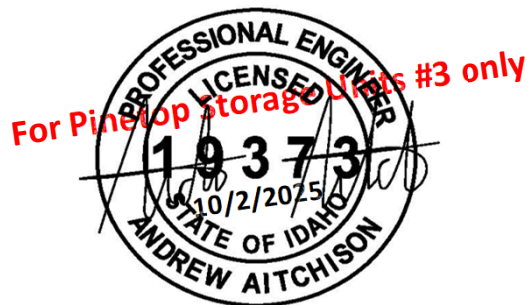


Structural Calculations

Project Title: Pinetop Storage Units #3

Location: Valley County, Idaho

Job #: 2025-10823



Disclaimer:

1. Calculations are not to be used for determining lengths of structural members.
2. Calculations are single use and location specific to property listed above.
3. Calculations shall not to be reproduced, reused, or altered in any way.
4. Calculations based on drawings received prior to stamp date. Any changes made after stamp date must be reviewed and approved by Engineer of Record prior to construction.
5. All work to conform to all local, state, and national codes.

Prepared in accordance with 2018 IBC. Calculations expire by: 10/2/2026

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SITE SPECIFIC DESIGN CRITERIA:

Snow Criteria:

Roof Load (P_f)	150 psf	
Ground Load (P_g)	150 psf	
Exposure Factor (C_e)	1.0	Partially
Thermal Factor (C_t)	1.0	Typical
Importance (I_s)	1.0	

Wind Criteria:

Wind Speed (V_3)	115 mph	
Wind Exposure	C	Open Terrain
Wind Importance (I_w)	1.0	
Building Category	II	

Seismic Criteria:

Site Class	D	Stiff Soil
S_s	0.51	F_a 1.39
S_1	0.15	F_v 2.19
S_{D1}	0.47	S_{D1} 0.22
Risk Category	II	Other
Seismic Importance (I_E)	1.0	
Seismic Design Category (SDC)	D	

Seismic Criteria (continued):

Wall Material	Design Base Shear	Response Coeff., R	
OSB	.09Wp	6.5	Typ @ Ext
GYP	.28Wp	2	Typ @ Int
Cant. Col.	.38Wp	1.5	

Soil Criteria:

Brg. Strength	1500 psf
---------------	-----------------

STRUCTURE SPECIFIC DESIGN CRITERIA:

Live Loads:

Typ Residential	40 psf
Garage (P.V.)	50 psf
Sleeping Area's	30 psf

Roof Dead Loads:

Deck	1.5
Insulation	2.0
Roofing	3.0
Joist	2.5
Ceiling	3.0
Misc	4.5

TOTAL 17 psf *Roof not engineered for Tile, Slate or Concrete.*

Exterior Wall Dead Loads:

Studs	2.0
Siding	2.5
Insulation	0.5
Gyp. Board	2.5
Sheathing	1.5
Misc	3.0

TOTAL 12 psf

Floor Dead Loads:

Deck	2.5
Joist	2.0
Ceiling	2.0
Flooring	2.5
Misc	3.0

TOTAL 12 psf

Interior Wall Dead Loads:

Studs	2.0
Gyp. Board	2.5
Misc	3.0

TOTAL 8 psf

Deck Dead Load

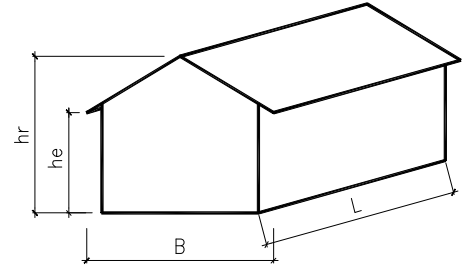
Decking	4.4
Joist	2.0
	0.0
Misc	3.0

TOTAL 10 psf

WIND ANALYSIS: Low-rise Building - Based on IBC / ASCE 7

INPUT DATA

Exposure category (B, C or D, ASCE 7-16 26.7.3)		C	
Importance factor (ASCE 7-16 Table 1.5-2)	$I_w =$	1.00	for all Category
Basic wind speed (ASCE 7-16 26.5.1 or 2018 IBC)	$V =$	115	mph
Topographic factor (ASCE 7-16 26.8 & Table 26.8-1)	$K_{zt} =$	1.00	Flat
Building height to ridge	$h_r =$	23.67 ft	ft
Building height to eave	$h_e =$	16.00 ft	ft
Building width	$B =$	50.00 ft	ft
Building length	$L =$	243.00 ft	ft
Overhang sloped width	$O_h =$	3.00 ft	ft
Effective area of components (or Solar Panel area)	$A =$	85.3 ft ²	ft ² , <== Overhang? (Yes or No): Yes
Enclosed? (Y/N)		y	



ANALYSIS

Velocity pressure

$$q_h = 0.00256 K_z K_{zt} K_d K_e V^2 = 25.91 \text{ psf}$$

where: q_h = velocity pressure at mean roof height, h. (Eq. 26.10-1 page 268)

K_z = velocity pressure exposure coefficient evaluated at height, h, (Tab. 26.10-1, pg 266) = **0.90**

K_d = wind directionality factor. (Tab. 26.6-1, for building, page 266) = **0.85**

h = mean roof height = **19.84 ft**

K_e = ground elevation factor. (**1.0** per Sec. 26.9, page 268)

< 60 ft, [Satisfactory] (ASCE 7-16 26.2.1)

< Min (L, B), [Satisfactory] (ASCE 7-16 26.2.2)

Design pressures for MWFRS

$$p = q_h [(G C_{pf}) - (G C_{pi})]$$

where: p = pressure in appropriate zone. (Eq. 28.3-1, page 311).

$p_{min} = 16 \text{ psf}$ (ASCE 7-16 28.3.4)

$G C_{pf}$ = product of gust effect factor and external pressure coefficient, see table below. (Fig. 28.3-1, page 312 & 313)

$G C_{pi}$ = product of gust effect factor and internal pressure coefficient. (Tab. 26.13-1, Enclosed Building, page 271)

= **0.18** or **-0.18**

a = width of edge strips, Fig 28.3-1, page 312, $\text{MAX}[\text{MIN}(0.1B, 0.1L, 0.4h), \text{MIN}(0.04B, 0.04L), 3] = 5.00 \text{ ft}$

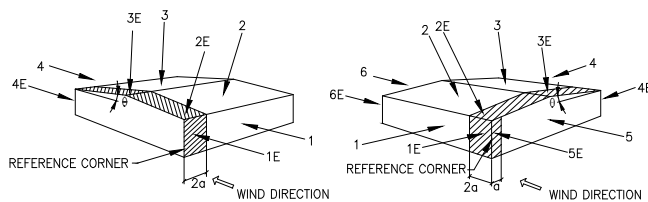
Net Pressures (psf), Basic Load Cases

Surface	Roof angle $q = 18.43$			Roof angle $q = 18.43$		
	$G C_{pf}$	Net Press. W/		$G C_{pf}$	Net Press. W/	
		(+GC _{pi})	(-GC _{pi})		(+GC _{pi})	(-GC _{pi})
1	0.52	8.72	18.04	-0.45	-16.32	-7.00
2	-0.69	-22.54	-13.21	-0.69	-22.54	-13.21
3	-0.47	-16.80	-7.48	-0.37	-14.25	-4.92
4	-0.42	-15.43	-6.10	-0.45	-16.32	-7.00
5				0.40	5.70	15.03
6				-0.29	-12.18	-2.85
1E	0.78	15.55	24.88	-0.48	-17.10	-7.77
2E	-1.07	-32.39	-23.06	-1.07	-32.39	-23.06
3E	-0.67	-22.11	-12.78	-0.53	-18.40	-9.07
4E	-0.62	-20.68	-11.35	-0.48	-17.10	-7.77
5E				0.61	11.14	20.47
6E				-0.43	-15.80	-6.48

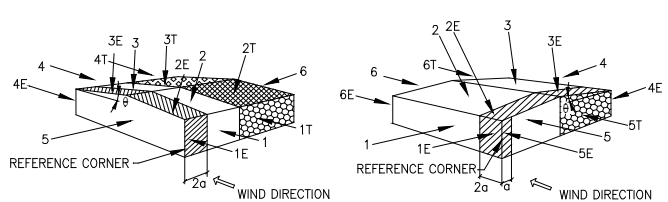
Net Pressures (psf), Torsional Load Cases

