1,245	50	18,680				0	2,625	32,813	-42	-42	2		1/2 HDU2	A	115	0.23	0.71	32	32						44	0.43	-0.03	-0.01
	3	25	10.50	0.44	57.13	0.18	1,097	2,343	94	24,599				0	1,838	22,969	451	409	2		1/2 HDU2	B	145	0.21	0.47	32	32						42	0.65	0.27	0.07
C	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.71	0	0	SW5	A	26	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.39	0	0							0.00	#N/A	0.00
	4	5	15.00	1.54	3.24	0.02	129	129	26	1,938				0	525	1,313	288	288	2		HDU2	J	260	0.56	1.39	32	32						22	0.10	0.09	0.03
	3	5	10.50	0.89	5.60	0.02	108	237	47	2,486				0	368	919	484	771	2		HDU2	J	260	0.41	0.83	32	32						21	0.18	0.25	0.09
D	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.39	0	0	SW5	A	26	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.39	0	0							0.00	#N/A	0.00
	4	5	15.00	1.54	3.24	0.02	129	129	26	1,938				0	525	1,313	288	288	2		HDU2	J	260	0.56	1.39	32	32						22	0.10	0.09	0.03
	3	5	10.50	0.89	5.60	0.02	108	237	47	2,486				0	368	919	484	771	2		HDU2	J	260	0.41	0.83	32	32						21	0.18	0.25	0.09
E	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.39	0	0	SW5	A	26	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.39	0	0							0.00	#N/A	0.00
	4	5	15.00	1.54	3.24	0.02	129	129	26	1,938				0	525	1,313	288	288	2		HDU2	J	260	0.56	1.39	32	32						22	0.10	0.09	0.03
	3	5	10.50	0.89	5.60	0.02	108	237	47	2,486				0	368	919	484	771	2		HDU2	J	260	0.41	0.83	32	32						21	0.18	0.25	0.09
F	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.39	0	0	SW5	A	26	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.39	0	0							0.00	#N/A	0.00
	4	5	15.00	1.54	3.24	0.02	129	129	26	1,938				0	525	1,313	288	288	2		HDU2	J	260	0.56	1.39	32	32						22	0.10	0.09	0.03
	3	5	10.50	0.89	5.60	0.02	108	237	47	2,486				0	368	919	484	771	2		HDU2	J	260	0.41	0.83	32	32						21	0.18	0.25	0.09
G	R				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.39	0	0	SW5	A	26	0.00	#N/A	0.00		
	S				0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.39	0	0							0.00	#N/A	0.00
	4	5	15.00	1.54	3.24	0.02	129	129	26	1,938				0	525	1,313	288	288	2		HDU2	J	260	0.56	1.39	32	32						22	0.10	0.09	0.03
	3	5	10.50	0.89	5.60	0.02	108	237	47	2,486				0	368	919	484	771	2		HDU2	J	260	0.41	0.83	32	32						21	0.18	0.25	0.09

Building A

Note: design is for 50% of lateral force and 1/2 of building shear walls

DL _{total} =	7	psf
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Multiplier: 7

Level	Height to Diaphragm (ft)	Wall Height (ft)	Lateral Load at Level (plf)	Lateral Load at Level (ft)	Lateral Load at Level (k)
T/P	0				
R	0	0		0.0	0.0
5	0	0		0.0	0.0
4	36	15	145	1.45	10.2
3	21	10.5	174	1.74	12.2
2	10.5	10.5	168	1.68	11.7

Base Shear = 34.1

Note R = 2 therefore gyp shearwalls are permitted when seismic controls

Shearwall Design

Type	Description	V _{allow} (plf)	G _s (kips/in.)
A	5/8" Gyp, UnBlocked, S=7	115	6
B	5/8" Gyp, UnBlocked, S=4	145	7.5
C	5/8" Gyp, Blocked, S=7	145	7.5
D	5/8" Gyp, Blocked, S=4	175	8.5
E	(2) 5/8" Gyp, UnBlocked, S=7	230	12
F	(2) 5/8" Gyp, UnBlocked, S=4	290	15
G	(2) 5/8" Gyp, Blocked, S=7	290	15
H	(2) 5/8" Gyp, Blocked, S=4	350	17
J	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 6/12	364	15
K	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 4/12	532	22
L	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 3/12	686	28
M	(2) Layers 5/8" Gyp, One Side w/ Edges Blocked	250	11

Note: V_{allow} loads for APA Rated Sheathing have been increased by 1.4 for shearwalls used to resist wind loads

Model No.	T _{allow} lbs	Defl. @ Allowable Load, Δ _s in.
HDU2	3,075	0.088
1/2 HDU2	1,538	0.088
HDU4	4,565	0.114
1/2 HDU4	2,283	0.114
HDU5	5,645	0.115
1/2 HDU5	2,823	0.115
(2)HDU2	6,150	0.088
(2)HDU4	9,130	0.114
(2)HDU5	11,290	0.115
HDU8	7,870	0.116
(2) HDU8	15,740	0.116
HDU11	11,175	0.137
(2) HDU11	22,350	0.137
HDU14	14,375	0.177

Sill Anchor Capacity		
20d Nail	272	lbs
1/4"x4 1/2 sds	350	lbs

Shearwall Unity Check Per Floor					
Level	R	5	4	3	2
# of SWs	0	0	8	8	8
Unity			0.25	0.46	0.62

E_{wind} = 1,600,000 (psi) DFL- #2

Transverse		3.00		34,073		244		Additional DL From Bearing				3,084		1.00		87																		
Shear Wall	Level	Trib Width	Length of Shear Wall	Height of Shear Wall	Relative Deflection δ _{rel}	Relative Stiffness, K = 1/δ _{rel}	Load Dist Coeff	V _{Level}	V _{total}	V _{PLF}	OM _{Level}	Trib Width	DL _{Floor}	DL _{Roof}	Total DL	DL	RM _{Level}	T=C _{Level}	T=C _{total}	Number of Chord Studs Each End of Shearwall	Hold Down	Shear Wall Type	V _{allow}	Deflection, δ _w	Total Deflection, Σδ _w	Sill Spacing (inches)	Shearwall Sched	Hold-Down Sched	Diaphragm to Shearwall	Unity Checks				
		(ft)	(ft)	(ft)				(lbs)	(lbs)	(plf)	(lb-ft)	(ft)	(psf)	(psf)	(plf)	(lbs)	(lb-ft)	(lbs)	(lbs)	2x4	2x6			(plf)	(in.)	(in.)	20d Nail	1/4"x4 1/2 sds			(plf)	Sheathing	Holdown	Chord Studs
1	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.00	0	0	SW1	A	39	0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.00	0	0				0.00	#N/A	0.00	
	4	8	15.00	1.05	7.59	0.03	314	314	39	4,707					0	840	3,360	384	384		2	HDU2	J	364	0.37	1.00	32	32				0.11	0.13	0.04
	3	8	10.50	0.61	13.10	0.03	374	688	86	7,221	6	20			120	1,548	6,192	501	885		2	HDU2	J	364	0.29	0.62	32	32				0.24	0.29	0.10
	2	8	10.50	0.31	26.20	0.03	375	1,063	133	11,163	6	20			120	1,548	6,192	1,064	1,949		2	HDU2	J	364	0.33	0.33	24	31				0.37	0.63	0.23
2	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.00	0	0	SW1	A	39	0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	1.00	0	0				0.00	#N/A	0.00	
	4	8	15.00	1.05	7.59	0.03	314	314	39	4,707					0	840	3,360	384	384		2	HDU2	J	364	0.37	1.00	32	32				0.11	0.13	0.04
	3	8	10.50	0.61	13.10	0.03	374	688	86	7,221	6	20			120	1,548	6,192	501	885		2	HDU2	J	364	0.29	0.62	32	32				0.24	0.29	0.10
	2	8	10.50	0.31	26.20	0.03	375	1,063	133	11,163	6	20			120	1,548	6,192	1,064	1,949		2	HDU2	J	364	0.33	0.33	24	31				0.37	0.63	0.23
3	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0	SW1	B	76	0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0				0.00	#N/A	0.00	
	4	23	15.00	0.55	42.07	0.17	1,739	1,739	76	26,078					0	2,415	27,773	428	428		2	HDU2	J	364	0.19	0.67	32	32				0.21	0.14	0.05
	3	23	10.50	0.33	70.23	0.16	2,005	3,743	163	39,306	6	20			120	2,891	33,241	880	1,308		2	HDU2	J	364	0.20	0.48	20	25				0.45	0.43	0.15
	2	23	10.50	0.18	130.97	0.16	1,877	5,620	244	59,013	6	20			120	2,891	33,241	1,776	3,084		2	HDU4	J	364	0.28	0.28	13	17				0.67	0.68	0.36
4	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0	SW2	B	76	0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0				0.00	#N/A	0.00	
	4	23	15.00	0.55	42.07	0.17	1,739	1,739	76	26,078					0	2,415	27,773	428	428		2	HDU2	J	364	0.19	0.67	32	32				0.21	0.14	0.05
	3	23	10.50	0.33	70.23	0.16	2,005	3,743	163	39,306	6	20			120	2,891	33,241	880	1,308		2	HDU2	J	364	0.20	0.48	20	25				0.45	0.43	0.15
	2	23	10.50	0.18	130.97	0.16	1,877	5,620	244	59,013	6	20			120	2,891	33,241	1,776	3,084		2	HDU4	J	364	0.28	0.28	13	17				0.67	0.68	0.36
5	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0	SW2	B	76	0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0				0.00	#N/A	0.00	
	4	23	15.00	0.55	42.07	0.17	1,739	1,739	76	26,078					0	2,415	27,773	428	428		2	HDU2	J	364	0.19	0.67	32	32				0.21	0.14	0.05
	3	23	10.50	0.33	70.23	0.16	2,005	3,743	163	39,306	6	20			120	2,891	33,241	880	1,308		2	HDU2	J	364	0.20	0.48	20	25				0.45	0.43	0.15
	2	23	10.50	0.18	130.97	0.16	1,877	5,620	244	59,013	6	20			120	2,891	33,241	1,776	3,084		2	HDU4	J	364	0.28	0.28	13	17				0.67	0.68	0.36
6	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0	SW1	B	76	0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0				0.00	#N/A	0.00	
	4	23	15.00	0.55	42.07	0.17	1,739	1,739	76	26,078					0	2,415	27,773	428	428		2	HDU2	J	364	0.19	0.67	32	32				0.21	0.14	0.05
	3	23	10.50	0.33	70.23	0.16	2,005	3,743	163	39,306	6	20			120	2,891	33,241	880	1,308		2	HDU2	J	364	0.20	0.48	20	25				0.45	0.43	0.15
	2	23	10.50	0.18	130.97	0.16	1,877	5,620	244	59,013	6	20			120	2,891	33,241	1,776	3,084		2	HDU4	J	364	0.28	0.28	13	17				0.67	0.68	0.36
7	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.78	0	0	SW2	C	54	0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.78	0	0				0.00	#N/A	0.00	
	4	24	15.00	0.77	31.25	0.13	1,292	1,292	54	19,374					0	2,520	30,240	53	53		2	1/2 HDU2	A	115	0.25	0.78	32	32				0.47	0.03	0.01
	3	24	10.50	0.40	59.82	0.14	1,708	2,999	125	31,493	6	20			120	2,964	35,568	441	495		2	1/2 HDU2	D	175	0.23	0.53	26	32				0.71	0.32	0.09
	2	24	10.50	0.20	120.98	0.15	1,734	4,733	197	49,696	6	20			120	2,964	35,568	1,233	1,728		2	1/2 HDU5	M	250	0.29	0.29	16	21				0.79	0.61	0.31
8	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.78	0	0	SW2	C	54	0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.78	0	0				0.00	#N/A	0.00	
	4	24	15.00	0.77	31.25	0.13	1,292	1,292	54	19,374					0	2,520	30,240	53	53		2	1/2 HDU2	A	115	0.25	0.78	32	32				0.47	0.03	0.01
	3	24	10.50	0.40	59.82	0.14	1,708	2,999	125	31,493	6	20			120	2,964	35,568	441	495		2	1/2 HDU2	D	175	0.23	0.53	26	32				0.71	0.32	0.09
	2	24	10.50	0.20	120.98	0.15	1,734	4,733	197	49,696	6	20			120	2,964	35,568	1,233	1,728		2	1/2 HDU5	M	250	0.29	0.29	16	21				0.79	0.61	0.31

