

**EcoGreen Architects LLC**

21316 Quarry Road  
Caledonia, Minnesota 55921  
608-317-1953

JOB TITLE Smokes4Less - Building Addition

La Crosse, WI 54601

JOB NO. 2023.05

SHEET NO. 1 OF 28

CALCULATED BY David Holstrom, PE

DATE 8/18/23

CHECKED BY

DATE

CS15 Ver 2015.06.04

[www.struware.com](http://www.struware.com)

**STRUCTURAL CALCULATIONS**

FOR

**Smokes4Less - Building Addition**

91 Copeland Avenue  
La Crosse, Wisconsin 54601

**EcoGreen Architects LLC**

21316 Quarry Road  
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SHEET NO. 2 OF 28

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www.struware.com

**Code Search****Code:** International Building Code 2015**Occupancy:**

Occupancy Group = M Mercantile

**Risk Category & Importance Factors:**

Risk Category = II  
 Wind factor = 1.00  
 Snow factor = 1.00  
 Seismic factor = 1.00

**Type of Construction:****Fire Rating:**

Roof = 0.0 hr  
 Floor = 0.0 hr

**Building Geometry:**

Roof angle ( $\theta$ ) 0.25 / 12 1.2 deg  
 Building length (L) 81.0 ft  
 Least width (B) 38.0 ft  
 Mean Roof Ht (h) 13.0 ft  
 Parapet ht above grd 14.0 ft  
 Minimum parapet ht 2.0 ft

**Live Loads:**

**Roof** 0 to 200 sf: 20 psf  
 200 to 600 sf: 24 - 0.02Area, but not less than 12 psf  
 over 600 sf: 12 psf

N/A

**Floor:**

Typical Floor 100 psf  
 Partitions 15 psf  
 Lobbies & first floor corridors 100 psf

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**Wind Loads :**

ASCE 7- 10

Ultimate Wind Speed	115 mph
Nominal Wind Speed	89.1 mph
Risk Category	II
Exposure Category	B
Enclosure Classif.	Enclosed Building
Internal pressure	+/-0.18
Directionality (Kd)	0.85
Kh case 1	0.701
Kh case 2	0.575
Type of roof	Gable

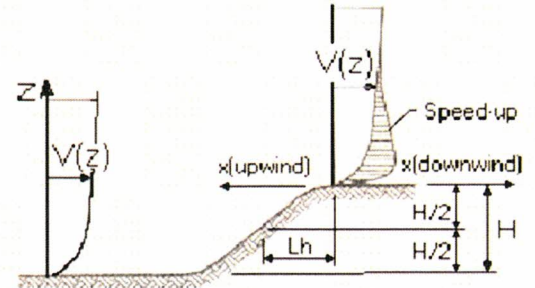
Topographic Factor (Kzt)

Topography	Flat
Hill Height (H)	0.0 ft
Half Hill Length (Lh)	0.0 ft
Actual H/Lh =	0.00
Use H/Lh =	0.00
Modified Lh =	0.0 ft
From top of crest: x =	0.0 ft
Bldg up/down wind?	upwind
H/Lh = 0.00	K <sub>1</sub> = 0.000
x/Lh = 0.00	K <sub>2</sub> = 0.000
z/Lh = 0.00	K <sub>3</sub> = 1.000

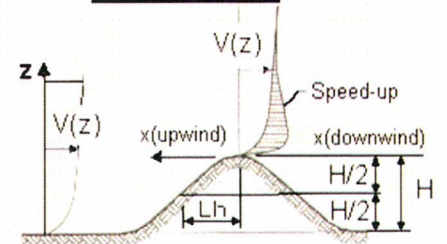
At Mean Roof Ht:

$Kzt = (1+K_1K_2K_3)^2 = 1.00$

H < 60ft; exp B  
∴ Kzt=1.0



**ESCARPMENT**



**2D RIDGE or 3D AXISYMMETRICAL HILL**

**Gust Effect Factor**

h =	13.0 ft
B =	38.0 ft
lz (0.6h) =	30.0 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).

However, if building h/B < 4 then probably rigid structure (rule of thumb).

h/B = 0.34 Rigid structure

**G = 0.85** Using rigid structure default

**Rigid Structure**

$\bar{e}$ =	0.33
ℓ =	320 ft
Z <sub>min</sub> =	30 ft
c =	0.30
g <sub>Q</sub> , g <sub>v</sub> =	3.4
L <sub>z</sub> =	310.0 ft
Q =	0.91
lz =	0.30
G =	0.87 use G = 0.85

**Flexible or Dynamically Sensitive Structure**

Natural Frequency (η <sub>1</sub> ) =	0.0 Hz		
Damping ratio (β) =	0		
lb =	0.45		
la =	0.25		
Vz =	74.1		
N <sub>1</sub> =	0.00		
R <sub>n</sub> =	0.000		
R <sub>h</sub> =	28.282	η =	0.000
R <sub>B</sub> =	28.282	η =	0.000
R <sub>L</sub> =	28.282	η =	0.000
g <sub>R</sub> =	0.000		
R =	0.000		
G =	0.000		

h = 13.0 ft

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**Wind Loads - MWFRS  $h \leq 60'$  (Low-rise Buildings) Enclosed/partially enclosed only**

$K_z = K_h$  (case 1) = 0.70  
Base pressure (qh) = 20.2 psf  
GCpi = +/-0.18

Edge Strip (a) = 3.8 ft  
End Zone (2a) = 7.6 ft  
Zone 2 length = 19.0 ft

**Wind Pressure Coefficients**

Surface	CASE A			CASE B		
	GCpf	$\theta = 1.2 \text{ deg}$ w/GCpi	w/GCpi	GCpf	w-GCpi	w+GCpi
1	0.40	0.58	0.22	-0.45	-0.27	-0.63
2	-0.69	-0.51	-0.87	-0.69	-0.51	-0.87
3	-0.37	-0.19	-0.55	-0.37	-0.19	-0.55
4	-0.29	-0.11	-0.47	-0.45	-0.27	-0.63
5				0.40	0.58	0.22
6				-0.29	-0.11	-0.47
1E	0.61	0.79	0.43	-0.48	-0.30	-0.66
2E	-1.07	-0.89	-1.25	-1.07	-0.89	-1.25
3E	-0.53	-0.35	-0.71	-0.53	-0.35	-0.71
4E	-0.43	-0.25	-0.61	-0.48	-0.30	-0.66
5E				0.61	0.79	0.43
6E				-0.43	-0.25	-0.61

**Ultimate Wind Surface Pressures (psf)**

1	11.7	4.4		-5.4	-12.7
2	-10.3	-17.5		-10.3	-17.5
3	-3.8	-11.1		-3.8	-11.1
4	-2.2	-9.5		-5.4	-12.7
5				11.7	4.4
6				-2.2	-9.5
1E	15.9	8.7		-6.0	-13.3
2E	-17.9	-25.2		-17.9	-25.2
3E	-7.1	-14.3		-7.1	-14.3
4E	-5.0	-12.3		-6.0	-13.3
5E				15.9	8.7
6E				-5.0	-12.3