Surface	Roof angle $q = 18.43$		
	$G C_{pf}$	Net Press. W/	
		(+GC _{pi})	(-GC _{pi})
1T	0.52	2.18	4.51
2T	-0.69	-5.64	-3.30
3T	-0.47	-4.20	-1.87
4T	0.00	-3.86	-1.52
Surface	Roof angle $q = 0.00$		
	$G C_{pf}$	Net Press. W/	
		(+GC _{pi})	(-GC _{pi})
5T	0.40	1.42	3.76
6T	-0.29	-3.04	-0.71

+ / - Wind Pressure **64%**



Load Case A (Transverse) Load Case B (Longitudinal)
Basic Load Cases



Load Case A (Transverse) Load Case B (Longitudinal)
Torsional Load Cases

Design pressures for components and cladding

$$p = q_h [(G C_p) - (G C_{pi})]$$

where: p = pressure on component. (Eq. 30.3-1, pg 33)

$$p_{min} = 16.00 \text{ psf (ASCE 7-16 30.2.2)}$$

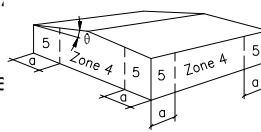
$$G C_p = 1.00 \text{ external pressure coefficient}$$

see table below. (ASCE 7-16 30.3.2)

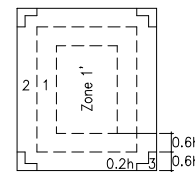
$$q = 18.43 \text{ }^{\circ}$$

$$p_{overhang} = -89.39 \text{ psf}$$

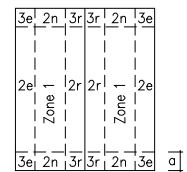
(ASCE 7-16 28.3.3)



Walls



Roof $\theta \leq 7^{\circ}$



Roof $\theta > 7^{\circ}$

Comp. & Cladding Coeffs.	Effective Area (ft ²)	Zone 1		Zone 1'		Zone 2		Zone 2e		Zone 2n		Zone 2r	
		GC _p	- GC _p	GC _p	- GC _p	GC _p	- GC _p	GC _p	- GC _p	GC _p	- GC _p	GC _p	- GC _p
	833	0.30	-0.80	0.30	-0.80	0.30	-2.20	0.30	-0.80	0.30	-1.00	0.30	-1.00
	Effective Area (ft ²)	Zone 3		Zone 3e		Zone 3r		Zone 4		Zone 5			
		GC _p	- GC _p	GC _p	- GC _p	GC _p	- GC _p	GC _p	- GC _p	GC _p	- GC _p		
	85	0.30	-2.50	0.30	-2.50	0.30	-1.80	0.95	-1.05	0.95	-1.31		

Comp. & Cladding Pressures	Zone 1		Zone 1'		Zone 2		Zone 2e		Zone 2n		Zone 2r	
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
	12.44	-25.39	12.44	-25.39	12.44	-61.66	12.44	-25.39	12.44	-30.57	12.44	-30.57
	Zone 3		Zone 3e		Zone 3r		Zone 4		Zone 5			
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	(Max Pressure 69.44 psf)	
	12.44	-69.44	12.44	-69.44	12.44	-51.30	29.38	-31.97	29.38	-38.55		

LOAD CASE 'A' FACTORED LOADS	
$0.6 * W_r = (Z_2 + Z_3) * 0.6 =$	3.4 psf
$0.6 * W_{re} = (Z_{2E} + Z_{3E}) * 0.6 =$	6.2 psf
$0.6 * W_w = (Z_1 + Z_4) * 0.6 =$	14.5 psf
$0.6 * W_{we} = (Z_{1E} + Z_{4E}) * 0.6 =$	21.7 psf

LOAD CASE 'B' FACTORED LOADS	
$0.6 * W_r = (Z_2 + Z_3) * 0.6 =$	5.0 psf
$0.6 * W_{re} = (Z_{2E} + Z_{3E}) * 0.6 =$	8.4 psf
$0.6 * W_w = (Z_5 + Z_6) * 0.6 =$	10.7 psf
$0.6 * W_{we} = (Z_{5E} + Z_{6E}) * 0.6 =$	16.2 psf

ROOF COMPONENTS FACTORED LOAD	
$0.6 * Z_{r,c\&c} =$	18.3 psf

WALL COMPONENTS FACTORED LOAD	
$0.6 * Z_{w,c\&c} =$	19.2 psf

OSB SEISMIC LOADING ANALYSIS

IBC / ASCE 7: Equivalent Lateral Force (ELF) Procedure:

INPUT DATA

Typical floor height: $h = 16$ ft
 Typical floor weight: $w_x = 206.6$ kips
 Number of floors: $n = 1$
 Importance factor (ASCE 11.5.1): $I_e = 1.00$
 Design spectral response: $S_{DS} = 0.47$ g
 $S_{D1} = 0.22$ g
 Mapped spectral resp.: $S_1 = 0.15$ g
 Period Parameter, C_t :
 (ASCE Tab 12.8-2): $C_t = 0.020$
 Resp. coefficient: (ASCE
 Tab. 12.2.1): $R = 6.5$
 Seismic design category: SDC = D
 $h_n = 23.7$ ft

DESIGN SUMMARY

$C_s = 1.2 * S_{DS} / (R / I_e) = 0.0870$ <= Applicable
 Period Parameter, $x = 0.75$, ASCE Tab 12.8-2
 Period: $T_a = C_t (h_n)^x = 0.21$ sec, ASCE 12.8.2.1
 $C_s < S_{D1} / [(R / I_e) T_a] = 0.1592$, ASCE Tab 12.8.1.1 <= Not Applicable
 $C_s > 0.044 S_{DS} I_e = 0.0207$, ASCE Tab 12.8.1.1 <= Not Applicable
 $C_s > 0.5 S_1 / (R / I_e) = 0.0117$, ASCE Tab 12.8.1.1 <= Not Applicable
 $k = 3.43$, (ASCE 12.8.3, page 91)
 $V = C_s W = 0.0870$ W
 $0.7 * V = 0.0609$ W
 $W = 207$ kips, total

SEISMIC COMPONENT & ANCHORING ANALYSIS

Out-of-plane seismic force for wall design (ASCE 7, Sec.12.11.1)

$$k_a = 1.0 + \frac{L_f}{100} \quad (12.11-2)$$

Lf: 10 ft ka: 1.1

$$F_p = 0.4 S_{DS} k_a I_e W_p \quad (12.11-1) = 2.5 \text{ psf} \quad \leq \text{USE FOR O.O.P. WALL}$$

Where: $W_p = 12.0$ psf, $I_e = 1.00$

For seismic design category C and above, flexible diaphragm (ASCE 7)

$$F_{px} = 0.4 S_{DS} I_e W_{px} \quad (12.10-3) = 3.2 \text{ psf} \quad \leq \text{USE FOR ROOF FRAMING UPLIFT}$$

Where: $W_{px} = 17.0$ psf,

WIND / SEISMIC SHEAR FORCE CALCULATIONS:

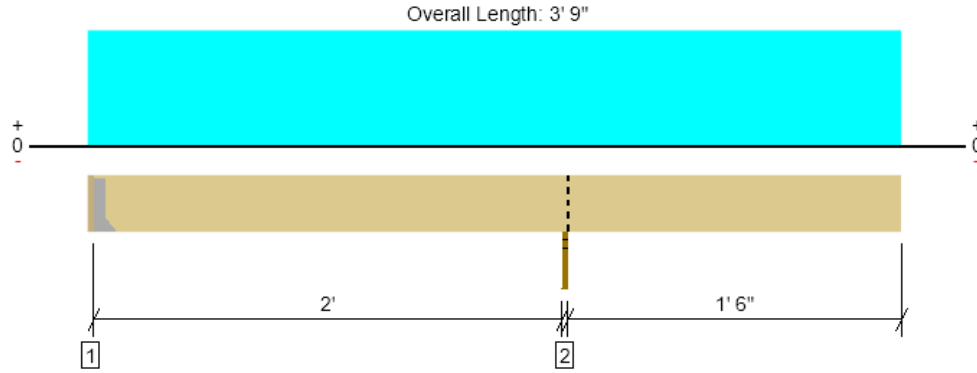
From ASCE 7-16 Wind & Seismic Loading Analysis