Building C

Note: design is for 50% of lateral force and 1/2 of building shear walls

DL _{max} =	7	psf
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Level	Height to Diaph (ft)	Wall Height (ft)	Lateral Load at Level (plf)	Lateral Load at Level (k)	50% Lateral Load at Level (k)
T/P	0				
R	0	0		0.00	0.00
5	0	0		0.00	0.00
4	36	15	242	20.78	10.39
3	21	10.5	290	12.18	6.09
2	10.5	10.5	280	11.73	5.86

Base Shear =

22.3

Note R = 2 therefore gyp shearwalls are permitted when seismic controls

Shearwall Design

Type	Description	V _{allow} (plf)	G _s (kips/in.)
A	5/8" Gyp, UnBlocked, S=7	115	6
B	5/8" Gyp, UnBlocked, S=4	145	7.5
C	5/8" Gyp, Blocked, S=7	145	7.5
D	5/8" Gyp, Blocked, S=4	175	8.5
E	2) 5/8" Gyp, UnBlocked, S=7	230	12
F	2) 5/8" Gyp, UnBlocked, S=4	290	15
G	2) 5/8" Gyp, Blocked, S=7	290	15
H	2) 5/8" Gyp, Blocked, S=4	350	17
J	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 6/12	260	15
K	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 4/12	380	22
L	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 3/12	490	28
M	2) Layers 5/8" Gyp, One Side w/ Edges Blocked	250	11

Note: V_{allow} loads for APA Rated Sheathing has not been increased by 1.4 for shearwalls used to resist wind loads

Model No.	T _{allow} lbs	Defl. @ Allowable Load, Δ _s in.
HDU2	3,075	0.088
1/2 HDU2	1,538	0.088
HDU4	4,565	0.114
1/2 HDU4	2,283	0.114
HDU5	5,645	0.115
(2) HDU2	6,150	0.088
(2) HDU4	9,130	0.114
(2) HDU5	11,290	0.115
HDU8	7,870	0.116
(2) HDU8	15,740	0.116
HDU11	11,175	0.137
(2) HDU11	22,350	0.137
HDU14	14,375	0.177

Sill Anchor Capacity		
20d Nail	272	lbs
1/4"x4 1/2 sds	350	lbs

Shearwall Unity Check Per Floor					
Level	R	5	4	3	2
# of SWs	0	0	12	12	12
Unity		0.25	0.37	0.47	

E _{wood} =	1,600,000 (psi)	DFL- #2
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Longitudinal										2,788										1.39										73									
Shear Wall	Level	Trib Width	Length of Shear Wall	Height of Shear Wall	Relative Deflection δ _{rel}	Relative Stiffness K = 1/δ _{rel}	Load Dist Coeff	V _{level}	V _{total}	V _{PLF}	OM _{level}	Trib Width	DL _{floor}	DL _{roof}	Total DL	DL	RM _{level}	T=C _{level}	T=C _{total}	Number of Chord Studs Each End of Shearwall		Hold Down	Shear Wall Type	V _{allow}	Deflecti on, δ _{max}	Total Deflection, Σδ _{max}	Sill Spacing (inches)		Shearwall Sched	Hold-Down Sched	Diaphragm to Shearwall	Unity Checks							
								(lbs)	(lbs)	(plf)	(lb-ft)		(ft)	(psf)	(psf)	(plf)	(lbs)	(lb-ft)	(lbs)	(lbs)	2x4				2x6	(plf)	(in.)	(in.)				20d Nail	1/4"x4 1/2 sds	(plf)	Sheathing	Holdown	Chord Studs		
A1	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.68	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.68	0	0				0.00	#N/A	0.00					
	4	35	15.00	0.72	48.75	0.21	2,212	2,212	63	33,181					0	3,675	64,313	-159	-159	2		1/2 HDU2	A	115	0.24	0.68	32	32			63	0.55	-0.10	-0.03					
	3	35	10.50	0.39	90.23	0.22	1,350	3,562	102	37,404					0	2,573	45,019	306	147	2		1/2 HDU2	B	145	0.20	0.44	32	32			39	0.70	0.10	0.03					
	2	35	10.50	0.19	180.87	0.22	1,301	4,863	139	51,065					0	2,573	45,019	707	854	2		1/2 HDU4	D	175	0.24	0.24	23	30			37	0.79	0.37	0.15					
A2	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.68	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.68	0	0				0.00	#N/A	0.00					
	4	35	15.00	0.72	48.75	0.21	2,212	2,212	63	33,181					0	3,675	64,313	-159	-159	2		1/2 HDU2	A	115	0.24	0.68	32	32			63	0.55	-0.10	-0.03					
	3	35	10.50	0.39	90.23	0.22	1,350	3,562	102	37,404					0	2,573	45,019	306	147	2		1/2 HDU2	B	145	0.20	0.44	32	32			39	0.70	0.10	0.03					
	2	35	10.50	0.19	180.87	0.22	1,301	4,863	139	51,065					0	2,573	45,019	707	854	2		1/2 HDU4	D	175	0.24	0.24	23	30			37	0.79	0.37	0.15					
B	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.75	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.75	0	0				0.00	#N/A	0.00					
	4	12	15.00	0.78	15.34	0.07	696	696	58	10,439					0	1,260	7,560	537	537	2		HDU2	J	260	0.28	0.75	32	32			58	0.22	0.17	0.06					
	3	12	10.50	0.45	26.44	0.06	396	1,092	91	11,461					0	882	5,292	753	1,290	2		HDU2	J	260	0.22	0.46	32	32			33	0.35	0.42	0.15					
	2	12	10.50	0.23	52.88	0.06	380	1,472	123	15,456					0	882	5,292	1,116	2,406	2		HDU2	J	260	0.24	0.24	26	32			32	0.47	0.78	0.28					
C	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.75	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.75	0	0				0.00	#N/A	0.00					
	4	12	15.00	0.78	15.34	0.07	696	696	58	10,439					0	1,260	7,560	537	537	2		HDU2	J	260	0.28	0.75	32	32			58	0.22	0.17	0.06					
	3	12	10.50	0.45	26.44	0.06	396	1,092	91	11,461					0	882	5,292	753	1,290	2		HDU2	J	260	0.22	0.46	32	32			33	0.35	0.42	0.15					
	2	12	10.50	0.23	52.88	0.06	380	1,472	123	15,456					0	882	5,292	1,116	2,406	2		HDU2	J	260	0.24	0.24	26	32			32	0.47	0.78	0.28					
D	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.64	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.64	0	0				0.00	#N/A	0.00					
	4	17	15.00	0.62	27.29	0.12	1,238	1,238	73	18,576					0	1,785	15,173	592	592	2		HDU2	J	260	0.23	0.64	32	32			73	0.28	0.19	0.07					
	3	17	10.50	0.36	47.02	0.12	704	1,942	114	20,391					0	1,250	10,621	876	1,468	2		HDU2	J	260	0.19	0.41	28	32			41	0.44	0.48	0.17					
	2	17	10.50	0.18	94.04	0.12	676	2,618	154	27,494					0	1,250	10,621	1,320	2,788	2		HDU2	J	260	0.22	0.22	21	27			40	0.59	0.91	0.32					
E	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.64	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.64	0	0				0.00	#N/A	0.00					
	4	17	15.00	0.62	27.29	0.12	1,238	1,238	73	18,576					0	1,785	15,173	592	592	2		HDU2	J	260	0.23	0.64	32	32			73	0.28	0.19	0.07					
	3	17	10.50	0.36	47.02	0.12	704	1,942	114	20,391					0	1,250	10,621	876	1,468	2		HDU2	J	260	0.19	0.41	28	32			41	0.44	0.48	0.17					
	2	17	10.50	0.18	94.04	0.12	676	2,618	154	27,494					0	1,250	10,621	1,320	2,788	2		HDU2	J	260	0.22	0.22	21	27			40	0.59	0.91	0.32					
F	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.75	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.75	0	0				0.00	#N/A	0.00					
	4	12	15.00	0.78	15.34	0.07	696	696	58	10,439					0	1,260	7,560	537	537	2		HDU2	J	260	0.28	0.75	32	32			58	0.22	0.17	0.06					
	3	12	10.50	0.45	26.44	0.06	396	1,092	91	11,461					0	882	5,292	753	1,290	2		HDU2	J	260	0.22	0.46	32	32			33	0.35	0.42	0.15					
	2	12	10.50	0.23	52.88	0.06	380	1,472	123	15,456					0	882	5,292	1,116	2,406	2		HDU2	J	260	0.24	0.24	26	32			32	0.47	0.78	0.28					
G	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.75	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	0.75	0	0				0.00	#N/A	0.00					
	4	12	15.00	0.78	15.34	0.07	696	696	58	10,439					0	1,260	7,560	537	537	2		HDU2	J	260	0.28	0.75	32	32			58	0.22	0.17	0.06					
	3	12	10.50	0.45	26.44	0.06	396	1,092	91	11,461					0	882	5,292	753	1,290	2		HDU2	J	260	0.22	0.46	32	32			33	0.35	0.42	0.15					
	2	12	10.50	0.23	52.88	0.06	380	1,472	123	15,456					0	882	5,292	1,116	2,406	2		HDU2	J	260	0.24	0.24	26	32			32	0.47	0.78	0.28					
H	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.39	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.39	0	0				0.00	#N/A	0.00					
	4	5	15.00	1.54	3.24	0.01	147	147	29	2,207					0	525	1,313	355	355	2		HDU2	J	260	0.56	1.39	32	32			29	0.11	0.12	0.04					
	3	5	10.50	0.89	5.60	0.01	84	231	46	2,425					0	368	919	468	823	2		HDU2	J	260	0.41	0.82	32	32			17	0.18	0.27	0.10					
	2	5	10.50	0.45	11.20	0.01	81	311	62	3,270					0	368	919	680	1,503	2		HDU2	J	260	0.42	0.42	32	32			16	0.24	0.49	0.17					
I	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.19	0	0				0.00	#N/A	0.00					
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.19	0	0				0.00	#N/A	0.00					
	4	5	15.00	1.54	3.24	0.01	147	147	29	2,207					0	525	1,313	355	355	2		HDU2	J	260	0.56	1.39	32	32			29	0.11	0.12	0.04					
	3	5	10.50	0.89	5.60	0.01	84	231	46	2,425					0	368	919	468	823	2		HDU2	J	260	0.41	0.82	32	32			17	0.18	0.27	0.10					
	2	5	10.50	0.45	11.20	0.01	81	311	62	3,270					0	368	919	680	1,503																				