**Parapet**

Windward parapet = 30.2 psf (GCpn = +1.5)  
Leeward parapet = -20.2 psf (GCpn = -1.0)

Windward roof overhangs = 14.1 psf (upward) add to windward roof pressure

**Horizontal MWFRS Simple Diaphragm Pressures (psf)**

**Transverse direction (normal to L)**

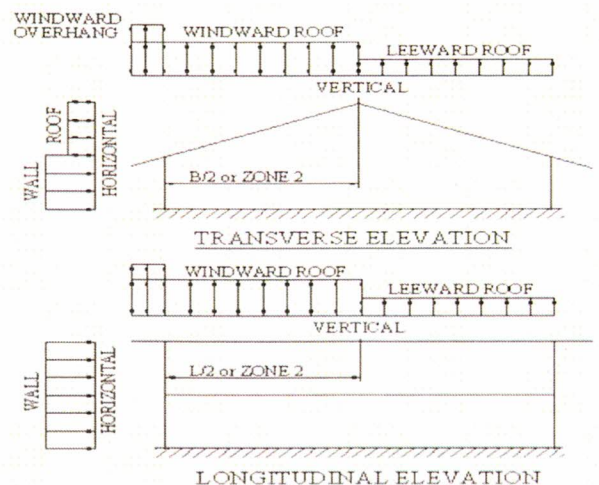
Interior Zone: Wall 13.9 psf  
Roof -6.5 psf \*\*  
End Zone: Wall 21.0 psf  
Roof -10.9 psf \*\*

**Longitudinal direction (parallel to L)**

Interior Zone: Wall 13.9 psf  
End Zone: Wall 21.0 psf

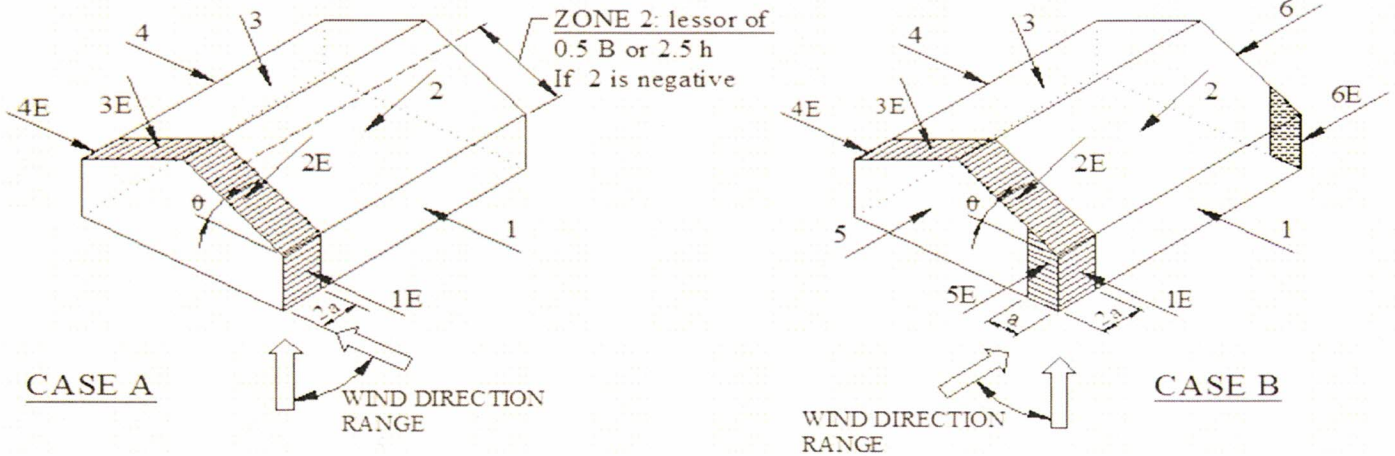
\*\* NOTE: Total horiz force shall not be less than that determined by neglecting roof forces (except for MWFRS moment frames).

The code requires the MWFRS be designed for a min ultimate force of 16 psf multiplied by the wall area plus an 8 psf force applied to the vertical projection of the roof.



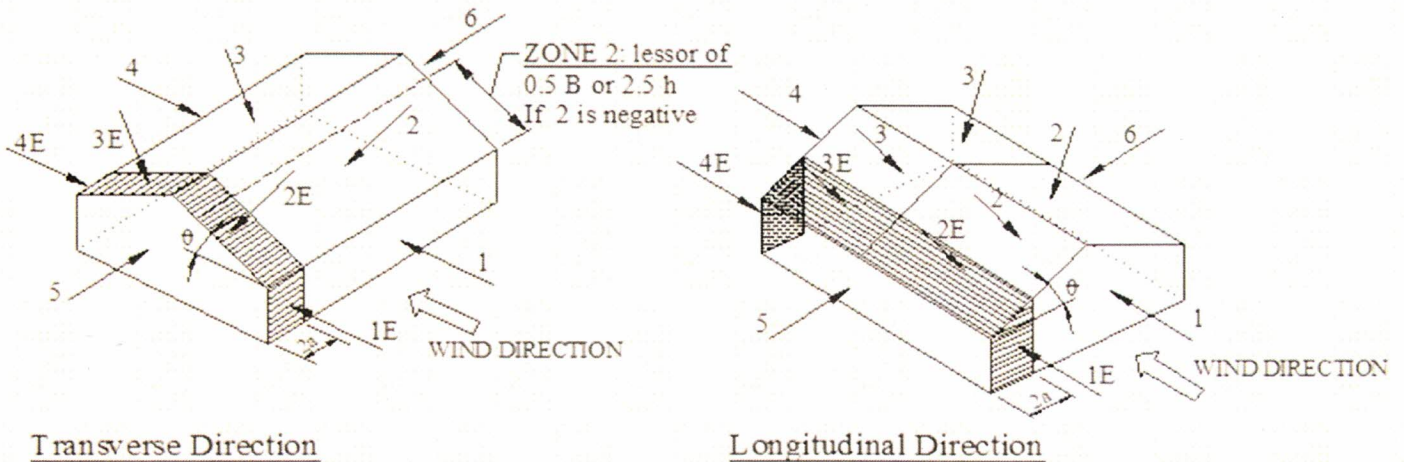


**Location of MWFRS Wind Pressure Zones**



NOTE: Torsional loads are 25% of zones 1 - 6. See code for loading diagram.

**ASCE 7 -99 and ASCE 7-10 (& later)**



NOTE: Torsional loads are 25% of zones 1 - 4. See code for loading diagram.