Wall Line	Roof / Floor						Wall					Load above		*C _s (Wp)	=	Loading		
	Wind Force (psf)	Diaph. Weight	Wr, We	truss trib (ft)	Area W (ft)	Area L (ft)	Wind Force (psf)	Wall DL (psf)	Wall ht (ft)	wall line dist (ft)	Upr. Flr Wall ht (ft)	Wind (#)	Seismic (#)			Wind Force (kips)	Seismic Force (kips)	Lateral Control
X1-1	9.6	47	7.7	50.0	243.0		15.9	12.0	16.0	50.0				0.06	=	5.03	17.97	Seismic
X2-1	9.6	47	7.7	50.0	243.0		15.9	12.0	16.0	50.0				0.06	=	5.03	17.97	Seismic
Y1-1	9.6	47	7.7	18.0	50.0		18.5	12.0	9.0	18.0				0.06	=	1.41	1.41	Wind
Y2-1	9.6	47	7.7	18.0	50.0		18.5	12.0	9.0	18.0				0.06	=	13.55	11.81	Wind
	9.6	47	7.7	125.0	50.0		15.1	12.0	16.0	125.0				0.06	=			
Y3-1	9.6	47	7.7	125.0	50.0		15.1	12.0	16.0	125.0				0.06	=	21.90	18.73	Wind
	9.6	47	7.7	100.0	50.0		15.2	12.0	16.0	100.0				0.06	=			
Y4-1	9.6	47	7.7	100.0	50.0		15.2	12.0	16.0	100.0				0.06	=	9.77	8.32	Wind

SHEAR WALL CALCULATIONS:						
	X1-1	X2-1	Y2-1	Y3-1	Y4-1	Y1-1
Shear Wall Forces						
Number of Panels	1	8	1	1	1	1
Total length of wall	250.00 ft	243.00 ft	49.00 ft	49.00 ft	50.00 ft	50.00 ft
Total length of shear wall	L = 250.00 ft	6.00 ft	49.00 ft	49.00 ft	50.00 ft	50.00 ft
Total length of full ht seg.	L _w = 74.00 ft	6.00 ft	49.00 ft	49.00 ft	50.00 ft	12.00 ft
height of shear wall	H = 16.00 ft	16.00 ft	16.00 ft	16.00 ft	16.00 ft	9.00 ft
Maximum opening height	H' = 0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	6.67 ft
Total force at top of wall	V ₁ = 17970 lbs	2246 lbs	13547 lbs	21901 lbs	9766 lbs	1412 lbs
Self weight	w _{DL self} = 192 plf	192 plf	192 plf	192 plf	192 plf	108 plf
Applied dead load	w _{DL above} = 40 plf	476 plf	40 plf	40 plf	40 plf	40 plf
Prefered OSB thickness	in 7/16	7/16	7/16	7/16	7/16	7/16
Prefered Gyp thickness	in 1/2	1/2	1/2	1/2	1/2	1/2
Wall Connected to Concrete	y/n = Y	Y	Y	Y	Y	Y
Shear Wall Segments						
	18.00	6.00	49.00	49.00	50.00	4.00
	8.00					4.00
	8.00					4.00
	8.00					
	8.00					
	8.00					
	8.00					
	8.00					
Shear Transfer to Concrete						
T =	Not Req'd	4788 lbs	1016 lbs	3744 lbs	Not Req'd	Not Req'd
1/2 Anchor Bolts @	72 " O.C.	72 " O.C.	36 " O.C.	24 " O.C.	60 " O.C.	72 " O.C.
Provide:	Code Min.	Code Min.	A3	A2	A5	Code Min.
Min # of 1/2 Anchor Bolts	(18) Min	(3) Min	(14) Min	(22) Min	(10) Min	(2) Min
Load From Above	0.00	0.00	0.00	0.00	0.00	0.00
		HD3	HD1	HD3		
Shear Resisting System						
Force Calculated	242.84	374.38	276.48	446.95	195.32	227.15
	OSB	OSB	OSB	OSB	OSB	OSB
Min Shear Wall Segment:	4.57 ft	4.57 ft	4.57 ft	4.57 ft	4.57 ft	2.57 ft
Provide: Va =	SW1	SW2	SW2	SW3	SW1	SW1
Min Shear Wall Segment:						
Provide: Va =						
Blocking / Nailing Framing Attachment						
Blocking Unit Shear	72 plf	74 plf	276 plf	447 plf	195 plf	28 plf
Blocking	NONE	NONE	B1	B2	B1	NONE
Nailing	See SCHED	See SCHED	T1	T3	T1	See SCHED
Unit Base Shear						
% of full height segments	%fh = L _w /L = 0.296	1.000	1.000	1.000	1.000	0.240
% of maximum opening height	%oh = H'/H = 0.000	0.000	0.000	0.000	0.000	0.741
Shear cap adj factor	SCAF = 1.00	1.00	1.00	1.00	1.00	0.52
Unit base shear	vbase V ₁ /L _w = 243 plf	374 plf	276 plf	447 plf	195 plf	118 plf
Effective unit base shear	vreq=v _{base} /SCAF = 243 plf	374 plf	276 plf	447 plf	195 plf	227 plf
Ovrtrn. mo. Ttl. length of wall	OTM = 287.5 k-ft	35.9 k-ft	216.8 k-ft	350.4 k-ft	156.3 k-ft	24.5 k-ft
Shear wall adjustment factor						
Resist moment total L. of wall	RM = 7243.1 k-ft	12.0 k-ft	278.3 k-ft	278.3 k-ft	289.7 k-ft	184.7 k-ft
	r = 0.9999	1.0000	1.0000	1.0000	1.0000	0.2988
	C ₀ = 3.3769	1.0000	1.0000	1.0000	1.0000	0.5182

Level, *OUTLOOKERS*

1 piece(s) 2 x 6 DF No.2 @ 24" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1064 @ 2' 2 1/4"	1406 (1.50")	Passed (76%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	368 @ 1' 8"	1139	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-408 @ 2' 2 1/4"	975	Passed (42%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.028 @ 3' 9"	0.200	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.030 @ 3' 9"	0.208	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (0.2") and TL (2L/180).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Member Length : 3' 7 1/2"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Hanger on 5 1/2" DF beam	1.50"	Hanger ¹	1.50"	19	258	277	See note ¹
2 - Stud wall - DF	1.50"	1.50"	1.50"	108	956	1064	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 8" o/c	
Bottom Edge (Lu)	3' 8" o/c	

- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 3' 9"	24"	17.0	150.0	Default Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Trevor Steelsmith Snake River Engineering 10/02/25 (208) 453-6512 trevor@snakeriverengineering.com	



4/11/2025 4:47:34 PM UTC
ForteWEB v3.9, Engine: V8.1.3-94, Data: V8.1.7.3
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File Name: 2025-9427 Pinetop Storage Units

Header Calculations (H1 (3))

	Additional Drift	Roof	Floor	Deck	Wall	Total Load	Total Load
Trib	0.0	4	0	0	9.33		780.0 plf
Dead Load	-	68.0	0.0	0.0	112.0	180.0 plf	
Live / Snow Load	0	600.0	0.0	0.0	-	600.0 plf	

Description:	3.5 ft Opening							
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Header Callout	(2)2x6 DF-L No. 2							
Trimmers	(1) 2x8 DF-L No. 2							
King Studs	(2) 2x8 DF-L No. 2							

Wood Design								
Species	DF-L							
Grade	No. 2							
Width	3.00 in							
Depth	5.50 in							

Reaction								
Dead Load	315 lbs							
Live Load	1,050 lbs							

Load								
lu	3.5 ft							
le	7.1 ft							

Adjustment Factors								
Cd	1.15							
CF	1.3							

Material Properties								
Fb	900 psi							
Fv	180 psi							
E	1,600,000 psi							
Emin	580,000 psi							

Calculated Prop.								
A	16.50 in^2							
I	41.59 in^4							
S	15.13 in^3							
RB	7.21							
Emin'	580,000 psi							
FbE	13,405 psi							
Fb*	1,346 psi							
CL	1							

Shear and Moment								
M	14,332 lb-in							
V	1,365 lbs							

Stress								
fb	948 psi							
Fb'	1,338 psi							
fb/Fb'	0.71							
fv	124 psi							
Fv'	207 psi							
fv/Fv'	0.60							
Max Ratio	0.71							
	Pass							

Deflection								
ΔTL	0.04 in							
	L/1,061							
ΔLL	0.03 in							
	L/1,380							
	Pass							

Header Calculations (H1 (1))

	Additional Drift	Roof	Floor	Deck	Wall	Total Load	Total Load
Trib	0.0	28	0	0	9.33		4,788.0 plf
Dead Load	-	476.0	0.0	0.0	112.0	588.0 plf	
Live / Snow Load	0	4200.0	0.0	0.0	-	4,200.0 plf	