Building C

Shearwall Design

Bob D. Campbell & Co.

Note: design is for 50% of lateral force and 1/2 of building shear walls

J	4	6	15.00	1.32	4.53	0.02	206	206	34	3,083				0	630	1,890	390	390			2	HDU2	J	260	0.48	1.19	32	32	SW5	A	34	0.13	0.13	0.04	
	3	6	10.50	0.77	7.82	0.02	117	322	54	3,386				0	441	1,323	518	908			2	HDU2	J	260	0.35	0.71	32	32	19		0.21	0.30	0.10		
	2	6	10.50	0.38	15.63	0.02	112	435	72	4,566				0	441	1,323	755	1,663			2	HDU2	J	260	0.36	0.36	32	32	19		0.28	0.54	0.19		
	R			0.00	0.00	0.00	0.00	0	0	0				0	0	0	0	0							0.00	1.19	0	0			0.00	#N/A	0.00		
K	5		0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0						0.00	1.19	0	0	SW5	A	34	0.00	#N/A	0.00		
	4	6	15.00	1.32	4.53	0.02	206	206	34	3,083				0	630	1,890	390	390			2	HDU2	J	260	0.48	1.19	32	32			19		0.13	0.13	0.04
	3	6	10.50	0.77	7.82	0.02	117	322	54	3,386				0	441	1,323	518	908			2	HDU2	J	260	0.35	0.71	32	32			19		0.21	0.30	0.10
	2	6	10.50	0.38	15.63	0.02	112	435	72	4,566				0	441	1,323	755	1,663			2	HDU2	J	260	0.36	0.36	32	32			19		0.28	0.54	0.19

Building C

Note: design is for 50% of lateral force and 1/2 of building shear walls

DL _{unit} =	7	psf
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Multiplier: 10

Level	Height to Diaphragm (ft)	Wall Height (ft)	Lateral Load at Level (plf)	Lateral Load at Level (ft)	Lateral Load at Level (k)
T/P	0				
R	0	0		0.0	0.0
5	0	0		0.0	0.0
4	36	15	145	1.45	14.5
3	21	10.5	174	1.74	17.4
2		10.5	168	1.68	16.8

Base Shear =

48.7

Note: R = 2 therefore gyp shearwalls are permitted when seismic controls

Shearwall Design

Type	Description	V _{allow} (plf)	G _s (kips/in.)
A	5/8" Gyp, UnBlocked, S=7	115	6
B	5/8" Gyp, UnBlocked, S=4	145	7.5
C	5/8" Gyp, Blocked, S=7	145	7.5
D	5/8" Gyp, Blocked, S=4	175	8.5
E	(2) 5/8" Gyp, UnBlocked, S=7	230	12
F	(2) 5/8" Gyp, UnBlocked, S=4	290	15
G	(2) 5/8" Gyp, Blocked, S=7	290	15
H	(2) 5/8" Gyp, Blocked, S=4	350	17
J	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 6/12	364	15
K	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 4/12	532	22
L	7/16 APA Rated Sheathing One Side, Blocked w/ 8d Nails 3/12	686	28
M	(2) Layers 5/8" Gyp, One Side w/ Edges Blocked	250	11

Note: V_{allow} loads for APA Rated Sheathing have been increased by 1.4 for shearwalls used to resist wind loads

Model No.	T _{allow} lbs	Defl. @ Allowable Load, Δ _s in.
HDU2	3,075	0.088
1/2 HDU2	1,538	0.088
HDU4	4,565	0.114
1/2 HDU4	2,283	0.114
HDU5	5,645	0.115
1/2 HDU5	2,823	0.115
(2)HDU2	6,150	0.088
(2)HDU4	9,130	0.114
(2)HDU5	11,290	0.115
HDU8	7,870	0.116
(2) HDU8	15,740	0.116
HDU11	11,175	0.137
(2) HDU11	22,350	0.137
HDU14	14,375	0.177

Bob D. Campbell & Co.

Sill Anchor Capacity		
20d Nail	272	lbs
1/4"x4 1/2 sds	350	lbs

Shearwall Unity Check Per Floor					
Level	R	5	4	3	2
# of SWs	0	0	12	12	12
Unity			0.28	0.47	0.57