**ASCE 7 -02 and ASCE 7-05**

**Snow Loads :** ASCE 7-10

Nominal Snow Forces

Roof slope = 1.2 deg  
 Horiz. eave to ridge dist (W) = 19.0 ft  
 Roof length parallel to ridge (L) = 81.0 ft

Type of Roof Hip and gable w/ rafters  
 Ground Snow Load  $P_g = 40.0$  psf  
 Risk Category = II  
 Importance Factor  $I = 1.0$   
 Thermal Factor  $C_t = 1.10$   
 Exposure Factor  $C_e = 1.0$

$P_f = 0.7 * C_e * C_t * I * P_g = 30.8$  psf  
 Unobstructed Slippery Surface no

Sloped-roof Factor  $C_s = 1.00$  use 1.00  
 Balanced Snow Load  $P_s = 30.8$  psf

Rain on Snow Surcharge Angle 0.38 deg  
 Code Maximum Rain Surcharge 5.0 psf  
 Rain on Snow Surcharge = 0.0 psf  
 Ps plus rain surcharge = 30.8 psf  
 Minimum Snow Load  $P_m = 20.0$  psf

Uniform Roof Design Snow Load = **30.8 psf**

NOTE: Alternate spans of continuous beams and other areas shall be loaded with half the design roof snow load so as to produce the greatest possible effect - see code.

**Unbalanced Snow Loads - for Hip & Gable roofs only**

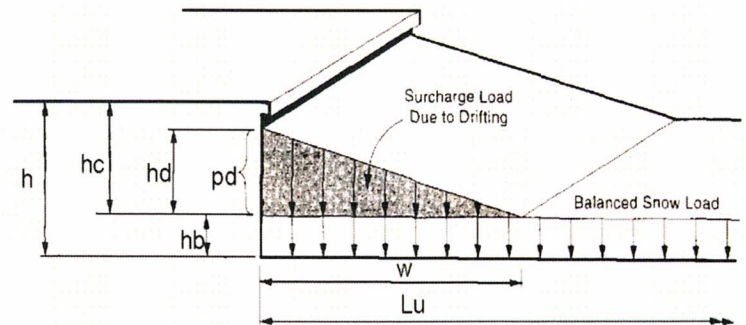
Required if slope is between 7 on 12 = 30.26 deg  
 and 2.38 deg = 2.38 deg **Unbalanced snow loads are not required**  
 Windward snow load = 30.8 psf  
 Leeward snow load = 30.8 psf

**Windward Snow Drifts 1 - Against walls, parapets, etc more than 15' long**

Upwind fetch  $l_u = 15.5$  ft  
 Projection height  $h = 0.0$  ft  
 Snow density  $g = 19.2$  pcf  
 Balanced snow height  $h_b = 1.60$  ft  
 $h_d = 1.20$  ft  
 $h_c = -1.60$  ft  
 $h_c/h_b < 0.2 = -1.0$  **Therefore, no drift**  
 Drift height (hc) = 0.00 ft  
 Drift width  $w = -12.83$  ft  
 Surcharge load:  $pd = \gamma * h_d = 0.0$  psf  
 Balanced Snow load: = 30.8 psf

**Windward Snow Drifts 2 - Against walls, parapets, etc > 15'**

Upwind fetch  $l_u = 0.0$  ft  
 Projection height  $h = 0.0$  ft  
 Snow density  $g = 19.2$  pcf  
 Balanced snow height  $h_b = 1.60$  ft  
 $h_d = 1.20$  ft  
 $h_c = -1.60$  ft  
 $h_c/h_b < 0.2 = -1.0$  **Therefore, no drift**  
 Drift height (hc) = 0.00 ft  
 Drift width  $w = -12.83$  ft  
 Surcharge load:  $pd = \gamma * h_d = 0.0$  psf  
 Balanced Snow load: = 30.8 psf







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**Roof Design Loads**

Items	Description	Multiple	psf (max)	psf (min)
Roofing	Single ply	x 3.0	3.0	2.1
Insulation	Rigid insulation, per 1"	x 2.0	3.0	1.4
Underlayment Bd	Metal Floor deck - 2", 20ga	x 2.0	4.0	3.0
Metal Deck	Metal Floor deck - 2", 18ga	x 1.5	4.5	3.0
Lt Ga Steel Joists	Steel roof beams & girders	x 1.1	5.5	3.3
Misc Mech/Elec	Mech. & Elec.	x 2.5	5.0	0.0
Misc Roof Equip't	Misc.	x 10.0	5.0	0.0
			0.0	0.0
	Actual Dead Load		<input checked="" type="radio"/> 30.0	<input checked="" type="radio"/> 12.8
	Use this DL instead		<input type="radio"/> 20.0	<input type="radio"/> 9.0
	Live Load		20.0	0.0
	Snow Load		30.8	0.0
	Ultimate Wind (zone 2 - 100sf)		16.0	-25.8
<b>ASD Loading</b>	D + S		60.8	-
	D + 0.75(0.6*W + S)		60.3	-
	0.6*D + 0.6*W		-	-7.8
<b>LRFD Loading</b>	1.2D + 1.6 S + 0.5W		93.3	-
	1.2D + 1.0W + 0.5S		67.4	-
	0.9D + 1.0W		-	-14.3

**Roof Live Load Reduction**

Roof angle 0.25 / 12 1.2 deg

0 to 200 sf: 20.0 psf  
 200 to 600 sf: 24 - 0.02Area, but not less than 12 psf  
 over 600 sf: 12.0 psf

	300 sf	18.0 psf
	400 sf	16.0 psf
	500 sf	14.0 psf
User Input:	450 sf	15.0 psf



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**Floor Design Loads**

Items	Description	Multiple	psf (max)	psf (min)
Flooring	Sheet vinyl	x 1.0	1.5	0.5
Conc Slab on gd	Concrete regular per 1"	x 4.0	50.0	48.0
		x 3.0	0.0	0.0
		x 2.0	0.0	0.0
		x 1.7	0.0	0.0
			0.0	0.0
			0.0	0.0
			0.0	0.0
			0.0	0.0
		Actual Dead Load	<input checked="" type="radio"/> 51.5	<input checked="" type="radio"/> 48.5
		Use this DL instead	<input type="radio"/> 20.0	<input type="radio"/> 20.0
		Partitions	15.0	0.0
		Live Load	100.0	0.0
		Total Live Load	115.0	0.0
		Total Load	166.5	48.5