Description:	3.0 ft Opening	12.0 ft Opening						
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Header Callout	(2)9.5 LVL 2.0E	6.75x21 DF/DF 24F - V4						
Trimmers	(3) 2x8 DF-L No. 2	(10) 2x8 DF-L No. 2						
King Studs	(2) 2x8 DF-L No. 2	(5) 2x8 DF-L No. 2						

Wood Design								
Species	LVL	DF/DF						
Grade	2.0E	24F - V4						
Width	3.50 in	6.75 in						
Depth	9.50 in	21.00 in						

Reaction								
Dead Load	882 lbs	3,528 lbs						
Live Load	6,300 lbs	25,200 lbs						

Load								
lu	3.0 ft	12.0 ft						
le	6.2 ft	24.7 ft						

Adjustment Factors								
Cd	1.15	1.15						
CF	1.1	1						

Material Properties								
Fb	2,900 psi	2,400 psi						
Fv	285 psi	265 psi						
E	2,000,000 psi	1,850,000 psi						
Emin	1,016,535 psi	950,000 psi						

Calculated Prop.								
A	33.25 in^2	141.75 in^2						
I	250.07 in^4	5,209.31 in^4						
S	52.65 in^3	496.13 in^3						
RB	7.58	11.69						
Emin'	1,016,535 psi	950,000 psi						
FbE	21,210 psi	8,338 psi						
Fb*	3,669 psi	2,760 psi						
CL	1	1						

Shear and Moment								
M	64,637 lb-in	1,034,199 lb-in						
V	7,182 lbs	28,728 lbs						

Stress								
fb	1,228 psi	2,085 psi						
Fb'	3,631 psi	2,696 psi						
fb/Fb'	0.34	0.77						
fv	324 psi	304 psi						
Fv'	328 psi	305 psi						
fv/Fv'	0.99	1.00						
Max Ratio	0.99	1.00						
	Pass	Pass						

Deflection								
ΔTL	0.02 in	0.23 in						
	L/2,063	L/621						
ΔLL	0.02 in	0.20 in						
	L/2,352	L/708						
	Pass	Pass						

Header Calculations (H1 (4))

	Additional Drift	Roof	Floor	Deck	Wall	Total Load	Total Load
Trib	0.0	28	0	0	2.33		4,704.0 plf
Dead Load	-	476.0	0.0	0.0	28.0	504.0 plf	
Live / Snow Load	0	4200.0	0.0	0.0	-	4,200.0 plf	

Description:	3.5 ft Opening	4.0 ft Opening						
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Header Callout	(3)9.5 LVL 2.0E	(3)9.5 LVL 2.0E						
Trimmers	(2) 2x8 DF-L No. 2	(2) 2x8 DF-L No. 2						
King Studs	(1) 2x8 DF-L No. 2	(1) 2x8 DF-L No. 2						

Wood Design								
Species	LVL	LVL						
Grade	2.0E	2.0E						
Width	5.25 in	5.25 in						
Depth	9.50 in	9.50 in						

Reaction								
Dead Load	882 lbs	1,008 lbs						
Live Load	7,350 lbs	8,400 lbs						

Load								
lu	3.5 ft	4.0 ft						
le	7.2 ft	8.2 ft						

Adjustment Factors								
Cd	1.15	1.15						
CF	1.1	1.1						

Material Properties								
Fb	2,900 psi	2,900 psi						
Fv	285 psi	285 psi						
E	2,000,000 psi	2,000,000 psi						
Emin	1,016,535 psi	1,016,535 psi						

Calculated Prop.								
A	49.88 in^2	49.88 in^2						
I	375.10 in^4	375.10 in^4						
S	78.97 in^3	78.97 in^3						
RB	5.46	5.84						
Emin'	1,016,535 psi	1,016,535 psi						
FbE	40,906 psi	35,792 psi						
Fb*	3,669 psi	3,669 psi						
CL	1	1						

Shear and Moment								
M	86,435 lb-in	112,895 lb-in						
V	8,232 lbs	9,408 lbs						

Stress								
fb	1,095 psi	1,430 psi						
Fb'	3,651 psi	3,648 psi						
fb/Fb'	0.30	0.39						
fv	248 psi	283 psi						
Fv'	328 psi	328 psi						
fv/Fv'	0.76	0.86						
Max Ratio	0.76	0.86						
	Pass	Pass						

Deflection								
ΔTL	0.02 in	0.04 in						
	L/1,984	L/1,329						
ΔLL	0.02 in	0.03 in						
	L/2,222	L/1,488						
	Pass	Pass						

TALL WALL CALCULATIONS:

This spreadsheet is used for designing a stud wall according to the NDS.

Description:

	16' Tall Wall	King Stud (12' Max Opening)		King Stud (3' Max Opening)	16' Tall Wall	16' Tall Wall
Type:	2x Lumber (2"-4")	2x Lumber (2"-4")		2x Lumber (2"-4")	2x Lumber (2"-4")	2x Lumber (2"-4")
Species:	DF-L	DF-L		DF-L	DF-L	DF-L
Grade:	No. 2	No. 2		No. 2	No. 2	No. 2
Nominal width, t =	(1) 2	(3) 2		(1) 2	(1) 2	(1) 2
Actual width =	1.50 in	4.50 in		1.50 in	1.50 in	1.50 in
Nominal depth, d =	8	8		8	6	6
Actual depth =	7.25 in	7.25 in		7.25 in	5.50 in	5.50 in
Span, L =	16.000 ft	16.000 ft		16.000 ft	16.000 ft	16.000 ft
w/o Plates	15.750 ft	15.750 ft		15.750 ft	15.750 ft	15.750 ft
Stud spacing, s =	8 in	78 in		24 in	12 in	16 in
Lat. Pressure, w_{wind} =	19.18 psf	19.18 psf		19.18 psf	19.18 psf	5.00 psf
Axial load, P =	3117 lbs	50 lbs		50 lbs	668 lbs	891 lbs
Eccentricity, e =	0 in	0 in		0 in	0 in	0 in
K_{CE} =	0.3	0.3		0.3	0.3	0.3
c =	0.8	0.8		0.8	0.8	0.8
w =	12.8 plf	125.1 plf		38.8 plf	19.2 plf	6.7 plf
F_b	900 psi	900 psi		900 psi	900 psi	900 psi
F_v	180 psi	180 psi		180 psi	180 psi	180 psi
F_{c-prll}	1,350 psi	1,350 psi		1,350 psi	1,350 psi	1,350 psi
F_{c-perp}	625 psi	625 psi		625 psi	625 psi	625 psi
C_d	1.60	1.60		1.60	1.60	1.60
$C_{F,Fb}$	1.20	1.20		1.20	1.30	1.30
$C_{F,Fcprll}$	1.05	1.05		1.05	1.10	1.10
C_r	1.15	1.00		1.00	1.15	1.15
C_p	0.29	0.29		0.29	0.16	0.16
C_H	1.00	1.00		1.00	1.00	6.00
C_b	1.00	1.00		1.00	1.07	1.07
E	1,600,000 psi	1,600,000 psi		1,600,000 psi	1,600,000 psi	1,600,000 psi
E_{min}	580,000 psi	580,000 psi		580,000 psi	580,000 psi	580,000 psi
Allowable Stress:						
$F'_b = F_b C_d C_F C_r$	1987 psi	1728 psi		1728 psi	2153 psi	2153 psi
$F'_v = F_v C_d C_H$	288 psi	288 psi		288 psi	288 psi	1728 psi
$F'_c = F_c C_d C_F$	2268 psi	2268 psi		2268 psi	2376 psi	2376 psi
$F'_{CE} = (K_{CE} E')/(l/d)^2$	706 psi	706 psi		706 psi	406 psi	406 psi
$F'_c = F_c C_d C_F C_p$	653 psi	653 psi		653 psi	391 psi	391 psi
$F'_{c-perp} = F_{c-perp} C_b$	625 psi	625 psi		625 psi	668 psi	668 psi
$E' = E$	1600000 psi	1600000 psi		1600000 psi	1600000 psi	1600000 psi
$F_{bE} =$	1143 psi	10286 psi		1143 psi	1506 psi	1506 psi
Slenderness Ratio:	< 50 OK	< 50 OK		< 50 OK	< 50 OK	< 50 OK
$R_b =$	25	8		25	21	21
Bending:	< F'b OK	< F'b OK		< F'b OK	< F'b OK	< F'b OK
$M = w L^2/8 + P e/12$	397 ft-lbs	3878 ft-lbs		1202 ft-lbs	595 ft-lbs	207 ft-lbs
$f_b = M/S$	362 psi	1181 psi		1098 psi	944 psi	328 psi
$S =$	13 in ³	39 in ³		13 in ³	8 in ³	8 in ³
Shear:	< F'v OK	< F'v OK		< F'v OK	< F'v OK	< F'v OK
$V = w L/2$	101 lbs	985 lbs		305 lbs	151 lbs	39 lbs
$f_v = 1.5 V/A$	14 psi	45 psi		42 psi	27 psi	7 psi
$A =$	11 in ²	33 in ²		11 in ²	8 in ²	8 in ²
Compression:	< F'c OK	< F'c OK		< F'c OK	< F'c OK	< F'c OK
$f_c = P/A$	287 psi	2 psi		5 psi	81 psi	108 psi
Compression (perp.):	< F'c OK	< F'c OK		< F'c OK	< F'c OK	< F'c OK
$f_{c-perp} = P/A$	287 psi	2 psi		5 psi	81 psi	108 psi
Combined:	< 1.0 OK				< 1.0 OK	< 1.0 OK
$(f_c/F_c)^2 + (f_b/(F_b(1-(f_c/F_cE)))) =$	0.50				0.59	0.28
Deflection:	≥ 180 OK	≥ 180 OK		≥ 180 OK	≥ 180 OK	≥ 180 OK
$D = 22.5 w L^4/E' I =$	0.23 in	0.76 in		0.70 in	0.80 in	0.28 in
$I =$	48 in ⁴	143 in ⁴		48 in ⁴	21 in ⁴	21 in ⁴
SPAN /	814	250		268	237	681