E_{wood} = 1,600,000 (psi) DFL- #2

Transverse		3.00					48,676				204				Additional DL From Bearing				2,135				0.96				72											
Shear Wall	Level	Trib Width (ft)	Length of Shear Wall (ft)	Height of Shear Wall (ft)	Relative Deflection δ _{rel}	Relative Stiffness, K = 1/δ _{rel}	Load Dist Coeff	V _{Level}	V _{Total}	V _{R/L}	OM _{Level}	Trib Width (ft)	DL _{Floor} (psf)	DL _{Roof} (psf)	Total DL (plf)	DL (lbs)	RM _{Level} (lb-ft)	T=C _{Level} (lbs)	T=C _{Total} (lbs)	Number of Chord Studs Each End of Shearwall		Hold Down	Shear Wall Type	V _{allow} (plf)	Deflecti on, δ _{allow} (in.)	Total Deflection, Σδ _{allow} (in.)	Sill Spacing (inches)		Shearwall Sched	Hold-Down Sched	Diaphragm to Shearwall (plf)	Unity Checks						
								(lbs)	(lbs)	(plf)	(lb-ft)									2x4	2x6						Sheathing	Holdown				Chord Studs						
1	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.96	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.96	0	0					0.00	#N/A	0.00				
	4	8	15.00	1.05	7.59	0.02	266	266	33	3,996	0	840	3,360	283	283	0	840	3,360	283	283	2	HDU2	J	364	0.37	0.96	32	32			33	A	33	0.09	0.09	0.03		
	3	8	10.50	0.61	13.10	0.02	304	570	71	5,984	6	20	120	1,548	6,192	324	607	1,548	6,192	324	607	2	HDU2	J	364	0.28	0.60	32	32			38		0.20	0.07			
	2	8	10.50	0.31	26.20	0.02	296	866	108	9,092	6	20	120	1,548	6,192	768	1,375	1,548	6,192	768	1,375	2	HDU2	J	364	0.31	0.31	30	32			37		0.30	0.45	0.16		
2	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.96	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.96	0	0					0.00	#N/A	0.00				
	4	8	15.00	1.05	7.59	0.02	266	266	33	3,996	0	840	3,360	283	283	0	840	3,360	283	283	2	HDU2	J	364	0.37	0.96	32	32			33	A	33	0.09	0.09	0.03		
	3	8	10.50	0.61	13.10	0.02	304	570	71	5,984	6	20	120	1,548	6,192	324	607	1,548	6,192	324	607	2	HDU2	J	364	0.28	0.60	32	32			38		0.20	0.07			
	2	8	10.50	0.31	26.20	0.02	296	866	108	9,092	6	20	120	1,548	6,192	768	1,375	1,548	6,192	768	1,375	2	HDU2	J	364	0.31	0.31	30	32			37		0.30	0.45	0.16		
3	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.61	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.61	0	0					0.00	#N/A	0.00				
	4	23	15.00	0.55	42.07	0.10	1,476	1,476	64	22,139	0		0	2,415	27,773	249	249	0	2,415	27,773	249	249	2	HDU2	J	364	0.18	0.61	32	32			64	B	64	0.18	0.08	0.03
	3	23	10.50	0.33	70.23	0.09	1,628	3,104	135	32,587	6	20	120	2,891	33,241	575	824	2,891	33,241	575	824	2	HDU2	J	364	0.18	0.42	24	31			71		0.37	0.27	0.10		
	2	23	10.50	0.18	130.97	0.09	1,480	4,583	199	48,125	6	20	120	2,891	33,241	1,281	2,104	2,891	33,241	1,281	2,104	2	HDU4	J	364	0.25	0.25	16	21			64		0.55	0.46	0.24		
4	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.60	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.60	0	0					0.00	#N/A	0.00				
	4	24	15.00	0.53	44.95	0.11	1,577	1,577	66	23,655	0		0	2,520	30,240	240	240	0	2,520	30,240	240	240	2	HDU2	J	364	0.18	0.60	32	32			66	B	66	0.18	0.08	0.03
	3	24	10.50	0.32	75.08	0.10	1,740	3,317	138	34,827	6	20	120	2,964	35,568	586	826	2,964	35,568	586	826	2	HDU2	J	364	0.18	0.42	23	30			72		0.38	0.27	0.10		
	2	24	10.50	0.17	140.18	0.09	1,584	4,901	204	51,457	6	20	120	2,964	35,568	1,309	2,135	2,964	35,568	1,309	2,135	2	HDU4	J	364	0.25	0.25	15	20			66		0.56	0.47	0.25		
5	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.61	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.61	0	0					0.00	#N/A	0.00				
	4	23	15.00	0.55	42.07	0.10	1,476	1,476	64	22,139	0		0	2,415	27,773	249	249	0	2,415	27,773	249	249	2	HDU2	J	364	0.18	0.61	32	32			64	B	64	0.18	0.08	0.03
	3	23	10.50	0.33	70.23	0.09	1,628	3,104	135	32,587	6	20	120	2,891	33,241	575	824	2,891	33,241	575	824	2	HDU2	J	364	0.18	0.42	24	31			71		0.37	0.27	0.10		
	2	23	10.50	0.18	130.97	0.09	1,480	4,583	199	48,125	6	20	120	2,891	33,241	1,281	2,104	2,891	33,241	1,281	2,104	2	HDU4	J	364	0.25	0.25	16	21			64		0.55	0.46	0.24		
6	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.60	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.60	0	0					0.00	#N/A	0.00				
	4	24	15.00	0.53	44.95	0.11	1,577	1,577	66	23,655	0		0	2,520	30,240	240	240	0	2,520	30,240	240	240	2	HDU2	J	364	0.18	0.60	32	32			66	B	66	0.18	0.08	0.03
	3	24	10.50	0.32	75.08	0.10	1,740	3,317	138	34,827	6	20	120	2,964	35,568	586	826	2,964	35,568	586	826	2	HDU2	J	364	0.18	0.42	23	30			72		0.38	0.27	0.10		
	2	24	10.50	0.17	140.18	0.09	1,584	4,901	204	51,457	6	20	120	2,964	35,568	1,309	2,135	2,964	35,568	1,309	2,135	2	HDU4	J	364	0.25	0.25	15	20			66		0.56	0.47	0.25		
7A	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0					0.00	#N/A	0.00				
	4	29	15.00	0.72	40.52	0.10	1,422	1,422	49	21,326	0		0	3,045	44,153	-184	-184	0	3,045	44,153	-184	-184	2	1/2 HDU2	A	115	0.22	0.67	32	32			49	B	49	0.43	-0.12	-0.03
	3	29	10.50	0.37	78.58	0.10	1,821	3,243	112	34,048	6	20	120	3,332	48,307	181	-4	120	3,332	48,307	181	-4	2	1/2 HDU2	D	175	0.20	0.46	29	32			63		0.64	0.00	0.00	
	2	29	10.50	0.18	161.19	0.11	1,821	5,064	175	53,172	6	20	120	3,332	48,307	864	860	2	120	3,332	48,307	864	860	2	1/2 HDU4	M	250	0.25	0.25	18	24			63		0.70	0.38	0.16
7B	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0					0.00	#N/A	0.00				
	4	29	15.00	0.72	40.52	0.10	1,422	1,422	49	21,326	0		0	3,045	44,153	-184	-184	0	3,045	44,153	-184	-184	2	1/2 HDU2	A	115	0.22	0.67	32	32			49	B	49	0.43	-0.12	-0.03
	3	29	10.50	0.37	78.58	0.10	1,821	3,243	112	34,048	6	20	120	3,332	48,307	181	-4	120	3,332	48,307	181	-4	2	1/2 HDU2	D	175	0.20	0.46	29	32			63		0.64	0.00	0.00	
	2	29	10.50	0.18	161.19	0.11	1,821	5,064	175	53,172	6	20	120	3,332	48,307	864	860	2	120	3,332	48,307	864	860	2	1/2 HDU4	M	250	0.25	0.25	18	24			63		0.70	0.38	0.16
8A	R			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0					0.00	#N/A	0.00				
	5			0.00	0.00	0.00	0.00	0	0	0	0				0	0	0	0	0					0.00	0.67	0	0					0.00	#N/A	0.00				
	4	29	15.00	0.72	40.52	0.10	1,422	1,422	49	21,326	0		0	3,045	44,153	-184	-184	0	3,045	44,153	-184	-184	2	1/2 HDU2	A	115	0.22	0.67	32	32			49	B	49	0.43	-0.12	-0.03
	3	29	10.50	0.37	78.58	0.10	1,821	3,243	112	34,048	6	20	120	3,332	48,307	181	-4	120	3,332	48,307	181	-4	2	1/2 HDU2	D	175	0.20	0.46	29	32			63		0.64	0.00	0.00	
	2	29	10.50	0.18	161.19	0.11	1,821	5,064	175	53,172	6	20	120	3,332	48,307	864	860	2	120	3,332	48,307	864	860	2	1/2													

Building C

Shearwall Design

Note: design is for 50% of lateral force and 1/2 of building shear walls

Bob D. Campbell & Co.

10	3	24	10.50	0.40	59.95	0.08	1.389	2.487	104	26,114	6	20	120	2,964	35,568	208	135	2		1/2 HDU2	D	175	0.21	0.46		31		32		58		0.59	0.09	0.02	
	2	24	10.50	0.20	121.52	0.08	1.373	3.860	161	40,531	6	20	120	2,964	35,568	834	969	2		1/2 HDU4	M	250	0.26	0.26		20		26		57		0.64	0.42	0.18	
	A			0.00	0.00	0.00	0.00	0	0	0	0			0	0	0	0	0					0.00	0.69		0		0				0.00	#N/A	0.00	
	5			0.00	0.00	0.00	0.00	0	0	0	0			0	0	0	0	0					0.00	0.69		0		0				0.00	#N/A	0.00	
	4	24	15.00	0.77	31.29	0.08	1.098	1.098	46	16,466				0	2,520	30,240	-73	-73	2		1/2 HDU2	A	115	0.23	0.69		32		32		46		0.40	-0.05	-0.01
	3	24	10.50	0.40	59.95	0.08	1.389	2.487	104	26,114	6	20	120	2,964	35,568	208	135	2		1/2 HDU2	D	175	0.21	0.46		31		32		58		0.59	0.09	0.02	
	2	24	10.50	0.20	121.52	0.08	1.373	3.860	161	40,531	6	20	120	2,964	35,568	834	969	2		1/2 HDU4	M	250	0.26	0.26		20		26		57		0.64	0.42	0.18	

HDU/DTT

Holdowns (cont.)