**FLOOR LIVE LOAD REDUCTION (not including partitions)**

NOTE: Not allowed for assembly occupancy or LL>100psf or passenger car garages, except may reduce columns 20% if 2 or more floors & non-assembly

$$L = L_o(0.25 + 15/\sqrt{K_{LL}A_T})$$

Unreduced design live load:  $L_o = 100$  psf

**Floor member**  $K_{LL} = 2$

Tributary Area  $A_T = 300$  sf

Reduced live load:  $L = 86.2$  psf

**Columns (2 or more floors)**  $K_{LL} = 4$

Tributary Area  $A_T = 500$  sf

Reduced live load:  $L = 58.5$  psf

**IBC alternate procedure**

Smallest of:

$$R = .08\%(SF - 150)$$

$$R = 23.1(1+D/L) = 35.0\%$$

R= 40% beams; 60% columns

$$R = 12.0\%$$

Reduced live load:  $L = 88.0$  psf

$$R = 28.0\%$$

Reduced live load:  $L = 72.0$  psf

## CODE SUMMARY

**Code:** International Building Code 2015

**Live Loads:**

Roof	0 to 200 sf: 20 psf
	200 to 600 sf: 24 - 0.02Area, but not less than 12 psf
	over 600 sf: 12 psf
	N/A
Typical Floor	100 psf
Partitions	15 psf
Lobbies & first floor corridors	100 psf

**Dead Loads:**

Floor	51.5 psf
Roof	30.0 psf

**Wind Design Data:**

Ultimate Design Wind Speed	115 mph
Nominal Design Wind Speed	89.08 mph
Risk Category	II
Mean Roof Ht (h)	13.0 ft
Exposure Category	B
Enclosure Classif.	Enclosed Building
Internal pressure Coef.	+/-0.18
Directionality (Kd)	0.85

**Roof Snow Loads:**

Design Uniform Roof Snow load	=	30.8 psf
Flat Roof Snow Load	Pf =	30.8 psf
Balanced Snow Load	Ps =	30.8 psf
Ground Snow Load	Pg =	40.0 psf
Importance Factor	I =	1.00
Snow Exposure Factor	Ce =	1.00
Thermal Factor	Ct =	1.10
Sloped-roof Factor	Cs =	1.00
Drift Surcharge load	Pd =	0.0 psf
Width of Snow Drift	0	0.0 ft

**Earthquake Design Data:**

Risk Category	=	II
Importance Factor	I =	1.00
Mapped spectral response acceleratic	Ss =	0.05 %g
	S1 =	0.04 %g
Site Class	=	D
Spectral Response Coef.	Sds =	0.001
	Sd1 =	0.001
Seismic Design Category	=	A
Basic Structural System	=	Building Frame Systems
Seismic Resisting System	=	Light frame (wood) walls with structural wood shear panels
Design Base Shear	V =	0.010W
Seismic Response Coef.	Cs =	0.010
Response Modification Factor	R =	7
Analysis Procedure	=	Equivalent Lateral-Force Analysis

**CODE SUMMARY- continued**

**Component and cladding ultimate wind pressures**

Roof	Area	Surface Pressure (psf)		
		10 sf	50 sf	100 sf
Negative Zone 1		-23.8	-22.4	-21.8
Negative Zone 2		-39.9	-30.1	-25.8
Negative Zone 3		-60.1	-36.1	-25.8
Positive All Zones		16.0	16.0	16.0
Overhang Zone 1&2		-34.3	-32.9	-32.3
Overhang Zone 3		-56.5	-28.3	-16.1

Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 3.6 psf)

Parapet	Area	Solid Parapet Pressure (psf)		
		10 sf	100 sf	500 sf
CASE A: Interior zone		54.4	37.1	34.9
Corner zone		74.6	37.1	34.9
CASE B: Interior zone		-38.1	-31.7	-27.2
Corner zone		-43.5	-33.9	-27.2

Wall	Area	Surface Pressure (psf)		
		10 sf	100 sf	500 sf
Negative Zone 4		-23.6	-20.4	-18.1
Negative Zone 5		-29.0	-22.6	-18.1
Positive Zone 4 & 5		21.8	18.6	16.3





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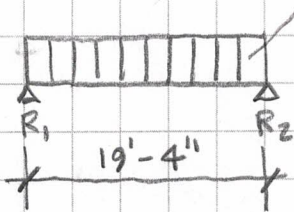
PROJECT: # 2023.05 SMOKES 4 LESS

DATE: 8-18-23 BY: HOLSTROM

RE: STRUCTURAL CALCULATIONS

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RJ-1 ROOF JOIST ABOVE NEW ADDITION - MAX SPAN 19'-4" @ 16" O.C.



$$W_S = 30.8 \text{ PSF} \times 1.67 \text{ FT} = 51.4 \text{ PLF}$$

$$W_{LR} = 12.0 \text{ PSF} \times 1.67 \text{ FT} = 20.0 \text{ PLF}$$

$$W_{DL} = 30.0 \text{ PSF} \times 1.67 \text{ FT} = 50.1 \text{ PLF}$$

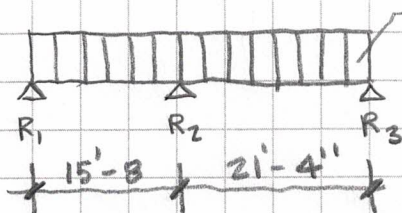
$$W_{WU} = 20.2 \text{ PSF} \times 1.67 \text{ FT} = 33.7 \text{ PLF}$$

$$\underline{155.2 \text{ PLF}}$$

$$R_1 = R_2 = 155.2 \text{ PLF} \times \frac{19'-4''}{2} = 1500 \text{ lbs}$$

USE 1200S 200-97 CLARKDIETRICH FLOOR JOIST @ 16" O.C.

RB-1 ROOF BEAM



$$W_S = 30.8 \text{ PSF} \times 24 \text{ FT} = 739 \text{ PLF}$$

$$W_{LR} = 12.0 \text{ PSF} \times 24 \text{ FT} = 288 \text{ PLF}$$

$$W_{DL} = 20.0 \text{ PSF} \times 24 \text{ FT} = 480 \text{ PLF}$$

$$W_{WU} = 20.2 \text{ PSF} \times 24 \text{ FT} = 485 \text{ PLF}$$

$$R_1 = 6.15 \text{ KIPS}$$

$$R_2 = 29.521 \text{ KIPS}$$

$$R_3 = 10.672 \text{ KIPS}$$

USE W10 X 30  $F_y = 50 \text{ KSI}$  STEEL BEAM

STUD-1 PERIMETER WALL STUDS

MAX HT = 16 FT

$$\text{MAX LOAD} = 1500 \text{ lbs (ROOF)} + 240 \text{ lbs (WALL)} = 1740 \text{ lbs}$$

USE 600S 162-54 CLARKDIETRICH WALL STUDS @ 16" O.C.