TALL WALL CALCULATIONS:

This spreadsheet is used for designing a stud wall according to the NDS.

Description:

	16' Trimmer		16' Trimmer	9' Tall Wall	9' Tall Wall	King Stud (4' Max Opening)
Type:	2x Lumber (2"-4")		2x Lumber (2"-4")	2x Lumber (2"-4")	2x Lumber (2"-4")	2x Lumber (2"-4")
Species:	DF-L		DF-L	DF-L	DF-L	DF-L
Grade:	No. 2		No. 2	No. 2	No. 2	No. 2
Nominal width, t =	(5) 2		(2) 2	(1) 2	(1) 2	(1) 2
Actual width =	7.50 in		3.00 in	1.50 in	1.50 in	1.50 in
Nominal depth, d =	8		8	8	6	6
Actual depth =	7.25 in		7.25 in	7.25 in	5.50 in	5.50 in
Span, L =	16.000 ft		16.000 ft	9.000 ft	9.000 ft	9.000 ft
w/o Plates	15.750 ft		15.750 ft	8.750 ft	8.750 ft	8.750 ft
Stud spacing, s =	8 in		8 in	16 in	16 in	34 in
Lat. Pressure, w_{wind} =	5.00 psf		5.00 psf	19.18 psf	19.18 psf	19.18 psf
Axial load, P =	28056 lbs		9352 lbs	6235 lbs	891 lbs	50 lbs
Eccentricity, e =	0 in		0 in	0 in	0 in	0 in
K_{CE} =	0.3		0.3	0.3	0.3	0.3
c =	0.8		0.8	0.8	0.8	0.8
w =	3.3 plf		3.3 plf	25.6 plf	25.6 plf	54.7 plf
F_b	900 psi		900 psi	900 psi	900 psi	900 psi
F_v	180 psi		180 psi	180 psi	180 psi	180 psi
F_{c-prll}	1,350 psi		1,350 psi	1,350 psi	1,350 psi	1,350 psi
F_{c-perp}	625 psi		625 psi	625 psi	625 psi	625 psi
C_d	1.15		1.15	1.60	1.60	1.60
$C_{F,Fb}$	1.20		1.20	1.20	1.30	1.30
$C_{F,Fcprll}$	1.05		1.05	1.05	1.10	1.10
C_r	1.00		1.00	1.15	1.15	1.00
C_p	0.39		0.39	0.69	0.47	0.47
C_H	1.00		1.00	1.00	1.00	6.00
C_b	1.00		1.00	1.00	1.07	1.07
E	1,600,000 psi		1,600,000 psi	1,600,000 psi	1,600,000 psi	1,600,000 psi
E_{min}	580,000 psi		580,000 psi	580,000 psi	580,000 psi	580,000 psi
Allowable Stress:						
$F'_b = F_b C_d C_F C_r$	1242 psi		1242 psi	1987 psi	2153 psi	1872 psi
$F'_v = F_v C_d C_H$	207 psi		207 psi	288 psi	288 psi	1728 psi
$F'_c = F_c C_d C_F$	1630 psi		1630 psi	2268 psi	2376 psi	2376 psi
$F'_{CE} = (K_{CE} E') / (l/d)^2$	706 psi		706 psi	2288 psi	1317 psi	1317 psi
$F'_c = F_c C_d C_F C_p$	628 psi		628 psi	1574 psi	1118 psi	1118 psi
$F'_{c-perp} = F_{c-perp} C_b$	625 psi		625 psi	625 psi	668 psi	668 psi
$E' = E$	1600000 psi		1600000 psi	1600000 psi	1600000 psi	1600000 psi
$F_{bE} =$	28571 psi		40500 psi	2057 psi	2712 psi	2712 psi
Slenderness Ratio:	< 50 OK		< 50 OK	< 50 OK	< 50 OK	< 50 OK
$R_b =$	5		12	18	16	16
Bending:	< F'b OK		< F'b OK	< F'b OK	< F'b OK	< F'b OK
$M = w L^2 / 8 + P e / 12$	103 ft-lbs		103 ft-lbs	245 ft-lbs	245 ft-lbs	524 ft-lbs
$f_b = M / S$	19 psi		47 psi	224 psi	388 psi	831 psi
$S =$	66 in ³		26 in ³	13 in ³	8 in ³	8 in ³
Shear:	< F'v OK		< F'v OK	< F'v OK	< F'v OK	< F'v OK
$V = w L / 2$	26 lbs		26 lbs	112 lbs	112 lbs	84 lbs
$f_v = 1.5 V / A$	1 psi		2 psi	15 psi	20 psi	15 psi
$A =$	54 in ²		22 in ²	11 in ²	8 in ²	8 in ²
Compression:	< F'c OK		< F'c OK	< F'c OK	< F'c OK	< F'c OK
$f_c = P / A$	516 psi		430 psi	573 psi	108 psi	6 psi
Compression (perp.):	< F'c OK		< F'c OK	< F'c OK	< F'c OK	< F'c OK
$f_{c-perp} = P / A$	516 psi		430 psi	573 psi	108 psi	6 psi
Combined:				< 1.0 OK	< 1.0 OK	
$(f_c / F_c) + (f_b / [F_b (1 - (f_c / F_{CE})])$				0.28	0.21	
Deflection:	> 180 OK		> 180 OK	> 180 OK	> 180 OK	> 180 OK
$D = 22.5 w L^4 / E' I$	0.01 in		0.03 in	0.04 in	0.10 in	0.22 in
$I =$	238 in ⁴		95 in ⁴	48 in ⁴	21 in ⁴	21 in ⁴
SPAN /	15606		6242	2373	1036	484

CF (3) Individual Footing Design

Program: Continuous Footing

Soil Bearing Pressure: 1500psf

<i>Roof</i>				
Roof Dead	(17psf)	(4.0ft)	=	68plf
Snow Live	(150psf)	(4.0ft)	=	600plf

<i>Misc</i>				
Wall Load:	(12psf)	(16.0ft)	=	192plf
Conc Stem:	(145pcf)	(2 x .5ft)	=	145plf
Misc Load:	(.0ft)	(.0ft)	(.0ft)	= plf

1005plf

Use Footing Width:	12	x	8	in
W/		(2)	#4	Cont.

CF (1) Individual Footing Design

Program: Continuous Footing

Soil Bearing Pressure: 1500psf

<i>Roof</i>				
Roof Dead	(17psf)	(28.0ft)	=	476plf
Snow Live	(150psf)	(28.0ft)	=	4200plf

<i>Misc</i>				
Wall Load:	(12psf)	(16.0ft)	=	192plf
Conc Stem:	(145pcf)	(2 x .5ft)	=	145plf
Misc Load:	(.0ft)	(.0ft)	(.0ft)	= plf

5013plf

Use Footing Width:	48	x	10	in
W/		(4)	#4	Cont.