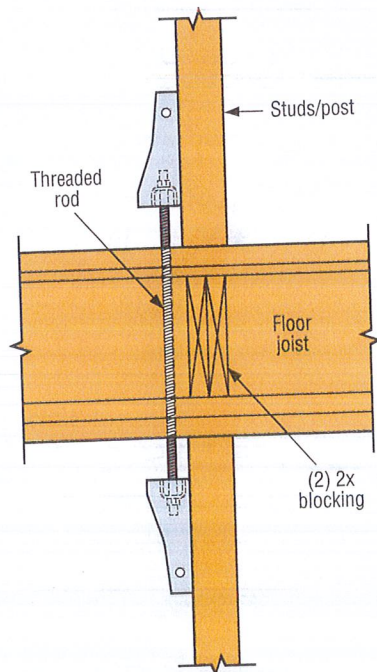
These products are available with additional corrosion protection. For more information, see p. 15.

SS For stainless-steel fasteners, see p. 21.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335-337 for more information.

Model No.	Ga.	Dimensions (in.)					Fasteners (in.)		Minimum Wood Member Size (in.)	Allowable Tension Loads (160)			Code Ref.
		W	H	B	CL	SO	Anchor Bolt Dia. (in.)	Wood Fasteners		DF/SP	SPF/HF	Deflection at Allowable Load (in.)	
DTT1Z	14	1½	7½	1⅞	¾	¾	¾	(6) SD #9 x 1½ (6) 0.148 x 1½ (8) 0.148 x 1½	1½ x 5½	840 910 910	840 640 850	0.17 0.167 0.167	IBC, FL, LA
DTT2Z	14	3¼	6½	1½	1⅞	¾	½	(8) ¼ x 1½ SDS (8) ¼ x 1½ SDS (8) ¼ x 2½ SDS	1½ x 3½ 3 x 3½ 3 x 3½	1,825 2,145 2,145	1,800 1,835 2,105	0.105 0.128 0.128	
DTT2Z-SDS2.5	14	3	8½	3¼	1⅞	1⅞	¾	(6) ¼ x 2½ SDS	3 x 3½	3,075	2,215	0.088	
HDU2-SDS2.5	14	3	10½	3¼	1⅞	1⅞	¾	(10) ¼ x 2½ SDS	3 x 3½	4,565	3,285	0.114	
HDU4-SDS2.5	14	3	13½	3¼	1⅞	1⅞	¾	(14) ¼ x 2½ SDS	3 x 3½	5,645	4,340	0.115	
HDU5-SDS2.5	14	3	16½	3½	1⅞	1½	¾	(20) ¼ x 2½ SDS	3 x 3½ 3½ x 3½ 3½ x 4½	6,765 6,970 7,870	5,820 5,995 6,580	0.11 0.116 0.113	
HDU8-SDS2.5	10	3	22¼	3½	1⅞	1½	1	(30) ¼ x 2½ SDS	3½ x 5½ 3½ x 7¼	9,335 11,175	8,030 9,610	0.137 0.137	
HDU11-SDS2.5	10	3	25¼	3½	1⅞	1½	1	(36) ¼ x 2½ SDS	3½ x 5½ 3½ x 7¼	10,770 14,390	9,260 12,375	0.122 0.177	
HDU14-SDS2.5	7	3	25¼	3½	1⅞	1½	1	(36) ¼ x 2½ SDS	5½ x 5½	14,445	12,425	0.172	IBC, FL, LA

1. HDU14 requires heavy-hex anchor nut to achieve tabulated loads (supplied with holdown).
2. Where noted in table, loads are applicable to installation on either the narrow or the wide face of the post.



Typical HDU Tie Between Floors

Holdowns and
Tension Ties

Table 4.3A Nominal Unit Shear Capacities for Wood-Frame Shear Walls^{1,3,6,7}**Wood-based Panels⁴**

Sheathing Material	Minimum Nominal Panel Thickness (in.)	Minimum Fastener Penetration in Framing Member or Blocking (in.)	Fastener Type & Size	A SEISMIC										B WIND																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
				Panel Edge Fastener Spacing (in.)										Panel Edge Fastener Spacing (in.)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
				6		4		3		2		6		4		3		2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
				V _s (plf)	G _a (kips/in.)	V _s (plf)	G _a (kips/in.)	V _s (plf)	G _a (kips/in.)	V _s (plf)	G _a (kips/in.)	V _s (plf)	G _a (kips/in.)	V _s (plf)	G _a (kips/in.)	V _s (plf)	G _a (kips/in.)	V _s (plf)	G _a (kips/in.)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Wood Structural Panels - Structural ^{1,4,5}	5/16	1-1/4	Nail (common or galvanized box)	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB	PLY	OSB

1. Nominal unit shear values shall be adjusted in accordance with 4.3.3 to determine ASD allowable unit shear capacity and LRFD factored unit resistance. For general construction requirements see 4.3.6. For specific requirements, see 4.3.7.1 for wood structural panel shear walls, 4.3.7.2 for particleboard shear walls, and 4.3.7.3 for fiberboard shear walls. See Appendix A for common and box nail dimensions.

2. Shears are permitted to be increased to values shown for 15/32 inch sheathing with same nailing provided (a) studs are spaced a maximum of 16 inches on center, or (b) panels are applied with long dimension across studs.

3. For species and grades of framing other than Douglas-Fir-Larch or Southern Pine, reduced nominal unit shear capacities shall be determined by multiplying the tabulated nominal unit shear capacity by the Specific Gravity Adjustment Factor = $[1 - (0.5 - G)]$, where G = Specific Gravity of the framing lumber from the *NDS* (Table 11.3.2A). The Specific Gravity Adjustment Factor shall not be greater than 1.

4. Apparent shear stiffness values G_a are based on nail slip in framing with moisture content less than or equal to 19% at time of fabrication and panel stiffness values for shear walls constructed with either OSB or 3-ply plywood panels. When 4-ply or 5-ply plywood panels or composite panels are used, G_a values shall be permitted to be increased by 1.2.

5. Where moisture content of the framing is greater than 19% at time of fabrication, G_a values shall be multiplied by 0.5.

6. Where panels are applied on both faces of a shear wall and nail spacing is less than 6" on center on either side, panel joints shall be offset to fall on different framing members. Alternatively, the width of the nailed face of framing members shall be 3" nominal or greater at adjoining panel edges and nails at all panel edges shall be staggered.

7. Galvanized nails shall be hot-dipped or tumbled.

Table 4.3C Nominal Unit Shear Capacities for Wood-Frame Shear Walls¹**Gypsum and Portland Cement Plaster**

Sheathing Material	Material Thickness	Fastener Type & Size ²	Max. Fastener Edge Spacing (in.) ³	Max. Stud Spacing (in.)	SEISMIC		WIND
					V _s (plf)	G _a (kips/in)	V _w (plf)
Gypsum wallboard, gypsum base for veneer plaster, or water-resistant gypsum backing board	1/2"	5d cooler (0.086" x 1-5/8" long, 15/64" head) or wallboard nail (0.086" x 1-5/8" long, 9/32" head) or 0.120" nail x 1-1/2" long, min 3/8" head	7	24	unblocked	4.0	150
			4	24	unblocked	6.0	220
			7	16	unblocked	5.5	200
			4	16	unblocked	6.5	250
			7	16	blocked	6.5	250
			4	16	blocked	7.5	300
	5/8"	No. 6 Type S or W drywall screws 1-1/4" long	8/12	16	unblocked	3.5	120
			4/16	16	blocked	8.0	320
			4/12	24	blocked	8.0	310
			8/12	16	blocked	4.0	140
			6/12	16	blocked	5.0	180
Gypsum sheathing board	1/2" x 2' x 8'	6d cooler (0.092" x 1-7/8" long, 1/4" head) or wallboard nail (0.0915" x 1-7/8" long, 19/64" head) or 0.120" nail x 1-3/4" long, min 3/8" head	7	24	unblocked	6.0	230
			4	24	unblocked	7.5	290
			7	16	blocked	7.5	290
			4	16	blocked	8.5	350
			8/12	16	unblocked	4.0	140
	1/2" x 4'	Base ply--6d cooler (0.092" x 1-7/8" long, 1/4" head) or wallboard nail (0.0915" x 1-7/8" long, 19/64" head) or 0.120" nail x 1-3/4" long, min 3/8" head	8/12	16	unblocked	5.0	180
			Base: 9	16	blocked	11	500
			Face: 7	16	blocked	11	500
			4	16	unblocked	4.0	150
			7	16	unblocked	8.5	350
Gypsum lath, plain or perforated with vertical joints staggered	5/8" x 4'	6d galvanized cooler (0.092" x 1-7/8" long, 1/4" head) or wallboard nail (0.0915" x 1-7/8" long, 19/64" head) or 0.120" nail x 1-3/4" long, min 3/8" head	4/7	16	blocked	9.5	400
			5	16	unblocked	9.0	360
	3/8" lath and 1/2" plaster	0.092" x 1-1/8" long, 19/64" head, gypsum wallboard blue nail or 0.120" nail x 1-1/4" long, min 3/8" head	5	16	unblocked	5.5	200
			6	16	unblocked	9.0	360
	7/8"	0.120" nail x 1-1/2" long, 7/16" head	6	16	unblocked	9.0	360

1. Nominal unit shear capacities shall be adjusted in accordance with 4.3.3 to determine ASD allowable unit shear capacity and LRFD factored unit resistance. For general construction requirements see 4.3.6. For specific requirements, see 4.3.7.4.

2. Type S or W drywall screws shall conform to requirements of ASTM C 1002.

3. Where two numbers are given for maximum fastener edge spacing, the first number denotes fastener spacing at the edges and the second number denotes fastener spacing along intermediate framing members.