C-2 COLUMN AT STEEL ROOF BEAM

$$\begin{aligned} \text{MAXIMUM HEIGHT} &= 12'-0'' \text{ MAX} \\ \text{MAXIMUM LOAD} - W_S &= 17.4 \text{ KIPS} \\ W_{LR} &= 6.8 \text{ KIPS} \\ W_D &= 11.3 \text{ KIPS} \\ W_{LL} &= 11.4 \text{ KIPS} \end{aligned}$$

USE HSS 4" x 4" x .25" A500 GR. B-45 SQ TUBE COLUMN

WF-1 PERIMETER WALL FOOTINGS

MAX LOADING:

$$\begin{aligned} \text{ROOF} \text{ --- } W_S &= 30.8 \text{ PSF} \times 12 \text{ FT} = 370 \text{ PLF} \\ W_{LR} &= 12.0 \text{ PSF} \times 12 \text{ FT} = 144 \text{ PLF} \\ W_{DL} &= 30.0 \text{ PSF} \times 12 \text{ FT} = 360 \text{ PLF} \\ W_{WLL} &= 20.2 \text{ PSF} \times 12 \text{ FT} = 242 \text{ PLF} \\ &= \underline{1116 \text{ PLF}} \end{aligned}$$

$$\text{WALL} \text{ --- } W_{DL} = 15.0 \text{ PSF} \times 16 \text{ FT} = 240 \text{ PLF}$$

$$\text{TOTAL} \quad \underline{\underline{1356 \text{ PLF}}}$$

USE 2'-0" WIDE x 12" THICK WITH 3 EA - #5 LONG

F-1 CONC COLUMN PAD FOOTING

MAX LOADING:

$$\begin{aligned} \text{ROOF} \text{ --- } W_S &= 6.296 \text{ KIPS} \\ W_{LR} &= 2.454 \text{ KIPS} \\ W_{DL} &= 4.090 \text{ KIPS} \\ W_{WLL} &= 4.132 \text{ KIPS} \end{aligned}$$

USE 3'-0" x 3'-0" x 12" THICK W/ 3EA #5 E.W.



F-2 CONG COLUMN PAD FOOTING  
MAX LOADING

ROOF ———  $W_S = 17.418$  KIPS  
 $W_{LR} = 6.788$  KIPS  
 $W_{DL} = 11.313$  KIPS  
 $W_{WH} = 11.431$  KIPS

USE 5'-0" x 6'-0" x 12" THICK W/ TEA #5 SHORT  $\cong$  6 EA #5 LONG

E-W WIND FORCE CALCULATION:

WIND FORCE = 20.2 PSF FOR MW  $\leq$  60 FT

MAX FORCE = 37.66 FT x 16 FT x 20.2 PSF = 12,172 lbs

N-S WIND FORCE CALCULATION:

MAX FORCE = 24 FT x 16 FT x 20.2 PSF = 7,756 lbs

MAX WIND FORCE - USE 12.2 KIPS

ANCHOR BOLTS (A.B) @ FOUNDATION WALL:

FDN BASE SHEAR = 12.2 KIPS

# OF REQ'D  $\frac{5}{8}$ " DIA A.B. = 12,200 lbs / 290 lbs / A.B. = 42 EA REQ'D

86 LF PERIMETER FDN: USE  $\frac{5}{8}$ " AB @ 24" O.C.



FLOOR JOIST SPAN LIMITATIONS

25psf Dead Load and 125psf Live Load (TL Deflection=L/240)

Member	Yield strength F <sub>y</sub> (ksi)	Live Load Deflection L/360						Live Load Deflection L/480					
		Single span spacing (in) o.c.			Two equal span spacing (in) o.c.			Single span spacing (in) o.c.			Two equal span spacing (in) o.c.		
		12	16	24	12	16	24	12	16	24	12	16	24
800S200-33	33	6'4"e	4'9"e	3'2"e	5'1"a	3'9"a	2'6"a	6'4"e	4'9"e	3'2"e	5'1"a	3'9"a	2'6"a
800S200-43	33	9'6"e	8'3"e	6'9"e	8'9"a	7'1"a	5'3"a	9'6"e	8'3"e	6'9"e	8'9"a	7'1"a	5'3"a
800S200-54	50	12'8"e	11'0"e	9'0"e	12'8"i	11'0"i	8'6"a	12'0"e	10'11"e	9'0"e	12'8"i	11'0"i	8'6"a
800S200-68	50	14'2"e	12'10"e	10'6"e	14'10"i	12'10"i	10'6"a	12'11"e	11'8"e	10'3"e	14'5"i	12'10"i	10'6"a
800S200-97	50	15'9"e	14'4"e	12'6"e	17'8"i	16'1"i	13'2"i	14'4"e	13'0"e	11'4"e	16'1"i	14'7"i	12'9"i
800S250-43	33	9'9"e	8'6"e	6'11"e	8'11"a	7'2"a	5'3"a	9'9"e	8'6"e	6'11"e	8'11"a	7'2"a	5'3"a
800S250-54	50	13'0"e	11'3"e	9'2"e	13'0"i	11'3"i	8'7"a	12'6"e	11'3"e	9'2"e	13'0"i	11'3"i	8'7"a
800S250-68	50	14'9"e	13'2"e	10'9"e	15'2"i	13'2"i	10'9"a	13'5"e	12'2"e	10'8"e	15'1"i	13'2"i	10'9"a
800S250-97	50	16'6"e	15'0"e	13'1"e	18'6"i	16'8"i	13'7"i	15'0"e	13'7"e	11'11"e	18'10"i	15'3"i	13'4"i
800S300-43	50	13'2"e	11'5"e	9'4"e	13'2"i	11'5"i	8'8"a	12'9"e	11'5"e	9'4"e	13'2"i	11'5"i	8'8"a
800S300-54	50	15'3"e	13'5"e	10'11"e	15'5"i	13'5"i	10'11"a	13'10"e	12'7"e	10'11"e	15'5"i	13'5"i	10'11"a
800S300-97	50	17'1"e	15'6"e	13'6"e	19'2"i	17'0"i	13'11"i	15'6"e	14'1"e	12'4"e	17'5"i	15'10"i	13'10"i
1000S162-43	33	9'10"e	8'4"e	5'7"e	8'0"a	6'5"a	4'5"a	9'10"e	8'4"e	5'7"e	8'0"a	6'5"a	4'5"a
1000S162-54	50	13'2"e	11'5"e	9'4"e	12'10"i	10'6"i	7'9"a	13'2"e	11'5"e	9'4"e	12'10"i	10'6"i	7'9"a
1000S162-68	50	15'6"e	13'5"e	11'0"e	15'6"i	13'5"i	11'0"a	14'8"e	13'4"e	11'0"e	15'6"i	13'5"i	11'0"a
1000S162-97	50	18'1"e	16'5"e	14'0"e	19'10"i	17'2"i	14'0"i	16'5"e	14'11"e	13'1"e	18'6"i	16'9"i	14'0"i
1000S200-43	33	10'8"e	8'4"e	5'7"e	8'3"a	6'7"a	4'5"a	10'8"e	8'4"e	5'7"e	8'3"a	6'7"a	4'5"a
1000S200-54	50	14'2"e	12'3"e	10'0"e	13'5"a	10'11"i	8'1"a	14'2"e	12'3"e	10'0"e	13'5"a	10'11"i	8'1"a
1000S200-68	50	16'8"e	14'5"e	11'9"e	16'8"i	14'5"i	11'9"a	15'4"e	13'11"e	11'9"e	16'8"i	14'5"i	11'9"a
1000S200-97	50	18'11"e	17'2"e	15'0"e	21'3"i	18'4"i	15'0"i	17'2"e	15'7"e	13'8"e	19'3"i	17'6"i	15'0"i
1000S250-54	50	14'7"e	12'7"e	10'4"e	13'8"a	11'1"a	8'2"a	14'7"e	12'7"e	10'4"e	13'8"a	11'1"a	8'2"a
1000S250-68	50	17'2"e	14'10"e	12'1"e	17'2"i	14'10"i	12'1"a	16'0"e	14'7"e	12'1"e	17'2"i	14'10"i	12'1"a
1000S250-97	50	19'8"e	17'11"e	15'6"e	21'10"i	18'11"i	15'6"i	17'11"e	16'3"e	14'2"e	20'1"i	18'3"i	15'6"i
1000S300-54	50	14'10"e	12'10"e	10'6"e	13'9"a	11'2"a	8'2"a	14'10"e	12'10"e	10'6"e	13'9"a	11'2"a	8'2"a
1000S300-68	50	17'5"e	15'1"e	12'4"e	17'5"i	15'1"i	12'4"a	16'6"e	15'0"e	12'4"e	17'5"i	15'1"i	12'4"a
1000S300-97	50	20'4"e	18'5"e	15'9"e	22'4"i	19'4"i	15'9"i	18'5"e	16'9"e	14'8"e	20'9"i	18'10"i	15'9"i
1200S162-54	50	14'2"e	12'3"e	9'2"e	12'4"a	9'11"a	7'3"a	14'2"e	12'3"e	9'2"e	12'4"a	9'11"a	7'3"a
1200S162-68	50	16'10"e	14'7"e	11'11"e	16'10"i	14'7"i	11'3"i	16'10"e	14'7"e	11'11"e	16'10"i	14'7"i	11'3"i
1200S162-97	50	21'1"e	18'10"e	15'5"e	21'9"i	18'10"i	15'5"i	19'2"e	17'5"e	15'2"e	21'6"i	18'10"i	15'5"i
1200S200-54	50	15'5"e	13'4"e	9'2"e	12'11"a	10'4"a	7'4"a	15'5"e	13'4"e	9'2"e	12'11"a	10'4"a	7'4"a
1200S200-68	50	18'2"e	15'9"e	12'10"e	18'2"i	15'7"i	11'9"i	17'7"e	15'9"e	12'10"e	18'2"i	15'7"i	11'9"i
1200S200-97	50	21'11"e	19'11"e	16'6"e	23'4"i	20'3"i	16'6"i	19'11"e	18'1"e	15'10"e	22'4"i	20'3"i	16'6"i