PAD FOOTING DESIGN CAPACITIES:

Soil Bearing (1500 psf)						
Dimensions (Inches)				Capacity	# of Bars	Min. Col. Size
72	x	72	x 12	47,500 lbs	10	3.5 sq.
66	x	66	x 12	39,750 lbs	8	3.5 sq.
60	x	60	x 10	33,450 lbs	6	3.5 sq.
54	x	54	x 10	27,000 lbs	5	3.5 sq.
48	x	48	x 8	21,500 lbs	4	3.5 sq.
42	x	42	x 8	16,500 lbs	4	3.5 sq.
36	x	36	x 8	12,000 lbs	4	3.5 sq.
30	x	30	x 8	8,350 lbs	3	3.5 sq.
24	x	24	x 8	5,300 lbs	2	3.5 sq.
18	x	18	x 8	2,900 lbs	2	3.5 sq.

Bars to be 3 1/2" from bottom of pad. Evenly space in both directions.

CONT. FOOTING DESIGN CAPACITIES:

Soil Bearing (1500 psf)				
Dimensions (Inches)			Capacity	# of Bars
60	x	10	6,850 plf	6
54	x	10	6,200 plf	5
48	x	10	5,500 plf	4
42	x	10	4,750 plf	4
36	x	10	4,000 plf	3
30	x	10	3,400 plf	3
24	x	8	2,800 plf	2
18	x	8	2,100 plf	2
16	x	8	1,850 plf	2
12	x	8	1,350 plf	2

Bars to be 3 1/2" from bottom of footing.

Wall Footing

File: 07 Foundation.ec6
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Andrew Aitchison

Lic. #: KW-06013353

DESCRIPTION: 18"x8" Ext Footing

Code References

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combinations Used : IBC 2018

General Information

Material Properties

f'_c : Concrete 28 day strength	=	2.50 ksi
f_y : Rebar Yield	=	60.0 ksi
E_c : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
ϕ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
AutoCalc Footing Weight as DL	:	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Reference Depth below Surface	=	2.0 ft
Allow. Pressure Increase per foot of depth	=	ksf
when base footing is below	=	ft

Increases based on footing Width

Allow. Pressure Increase per foot of width	=	ksf
when footing is wider than	=	ft

Adjusted Allowable Bearing Pressure

=	1.50 ksf
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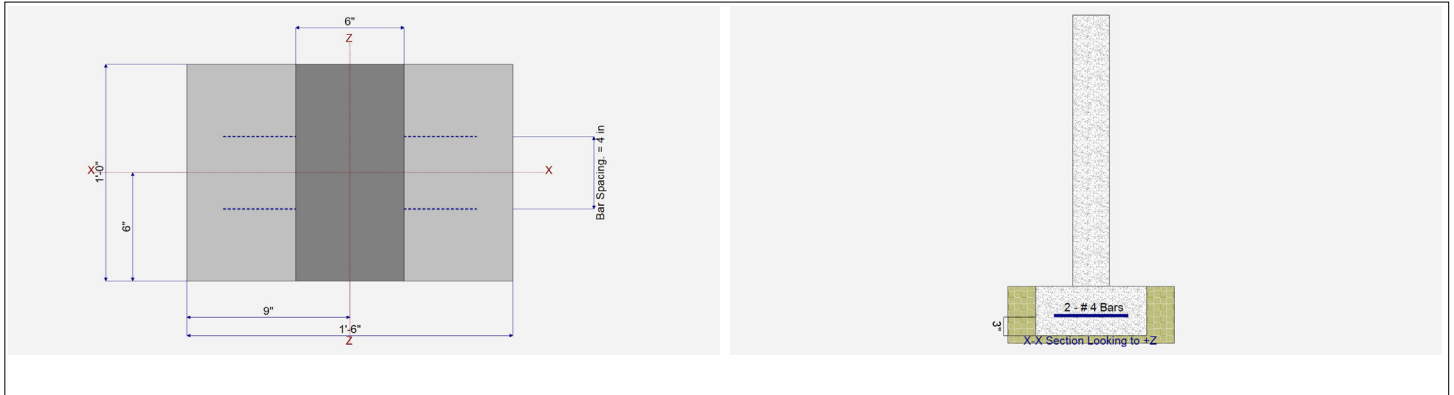
Dimensions

Footing Width	=	1.50 ft
Wall Thickness	=	6.0 in
Wall center offset from center of footing	=	0 in

Footing Thickness	=	8.0 in
Rebar Centerline to Edge of Concrete...		
at Bottom of footing	=	3.0 in

Reinforcing

Bars along X-X Axis		
# of Bars in 12" Width	=	2
Reinforcing Bar Size	=	# 4



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	2.10					k
OB : Overburden	=						ksf
V-x	=						k
M-zz	=						k-ft
Vx applied	=						in above top of footing

Wall Footing

Lic. # : KW-06013353

File: 07 Foundation.ec6
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Andrew Aitchison

DESCRIPTION: 18"x8" Ext Footing

DESIGN SUMMARY

Design OK

Factor of Safety	Item	Applied	Capacity	Governing Load Combination
PASS	n/a	Overturning - Z-Z	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	No Uplift
Utilization Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9978	Soil Bearing	1.497 ksf	+D+0.750L+0.750S+0.5
PASS	0.03213	Z Flexure (+X)	0.2619 k-ft	+1.40D+1.60H
PASS	0.02065	Z Flexure (-X)	0.1684 k-ft	+0.90D+E+0.90H
PASS	0.03725	1-way Shear (+X)	2.794 psi	+1.40D+1.60H
PASS	0.03725	1-way Shear (-X)	2.794 psi	+1.40D+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress -X	Actual Soil Bearing Stress +X	Actual / Allowable Ratio
, +D+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+L+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+Lr+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+S+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750Lr+0.750L+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750L+0.750S+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.60W+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.70E+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750Lr+0.750L+0.450W+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750L+0.750S+0.450W+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750L+0.750S+0.5250E+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +0.60D+0.60W+0.60H	1.50 ksf	0.0 in	0.8980 ksf	0.8980 ksf	0.599
, +0.60D+0.70E+0.60H	1.50 ksf	0.0 in	0.8980 ksf	0.8980 ksf	0.599

Overturning Stability

Units : k-ft

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status
Footing Has NO Sliding				

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.40D+1.60H	0.2619	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.40D+1.60H	0.2619	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50Lr+1.60L+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50Lr+1.60L+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+1.60L+0.50S+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+1.60L+0.50S+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+1.60Lr+0.50L+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+1.60Lr+0.50L+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+1.60Lr+0.50W+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+1.60Lr+0.50W+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50Lr+1.60S+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50Lr+1.60S+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50L+1.60S+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50L+1.60S+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50Lr+0.50L+W+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50Lr+0.50L+W+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50L+0.50S+W+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50L+0.50S+W+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK

Wall Footing

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DESCRIPTION: 18"x8" Ext Footing

, +1.20D+0.50L+0.70S+E+1.60H	0.2245	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +1.20D+0.50L+0.70S+E+1.60H	0.2245	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK

Wall Footing

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Lic. # : KW-06013353

DESCRIPTION: 18"x8" Ext Footing

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +0.90D+W+0.90H	0.1684	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +0.90D+W+0.90H	0.1684	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +0.90D+E+0.90H	0.1684	-X	Bottom	0.1728	Min Temp %	0.4	8.153	OK
, +0.90D+E+0.90H	0.1684	+X	Bottom	0.1728	Min Temp %	0.4	8.153	OK

Units : k

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	2.794 psi	2.794 psi	2.794 psi	75 psi	0.03725	OK
+1.20D+0.50Lr+1.60L+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+1.20D+1.60L+0.50S+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+1.20D+1.60Lr+0.50L+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+1.20D+1.60Lr+0.50W+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+1.20D+0.50L+1.60S+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+1.20D+1.60S+0.50W+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+1.20D+0.50Lr+0.50L+W+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+1.20D+0.50L+0.50S+W+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+1.20D+0.50L+0.70S+E+1.60H	2.395 psi	2.395 psi	2.395 psi	75 psi	0.03193	OK
+0.90D+W+0.90H	1.796 psi	1.796 psi	1.796 psi	75 psi	0.02395	OK
+0.90D+E+0.90H	1.796 psi	1.796 psi	1.796 psi	75 psi	0.02395	OK

Wall Footing

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DESCRIPTION: 48"x10" Ext Footing

Code References

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combinations Used : IBC 2018

General Information

Material Properties

f'_c : Concrete 28 day strength	=	2.50 ksi
f_y : Rebar Yield	=	60.0 ksi
E_c : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
ϕ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
AutoCalc Footing Weight as DL	:	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Reference Depth below Surface	=	2.0 ft
Allow. Pressure Increase per foot of depth when base footing is below	=	ksf ft