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Company:
Address:
Phone | Fax: |
Design: 1/2 anchor
Fastening point:

Page: 1
Specifier:
E-Mail:
Date: 8/30/2019

Specifier's comments:

1 Input data

Anchor type and diameter:

HIT-HY 200 + HAS-V-36 (ASTM F1554 Gr.36) 1/2

Item number:

not available (element) / 2022793 HIT-HY 200-R (adhesive)

Effective embedment depth:

$h_{ef,act} = 9.000$ in. ($h_{ef,limit} = -$ in.)

Material:

ASTM A 1554 Grade 36

Evaluation Service Report:

ESR-3187

Issued | Valid:

4/1/2019 | 3/1/2020

Proof:

Design Method ACI 318-14 / Chem

Stand-off installation:

Profile:

Base material:

cracked concrete, 4000, $f'_c = 4,000$ psi; $h = 12.000$ in., Temp. short/long: 32/32 °F

Installation:

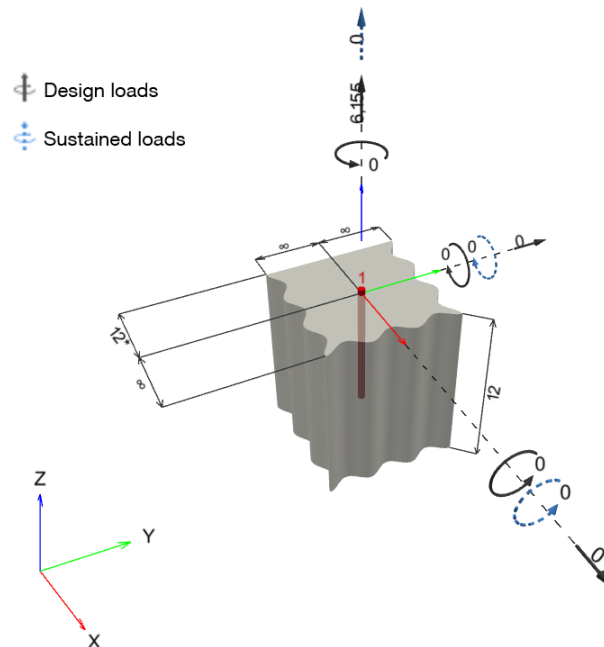
hammer drilled hole, Installation condition: Dry, Installation direction: vertical downward

Reinforcement:

tension: condition B, shear: condition B; no supplemental splitting reinforcement present
edge reinforcement: none or < No. 4 bar



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





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Company:		Page:	2
Address:		Specifier:	
Phone Fax:		E-Mail:	
Design:	1/2 anchor	Date:	8/30/2019
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 6,155; V_x = 0; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$ $N_{sus} = 0; M_{x,sus} = 0; M_{y,sus} = 0;$	no	100

2 Load case/Resulting anchor forces

Load case: Design loads

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	6,155	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]

3 Tension load

	Load N_{ua} [lb]	Capacity ϕN_n [lb]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	6,155	6,173	100	OK
Bond Strength**	6,155	10,932	57	OK
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	6,155	17,227	36	OK

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



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Design:	1/2 anchor	Date:	8/30/2019
Fastening point:			

3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-3187
 $\phi N_{sa} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

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}	ϕN_{sa} [lb]	N_{ua} [lb]
8,230	0.750	6,173	6,155

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Fastening point: 1/2 anchor	

3.2 Bond Strength

$$N_a = \left(\frac{A_{Na}}{A_{Na0}} \right) \psi_{ed,Na} \psi_{cp,Na} N_{ba} \quad \text{ACI 318-14 Eq. (17.4.5.1a)}$$

$$\phi N_a \geq N_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

$$A_{Na} \text{ see ACI 318-14, Section 17.4.5.1, Fig. R 17.4.5.1(b)}$$

$$A_{Na0} = (2 c_{Na})^2 \quad \text{ACI 318-14 Eq. (17.4.5.1c)}$$

$$c_{Na} = 10 d_a \sqrt{\frac{\tau_{uncr}}{1100}} \quad \text{ACI 318-14 Eq. (17.4.5.1d)}$$

$$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.5.4b)}$$

$$\psi_{cp,Na} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.5.5b)}$$

$$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \pi \cdot d_a \cdot h_{ef} \quad \text{ACI 318-14 Eq. (17.4.5.2)}$$

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	9.000	12.000	1.000	1,190
c_{ac} [in.]	λ_a				
25.761	1.000				

Calculations

c_{Na} [in.]	A_{Na} [in. ²]	A_{Na0} [in. ²]	$\psi_{ed,Na}$
7.239	209.62	209.62	1.000
$\psi_{cp,Na}$	N_{ba} [lb]		
1.000	16,818		

Results

N_a [lb]	ϕ_{bond}	ϕN_a [lb]	N_{ua} [lb]
16,818	0.650	10,932	6,155

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3.3 Concrete Breakout Failure

$$N_{cb} = \left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \quad \text{ACI 318-14 Eq. (17.4.2.1a)}$$

$$\phi N_{cb} \geq N_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

$$A_{Nc} \text{ see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)}$$

$$A_{Nc0} = 9 h_{ef}^2 \quad \text{ACI 318-14 Eq. (17.4.2.1c)}$$

$$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.5b)}$$

$$\psi_{cp,N} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.7b)}$$

$$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5} \quad \text{ACI 318-14 Eq. (17.4.2.2a)}$$

Variables

h_{ef} [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
9.000	12.000	1.000	25.761	17	1.000	4,000

Calculations

A_{Nc} [in. ²]	A_{Nc0} [in. ²]	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
688.50	729.00	0.967	1.000	29,030

Results

N_{cb} [lb]	$\phi_{concrete}$	ϕN_{cb} [lb]	N_{ua} [lb]
26,503	0.650	17,227	6,155



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4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_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 5216:2018, 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/>
- Installation of Hilti adhesive anchor systems shall be performed by personnel trained to install Hilti adhesive anchors. Reference ACI 318-14, Section 17.8.1.

Fastening meets the design criteria!

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Design:	1/2 anchor	Date:	8/30/2019
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6 Installation data

Profile: -

Hole diameter in the fixture: -

Plate thickness (input): -

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 + HAS-V-36

(ASTM F1554 Gr.36) 1/2

Item number: not available (element) / 2022793 HIT-HY 200-R (adhesive)

Installation torque: 360 in.lb

Hole diameter in the base material: 0.563 in.

Hole depth in the base material: 9.000 in.

Minimum thickness of the base material: 10.250 in.

1/2 Hilti HAS Carbon steel threaded rod with Hilti HIT-HY 200 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	0.000	0.000	12.000	-	-	-



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Design:	1/2 anchor	Date:	8/30/2019
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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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Design: 5/8 anchor
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Specifier's comments:

1 Input data

Anchor type and diameter:

HIT-HY 200 + HAS-V-36 (ASTM F1554 Gr.36) 5/8

Item number:

2198026 HAS-V-36 5/8"x10" (element) / 2022793 HIT-HY 200-R (adhesive)

Effective embedment depth:

$h_{ef,act} = 9.000$ in. ($h_{ef,limit} = -$ in.)

Material:

ASTM A 1554 Grade 36

Evaluation Service Report:

ESR-3187

Issued | Valid:

4/1/2019 | 3/1/2020

Proof:

Design Method ACI 318-08 / Chem

Stand-off installation:

Profile:

Base material:

cracked concrete, 4000, $f_c' = 4,000$ psi; $h = 12.000$ in., Temp. short/long: 32/32 °F

Installation:

hammer drilled hole, Installation condition: Dry, Installation direction: vertical downward

Reinforcement:

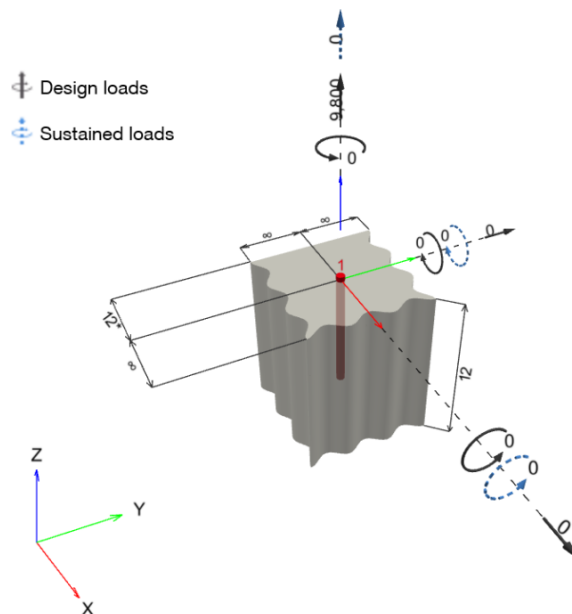
tension: condition B, shear: condition B; no supplemental splitting reinforcement present

Seismic loads (cat. C, D, E, or F)

no



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



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Fastening point: 5/8 anchor	

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 9,800; V_x = 0; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$ $N_{sus} = 0; M_{x,sus} = 0; M_{y,sus} = 0;$	no	100

2 Load case/Resulting anchor forces

Load case: Design loads

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	9,800	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]

3 Tension load

	Load N_{ua} [lb]	Capacity ϕN_n [lb]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	9,800	9,833	100	OK
Bond Strength**	9,800	14,086	70	OK
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	9,800	17,227	57	OK

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



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5/8 anchor

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3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-3187
 $\phi N_{sa} \geq N_{ua}$ ACI 318-08 Eq. (D-1)