Notes:

- 1 Web punchouts are not considered for shear and web crippling.
- 2 Deflection checks are computed using unbalanced loads for the two equal span conditions.

- 3 "e" indicates that the web stiffeners are required at the end support only.
- 4 "i" indicates that the web stiffeners are required at the interior support only.
- 5 "a" indicates that the web stiffeners are required at all supports.

6 See additional floor joist notes on page 62.

Complies with AISI S100-16 • IBC 2018

The technical content of this literature is effective 8/13/21 and supersedes all previous information.



# ALLOWABLE COMBINED AXIAL & LATERAL LOADS

(Kips/Stud)

Wind = 25 psf

S162 (1-5/8" Flange)

S200 (2" Flange)

S250 (2-1/2" Flange)

Stud length (ft)	Spacing (in) o.c.	S162 (1-5/8" Flange)					S200 (2" Flange)					S250 (2-1/2" Flange)				
		(20ksi) 33ksi	(18ksi) 33ksi	(14ksi) 50ksi	(12ksi) 50ksi	(10ksi) 50ksi	(20ksi) 33ksi	(18ksi) 33ksi	(14ksi) 50ksi	(12ksi) 50ksi	(10ksi) 50ksi	(20ksi) 33ksi	(18ksi) 33ksi	(14ksi) 50ksi	(12ksi) 50ksi	(10ksi) 50ksi
8	12	1.84 a	2.83 a	5.07 a	10.85 a	2.27 a	3.68 a	6.83 a	9.33 a	14.98 a	4.01 a	7.04 a	10.13 a	17.55 a	17.26 a	
	16	1.61 a	2.60 a	4.85 a	10.63 a	1.57 a	3.43 a	6.58 a	9.08 a	14.71 a	3.76 a	6.79 a	10.13 a	17.55 a	17.26 a	
9	12	1.16 a	2.16 a	4.43 a	10.19 a	2.03 a	2.93 a	6.07 a	8.57 a	14.19 a	3.25 a	6.30 a	9.60 a	16.69 a	16.98 a	
	16	1.36 a	2.63 a	4.87 a	10.64 a	1.76 a	3.11 a	6.18 a	8.64 a	14.52 a	3.44 a	6.42 a	9.66 a	16.61 a	16.98 a	
10	12	0.80 a	1.79 a	4.06 a	9.79 a	1.18 a	2.49 a	5.55 a	8.00 a	13.97 a	2.80 a	5.81 a	8.99 a	15.87 a	16.31 a	
	16	1.43 a	2.41 a	4.64 a	10.39 a	1.81 a	3.15 a	6.13 a	8.54 a	13.97 a	3.47 a	6.38 a	9.59 a	16.31 a	16.31 a	
12	12	1.08 a	2.06 a	4.30 a	10.03 a	1.45 a	2.76 a	5.73 a	8.14 a	13.54 a	3.08 a	6.00 a	9.12 a	15.84 a	15.84 a	
	16	0.41 a	1.39 a	3.64 a	9.32 a	0.77 a	2.02 a	4.97 a	7.35 a	12.70 a	2.31 a	5.25 a	8.30 a	14.93 a	14.93 a	
14	12	0.92 a	1.87 a	4.05 a	9.75 a	1.27 a	2.50 a	5.24 a	7.51 a	12.58 a	2.82 a	5.55 a	8.46 a	14.66 a	14.66 a	
	16	0.46 b	1.40 a	3.56 a	9.20 a	0.80 a	1.98 a	4.70 a	6.94 a	11.96 a	2.28 a	5.02 a	7.87 a	14.00 a	14.00 a	
16	12	—	0.52 b	2.66 a	8.17 a	—	1.02 b	3.69 a	5.88 a	10.80 a	1.27 a	4.02 a	6.75 a	12.73 a	12.73 a	
	16	—	0.70 c	2.66 b	8.85 a	0.71 b	1.80 a	4.23 a	6.29 a	10.88 a	2.10 a	4.62 a	7.21 a	12.71 a	12.71 a	
16	12	—	0.68 c	2.42 b	7.30 a	0.17 d	1.11 c	3.23 a	5.03 a	8.66 a	0.24 c	2.75 b	5.10 a	10.29 a	10.29 a	
	16	—	0.05 d	1.78 d	6.46 a	—	0.42 d	2.51 c	4.26 b	8.15 a	0.63 c	2.93 b	5.07 a	9.65 a	9.65 a	
24	—	—	1.89 b	4.98 c	—	—	1.24 d	2.88 d	6.56 b	—	—	1.57 d	3.55 c	7.91 b	7.91 b	