Increases based on footing Width

Allow. Pressure Increase per foot of width when footing is wider than	=	ksf ft
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Adjusted Allowable Bearing Pressure

= 1.50 ksf

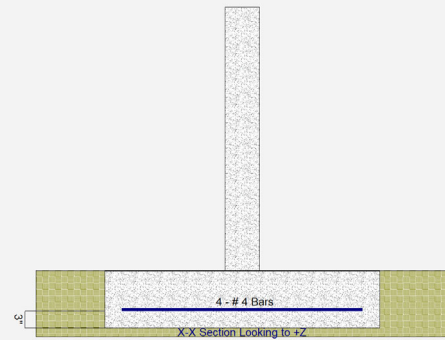
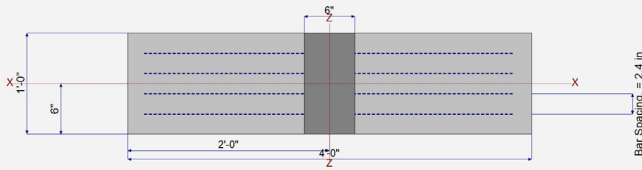
Dimensions

Footing Width	=	4.0 ft
Wall Thickness	=	6.0 in
Wall center offset from center of footing	=	0 in

Footing Thickness	=	10.0 in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in

Reinforcing

Bars along X-X Axis	=	4
# of Bars in 12" Width	=	# 4
Reinforcing Bar Size	=	# 4



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	5.50					k
OB : Overburden	=						ksf
V-x	=						k
M-zz	=						k-ft
Vx applied	=						in above top of footing

Wall Footing

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DESCRIPTION: 48"x10" Ext Footing

DESIGN SUMMARY

Design OK

Factor of Safety	Item	Applied	Capacity	Governing Load Combination
PASS	n/a	Overturning - Z-Z	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	No Uplift
Utilization Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9972	Soil Bearing	1.496 ksf	+D+0.750L+0.750S+0.5
PASS	0.1470	Z Flexure (+X)	3.207 k-ft	+1.40D+1.60H
PASS	0.09451	Z Flexure (-X)	2.061 k-ft	+0.90D+E+0.90H
PASS	0.390	1-way Shear (+X)	29.252 psi	+1.40D+1.60H
PASS	0.390	1-way Shear (-X)	29.252 psi	+1.40D+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress -X	Actual Soil Bearing Stress +X	Actual / Allowable Ratio
, +D+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+L+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+Lr+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+S+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+0.750Lr+0.750L+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+0.750L+0.750S+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+0.60W+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+0.70E+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+0.750Lr+0.750L+0.450W+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+0.750L+0.750S+0.450W+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +D+0.750L+0.750S+0.5250E+H	1.50 ksf	0.0 in	1.496 ksf	1.496 ksf	0.997
, +0.60D+0.60W+0.60H	1.50 ksf	0.0 in	0.8975 ksf	0.8975 ksf	0.598
, +0.60D+0.70E+0.60H	1.50 ksf	0.0 in	0.8975 ksf	0.8975 ksf	0.598

Overturning Stability

Units : k-ft

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
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Footing Has NO Overturning

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status
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Footing Has NO Sliding

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.40D+1.60H	3.207	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.40D+1.60H	3.207	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50Lr+1.60L+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50Lr+1.60L+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+1.60L+0.50S+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+1.60L+0.50S+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+1.60Lr+0.50L+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+1.60Lr+0.50L+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+1.60Lr+0.50W+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+1.60Lr+0.50W+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50Lr+1.60S+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50Lr+1.60S+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+1.60S+0.50W+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+1.60S+0.50W+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50Lr+0.50L+W+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50Lr+0.50L+W+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50L+0.50S+W+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50L+0.50S+W+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK

Wall Footing

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DESCRIPTION: 48"x10" Ext Footing

, +1.20D+0.50L+0.70S+E+1.60H	2.749	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +1.20D+0.50L+0.70S+E+1.60H	2.749	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK

Wall Footing

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DESCRIPTION: 48"x10" Ext Footing

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +0.90D+W+0.90H	2.061	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +0.90D+W+0.90H	2.061	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +0.90D+E+0.90H	2.061	-X	Bottom	0.216	Min Temp %	0.8	21.812	OK
, +0.90D+E+0.90H	2.061	+X	Bottom	0.216	Min Temp %	0.8	21.812	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	29.252 psi	29.252 psi	29.252 psi	75 psi	0.39	OK
+1.20D+0.50Lr+1.60L+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+1.20D+1.60L+0.50S+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+1.20D+1.60Lr+0.50L+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+1.20D+1.60Lr+0.50W+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+1.20D+0.50L+1.60S+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+1.20D+1.60S+0.50W+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+1.20D+0.50Lr+0.50L+W+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+1.20D+0.50L+0.50S+W+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+1.20D+0.50L+0.70S+E+1.60H	25.073 psi	25.073 psi	25.073 psi	75 psi	0.3343	OK
+0.90D+W+0.90H	18.805 psi	18.805 psi	18.805 psi	75 psi	0.2507	OK
+0.90D+E+0.90H	18.805 psi	18.805 psi	18.805 psi	75 psi	0.2507	OK

Wall Footing

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DESCRIPTION: 12"x8" Int Footing

Code References

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combinations Used : IBC 2018

General Information

Material Properties

f'_c : Concrete 28 day strength	=	2.50 ksi
f_y : Rebar Yield	=	60.0 ksi
E_c : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
ϕ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
AutoCalc Footing Weight as DL	:	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Reference Depth below Surface	=	ft
Allow. Pressure Increase per foot of depth when base footing is below	=	ksf ft

Increases based on footing Width

Allow. Pressure Increase per foot of width when footing is wider than	=	ksf ft
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Adjusted Allowable Bearing Pressure

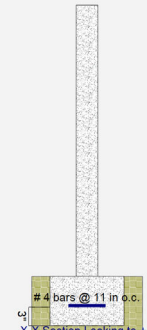
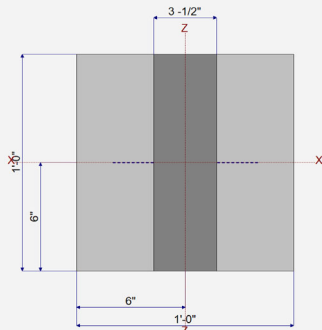
= 1.50 ksf

Dimensions

Footing Width	=	1.0 ft
Wall Thickness	=	3.50 in
Wall center offset from center of footing	=	0 in

Reinforcing

Footing Thickness	=	8.0 in	Bars along X-X Axis	=	
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in	Bar spacing	=	11.00
			Reinforcing Bar Size	=	# 4



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	1.40					k
OB : Overburden	=						ksf
V-x	=						k
M-zz	=						k-ft
Vx applied	=						in above top of footing

Wall Footing

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DESCRIPTION: 12"x8" Int Footing

DESIGN SUMMARY

Design OK

Factor of Safety	Item	Applied	Capacity	Governing Load Combination
PASS	n/a	Overturning - Z-Z	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	No Uplift
Utilization Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9978	Soil Bearing	1.497 ksf	+D+0.750L+0.750S+0.5
PASS	0.02821	Z Flexure (+X)	0.1314 k-ft	+1.40D+1.60H
PASS	0.01814	Z Flexure (-X)	0.08446 k-ft	+0.90D+E+0.90H
PASS	n/a	1-way Shear (+X)	0.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	n/a

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress -X	Actual Soil Bearing Stress +X	Actual / Allowable Ratio
, +D+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+L+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+Lr+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+S+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750Lr+0.750L+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750L+0.750S+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.60W+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.70E+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750Lr+0.750L+0.450W+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750L+0.750S+0.450W+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +D+0.750L+0.750S+0.5250E+H	1.50 ksf	0.0 in	1.497 ksf	1.497 ksf	0.998
, +0.60D+0.60W+0.60H	1.50 ksf	0.0 in	0.8980 ksf	0.8980 ksf	0.599
, +0.60D+0.70E+0.60H	1.50 ksf	0.0 in	0.8980 ksf	0.8980 ksf	0.599

Overturning Stability

Units : k-ft

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
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Footing Has NO Overturning

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status
--	---------------	-----------------	---------------------	--------