Variables

$A_{se,N}$ [in. ²]	f_{uta} [psi]
0.23	58,000

Calculations

N_{sa} [lb]
13,110

Results

N_{sa} [lb]	ϕ_{steel}	ϕN_{sa} [lb]	N_{ua} [lb]
13,110	0.750	9,833	9,800

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Fastening point:	

3.2 Bond Strength

$$N_a = \left(\frac{A_{Na}}{A_{Na0}} \right) \psi_{ed,Na} \psi_{cp,Na} N_{ba} \quad \text{ACI 318-11 Eq. (D-18)}$$

$$\phi N_a \geq N_{ua} \quad \text{ACI 318-11 Table D.4.1.1}$$

$$A_{Na} = \text{see ACI 318-11, Part D.5.5.1, Fig. RD.5.5.1(b)}$$

$$A_{Na0} = (2 c_{Na})^2 \quad \text{ACI 318-11 Eq. (D-20)}$$

$$c_{Na} = 10 d_a \sqrt{\frac{\tau_{uncr}}{1100}} \quad \text{ACI 318-11 Eq. (D-21)}$$

$$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}} \right) \leq 1.0 \quad \text{ACI 318-11 Eq. (D-25)}$$

$$\psi_{cp,Na} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-11 Eq. (D-27)}$$

$$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \pi \cdot d_a \cdot h_{ef} \quad \text{ACI 318-11 Eq. (D-22)}$$

Variables

$\tau_{k,c,uncr}$ [psi]	d_a [in.]	h_{ef} [in.]	$c_{a,min}$ [in.]	$\alpha_{overhead}$	$\tau_{k,c}$ [psi]
2,327	0.625	9.000	12.000	1.000	1,226
c_{ac} [in.]	λ_a				
25.727	1.000				

Calculations

c_{Na} [in.]	A_{Na} [in. ²]	A_{Na0} [in. ²]	$\psi_{ed,Na}$
9.049	327.54	327.54	1.000
$\psi_{cp,Na}$	N_{ba} [lb]		
1.000	21,671		

Results

N_a [lb]	ϕ_{bond}	ϕN_a [lb]	N_{ua} [lb]
21,671	0.650	14,086	9,800

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3.3 Concrete Breakout Failure

$$N_{cb} = \left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \quad \text{ACI 318-08 Eq. (D-4)}$$

$$\phi N_{cb} \geq N_{ua} \quad \text{ACI 318-08 Eq. (D-1)}$$

 A_{Nc} see ACI 318-08, Part D.5.2.1, Fig. RD.5.2.1(b)

$$A_{Nc0} = 9 h_{ef}^2 \quad \text{ACI 318-08 Eq. (D-6)}$$

$$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0 \quad \text{ACI 318-08 Eq. (D-11)}$$

$$\psi_{cp,N} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-08 Eq. (D-13)}$$

$$N_b = k_c \lambda \sqrt{f'_c} h_{ef}^{1.5} \quad \text{ACI 318-08 Eq. (D-7)}$$

Variables

h_{ef} [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$	c_{ac} [in.]	k_c	λ	f'_c [psi]
9.000	12.000	1.000	25.727	17	1	4,000

Calculations

A_{Nc} [in. ²]	A_{Nc0} [in. ²]	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
688.50	729.00	0.967	1.000	29,030

Results

N_{cb} [lb]	$\phi_{concrete}$	ϕN_{cb} [lb]	N_{ua} [lb]
26,503	0.650	17,227	9,800



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4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_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 5216:2018, 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.
- The present version of the software does not account for special design provisions for overhead applications. Refer to related approval (e.g. section 4.1.1 of the ICC-ESR 2322) for details.
- For additional information about ACI 318 strength design provisions, please go to <https://submittals.us.hilti.com/PROFISAnchorDesignGuide/>

Fastening meets the design criteria!



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Design:	5/8 anchor	Date:	8/30/2019
Fastening point:			

6 Installation data

Profile: -

Hole diameter in the fixture: -

Plate thickness (input): -

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 + HAS-V-36

(ASTM F1554 Gr.36) 5/8

Item number: 2198026 HAS-V-36 5/8"x10" (element) /
2022793 HIT-HY 200-R (adhesive)

Installation torque: 720 in.lb

Hole diameter in the base material: 0.750 in.

Hole depth in the base material: 9.000 in.

Minimum thickness of the base material: 10.500 in.

5/8 Hilti HAS Carbon steel threaded rod with Hilti HIT-HY 200 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	0.000	0.000	12.000	-	-	-



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Design:	5/8 anchor	Date:	8/30/2019
Fastening point:			

7 Remarks; Your Cooperation Duties

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- 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.

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Company:
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Phone | Fax: |
Design: 3/4 anchor
Fastening point:

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Specifier's comments:

1 Input data

Anchor type and diameter:

HIT-HY 200 + HAS-V-36 (ASTM F1554 Gr.36) 3/4

Item number:

2198030 HAS-V-36 3/4"x10" (element) / 2022793 HIT-HY 200-R (adhesive)

Effective embedment depth:

$h_{ef,act} = 9.000$ in. ($h_{ef,limit} = -$ in.)

Material:

ASTM A 1554 Grade 36

Evaluation Service Report:

ESR-3187

Issued | Valid:

4/1/2019 | 3/1/2020

Proof:

Design Method ACI 318-08 / Chem

Stand-off installation:

Profile:

Base material:

cracked concrete, 4000, $f'_c = 4,000$ psi; $h = 12.000$ in., Temp. short/long: 32/32 °F

Installation:

hammer drilled hole, Installation condition: Dry, Installation direction: vertical downward

Reinforcement:

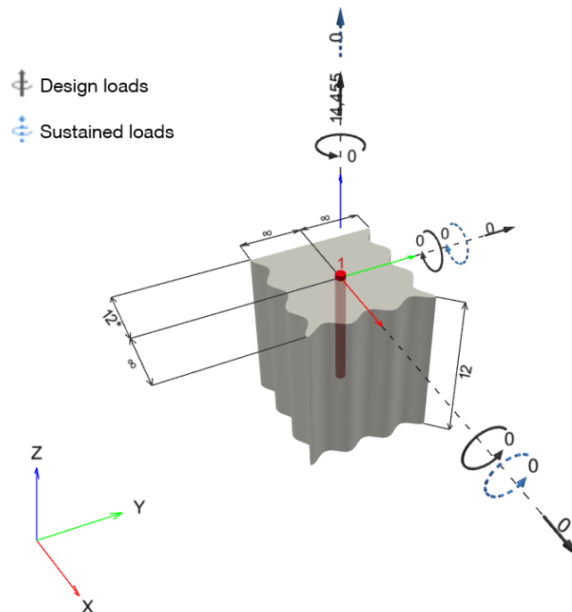
tension: condition B, shear: condition B; no supplemental splitting reinforcement present

Seismic loads (cat. C, D, E, or F)

no



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



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Phone Fax:		E-Mail:	
Design:	3/4 anchor	Date:	8/30/2019
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 14,455; V_x = 0; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$ $N_{sus} = 0; M_{x,sus} = 0; M_{y,sus} = 0;$	no	100

2 Load case/Resulting anchor forces

Load case: Design loads

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	14,455	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]

3 Tension load

	Load N_{ua} [lb]	Capacity ϕN_n [lb]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	14,455	14,550	100	OK
Bond Strength**	14,455	18,203	80	OK
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	14,455	17,227	84	OK

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



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Design:	3/4 anchor	Date:	8/30/2019
Fastening point:			

3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-3187
 $\phi N_{sa} \geq N_{ua}$ ACI 318-08 Eq. (D-1)

Variables

$A_{se,N}$ [in. ²]	f_{uta} [psi]
0.33	58,000

Calculations

N_{sa} [lb]
19,400

Results

N_{sa} [lb]	ϕ_{steel}	ϕN_{sa} [lb]	N_{ua} [lb]
19,400	0.750	14,550	14,455

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Address:	Specifier:
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Design: 3/4 anchor	Date: 8/30/2019
Fastening point:	

3.2 Bond Strength

$$N_a = \left(\frac{A_{Na}}{A_{Na0}} \right) \psi_{ed,Na} \psi_{cp,Na} N_{ba} \quad \text{ACI 318-11 Eq. (D-18)}$$

$$\phi N_a \geq N_{ua} \quad \text{ACI 318-11 Table D.4.1.1}$$

$$A_{Na} = \text{see ACI 318-11, Part D.5.5.1, Fig. RD.5.5.1(b)}$$

$$A_{Na0} = (2 c_{Na})^2 \quad \text{ACI 318-11 Eq. (D-20)}$$

$$c_{Na} = 10 d_a \sqrt{\frac{\tau_{uncr}}{1100}} \quad \text{ACI 318-11 Eq. (D-21)}$$

$$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}} \right) \leq 1.0 \quad \text{ACI 318-11 Eq. (D-25)}$$

$$\psi_{cp,Na} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-11 Eq. (D-27)}$$

$$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \pi \cdot d_a \cdot h_{ef} \quad \text{ACI 318-11 Eq. (D-22)}$$

Variables

$\tau_{k,c,uncr}$ [psi]	d_a [in.]	h_{ef} [in.]	$c_{a,min}$ [in.]	$\alpha_{overhead}$	$\tau_{k,c}$ [psi]
2,327	0.750	9.000	12.000	1.000	1,321
c_{ac} [in.]	λ_a				
23.917	1.000				