Stud length (ft)	Spacing (in) o.c.	S162 (1-5/8" Flange)					S200 (2" Flange)					S250 (2-1/2" Flange)				
		(20ksi) 33ksi	(18ksi) 33ksi	(14ksi) 50ksi	(12ksi) 50ksi	(10ksi) 50ksi	(20ksi) 33ksi	(18ksi) 33ksi	(14ksi) 50ksi	(12ksi) 50ksi	(10ksi) 50ksi	(20ksi) 33ksi	(18ksi) 33ksi	(14ksi) 50ksi	(12ksi) 50ksi	(10ksi) 50ksi
8	12	1.99 a*	2.96 a	5.08 a	10.92 a	2.53 a*	4.02 a	7.30 a	9.84 a	15.54 a	4.42 a	7.72 a	11.32 a	19.26 a	19.26 a	
	16	1.82 a*	2.80 a	4.98 a	10.78 a	2.35 a*	3.83 a	7.11 a	9.66 a	15.36 a	4.23 a	7.54 a	11.13 a	19.05 a	19.05 a	
9	12	1.85 a*	2.83 a	4.95 a	10.80 a	2.38 a*	3.86 a	7.14 a	9.69 a	15.38 a	4.25 a	7.53 a	11.11 a	18.99 a	18.99 a	
	16	1.64 a*	2.63 a	4.76 a	10.62 a	2.16 a*	3.63 a	6.90 a	9.45 a	15.16 a	4.00 a	7.30 a	10.86 a	18.72 a	18.72 a	
10	12	1.22 a*	2.22 a	4.39 a	10.26 a	1.71 a*	3.16 a	6.43 a	9.00 a	14.70 a	3.52 a	6.83 a	10.36 a	18.19 a	18.19 a	
	16	1.69 a*	2.68 a	4.81 a	10.66 a	2.22 a*	3.68 a	6.95 a	9.50 a	15.20 a	4.05 a	7.31 a	10.87 a	18.67 a	18.67 a	
12	12	1.43 a*	2.43 a	4.58 a	10.44 a	1.94 a*	3.39 a	6.66 a	9.21 a	14.91 a	3.75 a	7.02 a	10.55 a	18.34 a	18.34 a	
	16	1.93 a*	2.93 a	5.06 a	10.99 a	2.81 a*	4.51 a	8.08 a	10.64 a	16.34 a	4.42 a	7.72 a	11.32 a	19.26 a	19.26 a	
14	12	1.33 a*	2.32 a	4.47 a	10.32 a	1.83 a*	3.27 a	6.51 a	9.06 a	14.74 a	3.59 a	6.77 a	10.25 a	17.87 a	17.87 a	
	16	0.97 a*	1.97 a	4.13 a	9.98 a	1.44 a*	2.85 a	6.08 a	8.63 a	14.31 a	3.15 a	6.35 a	9.80 a	17.37 a	17.37 a	
16	12	0.27 a*	1.27 a	3.47 a	9.32 a	0.68 a*	2.03 a	5.24 a	7.80 a	13.46 a	2.32 a	5.53 a	8.90 a	16.39 a	16.39 a	
	16	0.45 a*	1.45 a	4.05 a	9.87 a	1.36 a*	2.73 a	5.88 a	8.44 a	14.14 a	3.03 a	6.10 a	9.42 a	16.71 a	16.71 a	
16	12	—	0.53 a	2.71 a	8.49 a	—	1.14 a	4.20 a	7.85 a	13.53 a	2.47 a	5.54 a	8.81 a	16.03 a	16.03 a	
	16	0.47 a*	1.44 a	3.56 a	9.32 a	0.86 a*	2.13 a	5.35 a	7.99 a	12.34 a	1.39 a	4.47 a	7.62 a	14.70 a	14.70 a	
16	12	—	0.85 a	2.98 a	8.70 a	0.25 b*	1.46 a	4.35 a	8.05 a	12.24 a	1.72 a	4.63 a	7.63 a	14.32 a	14.32 a	
	24	—	—	1.89 b	7.51 a	—	0.22 c	3.03 a	5.38 a	10.74 a	0.43 b	3.33 a	6.18 a	12.67 a	12.67 a	

See page 27 for clarification of code developed wind pressures prior to using this table.

Notes:

- For additional general notes, see page 41.
- Allowable axial loads listed in kips (1 kip = 1000 pounds).
- Allowable axial loads determined in accordance with AISI S100-16 and assuming that all axial loads pass through centroid of effective section.
- Listed tables are based on simple (single)-span.
- Studs are assumed to be adequately braced at a maximum spacing of  $L_u$  to develop full allowable moment,  $M_n$ .
- Cells marked with an "a," "b," "c," "d," "e," or "f" meet L/720, L/600, L/480, L/360, L/240, or L/120 respectively. Blank cells do not meet L/120.
- For deflection calculations, lateral loads are multiplied by 0.7 per the AISI Standard for Cold-Formed Steel Framing - Wall Stud Design except for 5psf load which is considered interior wall load.
- Cells marked with an "\*" have  $h/t > 200$ , and thus require bearing stiffeners. Cells are left blank when  $h/t > 260$ .