Footing Has NO Sliding

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.40D+1.60H	0.1314	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.40D+1.60H	0.1314	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50Lr+1.60L+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50Lr+1.60L+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+1.60L+0.50S+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+1.60L+0.50S+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+1.60Lr+0.50L+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+1.60Lr+0.50L+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+1.60Lr+0.50W+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+1.60Lr+0.50W+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50Lr+1.60S+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50Lr+1.60S+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+1.60S+0.50W+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+1.60S+0.50W+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50Lr+0.50L+W+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50Lr+0.50L+W+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50L+0.50S+W+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50L+0.50S+W+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK

Wall Footing

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DESCRIPTION: 12"x8" Int Footing

, +1.20D+0.50L+0.70S+E+1.60H	0.1126	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +1.20D+0.50L+0.70S+E+1.60H	0.1126	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK

Wall Footing

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DESCRIPTION: 12"x8" Int Footing

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +0.90D+W+0.90H	0.08446	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +0.90D+W+0.90H	0.08446	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +0.90D+E+0.90H	0.08446	-X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK
, +0.90D+E+0.90H	0.08446	+X	Bottom	0.1728	Min Temp %	0.2182	4.657	OK

One Way Shear

Units : k

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+1.60L+0.50S+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+1.60Lr+0.50L+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+1.60Lr+0.50W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50L+1.60S+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+1.60S+0.50W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50Lr+0.50L+W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50L+0.50S+W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50L+0.70S+E+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+0.90D+W+0.90H	0 psi	0 psi	0 psi	75 psi	0	OK
+0.90D+E+0.90H	0 psi	0 psi	0 psi	75 psi	0	OK

General Footing

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DESCRIPTION: 60"x60"x10" Pad Footing

Code References

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combinations Used : IBC 2018

General Information

Material Properties

f'_c : Concrete 28 day strength	=	2.50	ksi
f_y : Rebar Yield	=	60.0	ksi
E_c : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
ϕ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=		
Min Allow % Temp Reinf.	=	0.00180	
Min. Overturning Safety Factor	=	1.0	: 1
Min. Sliding Safety Factor	=	1.0	: 1
Add Ftg Wt for Soil Pressure	:	Yes	
Use ftg wt for stability, moments & shears	:	Yes	
Add Pedestal Wt for Soil Pressure	:	Yes	
Use Pedestal wt for stability, mom & shear	:	Yes	

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=		ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

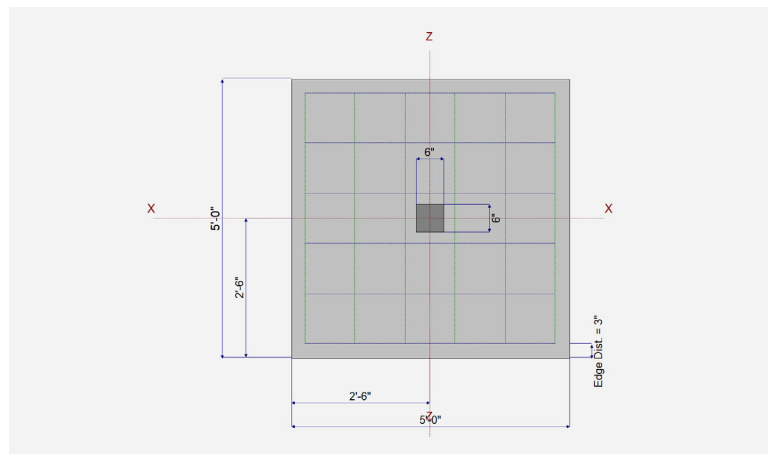
Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=		ksf
when max. length or width is greater than	=		ft

Dimensions

Width parallel to X-X Axis	=	5.0	ft
Length parallel to Z-Z Axis	=	5.0	ft
Footing Thickness	=	10.0	in

Pedestal dimensions...	=		
px : parallel to X-X Axis	=	6.0	in
pz : parallel to Z-Z Axis	=	6.0	in
Height	=	24.0	in
Rebar Centerline to Edge of Concrete...	=	3.250	in
at Bottom of footing	=		



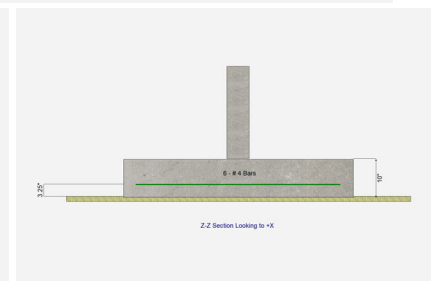
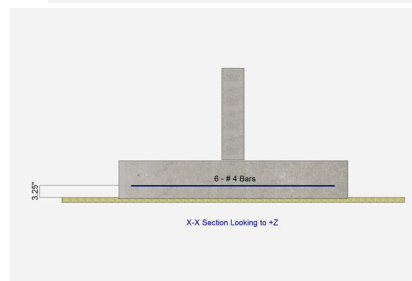
Reinforcing

Bars parallel to X-X Axis	=		
Number of Bars	=	6.0	
Reinforcing Bar Size	=	# 4	
Bars parallel to Z-Z Axis	=		
Number of Bars	=	6.0	
Reinforcing Bar Size	=	# 4	

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	33.250					k
OB : Overburden	=	0.040					ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k

General Footing

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DESCRIPTION: 60"x60"x10" Pad Footing

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9953	Soil Bearing	1.493 ksf	1.50 ksf	D Only about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.6760	Z Flexure (+X)	4.722 k-ft/ft	6.985 k-ft/ft	+1.40D
PASS	0.6760	Z Flexure (-X)	4.722 k-ft/ft	6.985 k-ft/ft	+1.40D
PASS	0.6760	X Flexure (+Z)	4.722 k-ft/ft	6.985 k-ft/ft	+1.40D
PASS	0.6760	X Flexure (-Z)	4.722 k-ft/ft	6.985 k-ft/ft	+1.40D
PASS	0.5220	1-way Shear (+X)	39.152 psi	75.0 psi	+1.40D
PASS	0.5220	1-way Shear (-X)	39.152 psi	75.0 psi	+1.40D
PASS	0.5220	1-way Shear (+Z)	39.152 psi	75.0 psi	+1.40D
PASS	0.5220	1-way Shear (-Z)	39.152 psi	75.0 psi	+1.40D
PASS	0.8595	2-way Punching	128.919 psi	150.0 psi	+1.40D

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
			(in)	Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	1.50	n/a	0.0	1.493	1.493	n/a	n/a	0.995
X-X, +0.60D	1.50	n/a	0.0	0.8960	0.8960	n/a	n/a	0.597
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	1.493	1.493	0.995
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.8960	0.8960	0.597

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				
All units k				

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	4.722	+Z	Bottom	0.2160	Min Temp %	0.240	6.985	OK
X-X, +1.40D	4.722	-Z	Bottom	0.2160	Min Temp %	0.240	6.985	OK
X-X, +1.20D	4.047	+Z	Bottom	0.2160	Min Temp %	0.240	6.985	OK
X-X, +1.20D	4.047	-Z	Bottom	0.2160	Min Temp %	0.240	6.985	OK
X-X, +0.90D	3.036	+Z	Bottom	0.2160	Min Temp %	0.240	6.985	OK
X-X, +0.90D	3.036	-Z	Bottom	0.2160	Min Temp %	0.240	6.985	OK
Z-Z, +1.40D	4.722	-X	Bottom	0.2160	Min Temp %	0.240	6.985	OK
Z-Z, +1.40D	4.722	+X	Bottom	0.2160	Min Temp %	0.240	6.985	OK
Z-Z, +1.20D	4.047	-X	Bottom	0.2160	Min Temp %	0.240	6.985	OK
Z-Z, +1.20D	4.047	+X	Bottom	0.2160	Min Temp %	0.240	6.985	OK
Z-Z, +0.90D	3.036	-X	Bottom	0.2160	Min Temp %	0.240	6.985	OK
Z-Z, +0.90D	3.036	+X	Bottom	0.2160	Min Temp %	0.240	6.985	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	39.15 psi	39.15 psi	39.15 psi	39.15 psi	39.15 psi	75.00 psi	0.52	OK
+1.20D	33.56 psi	33.56 psi	33.56 psi	33.56 psi	33.56 psi	75.00 psi	0.45	OK
+0.90D	25.17 psi	25.17 psi	25.17 psi	25.17 psi	25.17 psi	75.00 psi	0.34	OK

General Footing

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DESCRIPTION: 60"x60"x10" Pad Footing

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	128.92 psi	150.00psi	0.8595	OK
+1.20D	110.50 psi	150.00psi	0.7367	OK
+0.90D	82.88 psi	150.00psi	0.5525	OK