Calculations

c_{Na} [in.]	A_{Na} [in. ²]	A_{Na0} [in. ²]	$\psi_{ed,Na}$
10.859	471.66	471.66	1.000
$\psi_{cp,Na}$	N_{ba} [lb]		
1.000	28,005		

Results

N_a [lb]	ϕ_{bond}	ϕN_a [lb]	N_{ua} [lb]
28,005	0.650	18,203	14,455

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3.3 Concrete Breakout Failure

$$N_{cb} = \left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \quad \text{ACI 318-08 Eq. (D-4)}$$

$$\phi N_{cb} \geq N_{ua} \quad \text{ACI 318-08 Eq. (D-1)}$$

$$A_{Nc} \text{ see ACI 318-08, Part D.5.2.1, Fig. RD.5.2.1(b)}$$

$$A_{Nc0} = 9 h_{ef}^2 \quad \text{ACI 318-08 Eq. (D-6)}$$

$$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0 \quad \text{ACI 318-08 Eq. (D-11)}$$

$$\psi_{cp,N} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-08 Eq. (D-13)}$$

$$N_b = k_c \lambda \sqrt{f_c} h_{ef}^{1.5} \quad \text{ACI 318-08 Eq. (D-7)}$$

Variables

h_{ef} [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$	c_{ac} [in.]	k_c	λ	f_c [psi]
9.000	12.000	1.000	23.917	17	1	4,000

Calculations

A_{Nc} [in. ²]	A_{Nc0} [in. ²]	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
688.50	729.00	0.967	1.000	29,030

Results

N_{cb} [lb]	$\phi_{concrete}$	ϕN_{cb} [lb]	N_{ua} [lb]
26,503	0.650	17,227	14,455



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4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_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 5216:2018, 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.
- The present version of the software does not account for special design provisions for overhead applications. Refer to related approval (e.g. section 4.1.1 of the ICC-ESR 2322) for details.
- For additional information about ACI 318 strength design provisions, please go to <https://submittals.us.hilti.com/PROFISAnchorDesignGuide/>

Fastening meets the design criteria!

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6 Installation data

Profile: -

Hole diameter in the fixture: -

Plate thickness (input): -

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 + HAS-V-36

(ASTM F1554 Gr.36) 3/4

Item number: 2198030 HAS-V-36 3/4"x10" (element) /
2022793 HIT-HY 200-R (adhesive)

Installation torque: 1,200 in.lb

Hole diameter in the base material: 0.875 in.

Hole depth in the base material: 9.000 in.

Minimum thickness of the base material: 10.750 in.

3/4 Hilti HAS Carbon steel threaded rod with Hilti HIT-HY 200 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	0.000	0.000	12.000	-	-	-



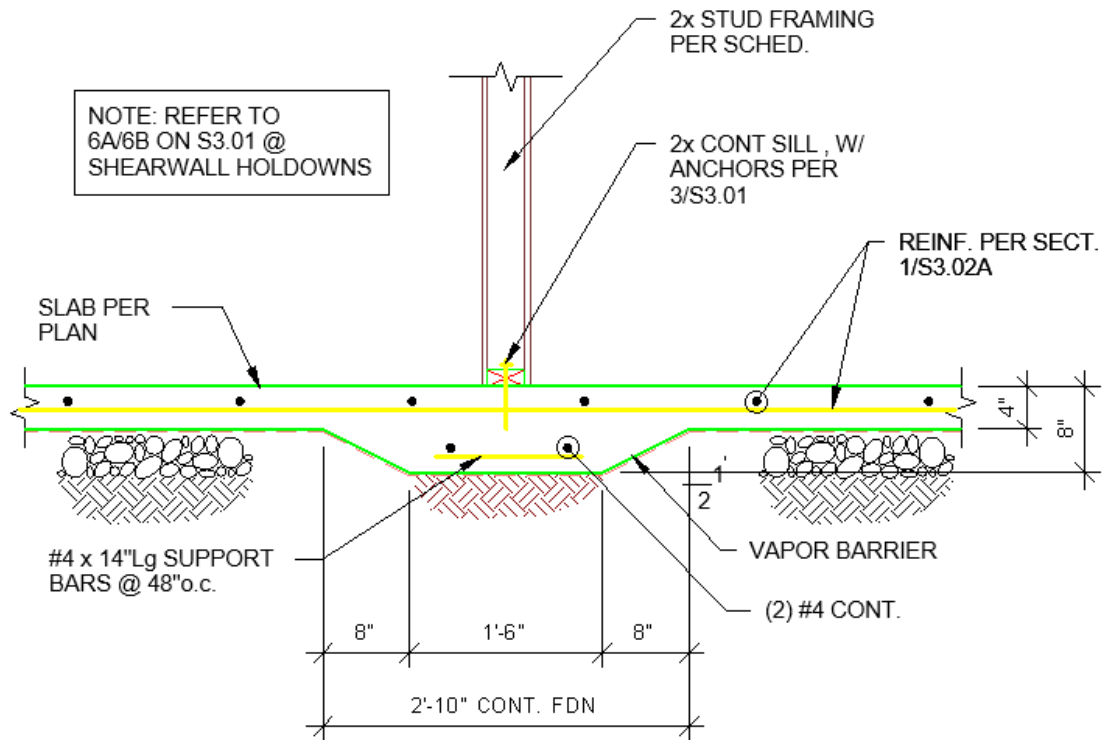
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7 Remarks; Your Cooperation Duties

- 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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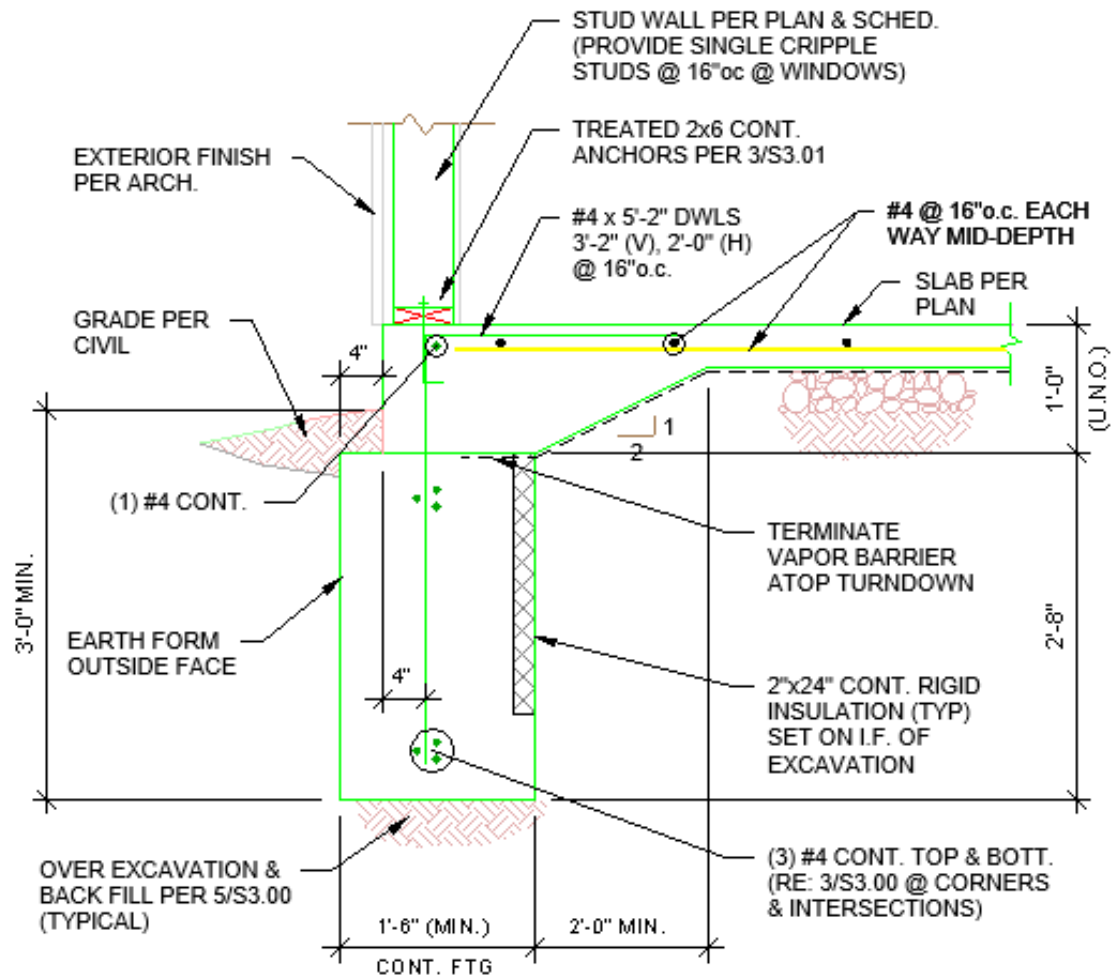
FOUNDATION DESIGN



INTERIOR BRG. WALL FTG AT SINGLE WALLS

TYPICAL INTERIOR FOUNDATION

MAX WALL LOAD = 3210 PLF
 BEARING PRESSURE AT 2.833' FOOTING
 $= 3210 \text{ plf} / 2.833 = 1133 \text{ psf} < 2000 \text{ psf} \text{ -- OK}$



1 SECTION

3/4" = 1'-0"

TYPICAL EXTERIOR FOUNDATION

MAX WALL LOAD = 3020 PLF
BEARING PRESSURE AT 2' FOOTING
= 3020 plf / 1.5 = 2013 psf = +/- 2000 psf -- OK