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**Steel Beam**

Project File: 2023.05 - smokes4less - building addition.ecb

LIC# : KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

(c) ENERCALC INC 1983-2023

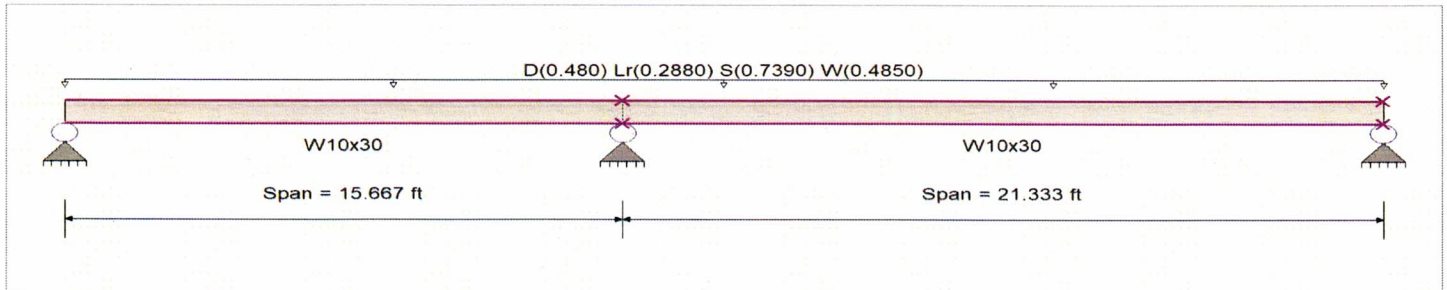
**DESCRIPTION:** RB-1 Roof Beam

**CODE REFERENCES**

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10  
Load Combination Set : ASCE 7-10

**Material Properties**

Analysis Method Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling	E : Modulus :	29,000.0 ksi
Bending Axis : Major Axis Bending		



**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added  
Loads on all spans...

Uniform Load on ALL spans : D = 0.480, Lr = 0.2880, S = 0.7390, W = 0.4850 k/ft

**DESIGN SUMMARY**

**Design OK**

Maximum Bending Stress Ratio =	<b>0.628 : 1</b>	Maximum Shear Stress Ratio =	<b>0.255 : 1</b>
Section used for this span	<b>W10x30</b>	Section used for this span	<b>W10x30</b>
Ma : Applied	57.354 k-ft	Va : Applied	16.048 k
Mn / Omega : Allowable	91.317 k-ft	Vn/Omega : Allowable	63.0 k
Load Combination	+D+0.750S+0.450W	Load Combination	+D+0.750S+0.450W
Span # where maximum occurs	Span # 1	Location of maximum on span	15.667 ft
		Span # where maximum occurs	Span # 1
<b>Maximum Deflection</b>			
Max Downward Transient Deflection	0.368 in Ratio = <b>695</b> >=360	Span: 2 : S Only	
Max Upward Transient Deflection	-0.021 in Ratio = <b>9,103</b> >=360	Span: 2 : S Only	
Max Downward Total Deflection	0.624 in Ratio = <b>410</b> >=240	Span: 2 : +D+0.750S+0.450W	
Max Upward Total Deflection	-0.035 in Ratio = <b>5371</b> >=240	Span: 2 : +D+0.750S+0.450W	

**Maximum Forces & Stresses for Load Combinations**

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
<b>D Only</b>														
Dsgn. L =	15.67 ft	1	0.241	0.098	5.79	-21.98	21.98	152.50	91.32	1.00	1.00	6.15	94.50	63.00
Dsgn. L =	21.33 ft	2	0.241	0.098	17.42	-21.98	21.98	152.50	91.32	1.00	1.00	6.15	94.50	63.00
<b>+D+Lr</b>														
Dsgn. L =	15.67 ft	1	0.385	0.156	9.26	-35.17	35.17	152.50	91.32	1.00	1.00	9.84	94.50	63.00
Dsgn. L =	21.33 ft	2	0.385	0.156	27.88	-35.17	35.17	152.50	91.32	1.00	1.00	9.84	94.50	63.00
<b>+D+S</b>														
Dsgn. L =	15.67 ft	1	0.611	0.248	14.70	-55.82	55.82	152.50	91.32	1.00	1.00	15.62	94.50	63.00
Dsgn. L =	21.33 ft	2	0.611	0.248	44.25	-55.82	55.82	152.50	91.32	1.00	1.00	15.62	94.50	63.00
<b>+D+0.750Lr</b>														
Dsgn. L =	15.67 ft	1	0.349	0.142	8.39	-31.87	31.87	152.50	91.32	1.00	1.00	8.92	94.50	63.00
Dsgn. L =	21.33 ft	2	0.349	0.142	25.26	-31.87	31.87	152.50	91.32	1.00	1.00	8.92	94.50	63.00
<b>+D+0.750S</b>														
Dsgn. L =	15.67 ft	1	0.519	0.210	12.47	-47.36	47.36	152.50	91.32	1.00	1.00	13.25	94.50	63.00
Dsgn. L =	21.33 ft	2	0.519	0.210	37.54	-47.36	47.36	152.50	91.32	1.00	1.00	13.25	94.50	63.00
<b>+D+0.60W</b>														
Dsgn. L =	15.67 ft	1	0.387	0.157	9.30	-35.31	35.31	152.50	91.32	1.00	1.00	9.88	94.50	63.00
Dsgn. L =	21.33 ft	2	0.387	0.157	27.98	-35.31	35.31	152.50	91.32	1.00	1.00	9.88	94.50	63.00
<b>+D+0.750Lr+0.450W</b>														
Dsgn. L =	15.67 ft	1	0.458	0.186	11.02	-41.87	41.87	152.50	91.32	1.00	1.00	11.71	94.50	63.00
Dsgn. L =	21.33 ft	2	0.458	0.186	33.18	-41.87	41.87	152.50	91.32	1.00	1.00	11.71	94.50	63.00

**Steel Beam**

Project File: 2023.05 - smokes4less - building addition.ec6

LIC# : KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** RB-1 Roof Beam

**Maximum Forces & Stresses for Load Combinations**

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega Cb	Rm	Va Max	VnxVnx/Omega		
<b>+D+0.750S+0.450W</b>														
Dsgn. L = 15.67 ft		1	0.628	0.255	15.10	-57.35	57.35	152.50	91.32	1.00	1.00	16.05	94.50	63.00
Dsgn. L = 21.33 ft		2	0.628	0.255	45.46	-57.35	57.35	152.50	91.32	1.00	1.00	16.05	94.50	63.00
<b>+0.60D+0.60W</b>														
Dsgn. L = 15.67 ft		1	0.290	0.118	6.98	-26.51	26.51	152.50	91.32	1.00	1.00	7.42	94.50	63.00
Dsgn. L = 21.33 ft		2	0.290	0.118	21.02	-26.51	26.51	152.50	91.32	1.00	1.00	7.42	94.50	63.00
<b>+0.60D</b>														
Dsgn. L = 15.67 ft		1	0.144	0.059	3.47	-13.19	13.19	152.50	91.32	1.00	1.00	3.69	94.50	63.00
Dsgn. L = 21.33 ft		2	0.144	0.059	10.45	-13.19	13.19	152.50	91.32	1.00	1.00	3.69	94.50	63.00

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750S+0.450W	1	0.0563	5.013	+D+0.750S+0.450W	-0.0350	13.411
+D+0.750S+0.450W	2	0.6241	11.861		0.0000	13.411

**Vertical Reactions**

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	6.150	29.521	10.672
Max Upward from Load Combinations	6.150	29.521	10.672
Max Upward from Load Cases	3.629	17.418	6.296
D Only	2.357	11.313	4.090
+D+Lr	3.771	18.101	6.544
+D+S	5.986	28.731	10.386
+D+0.750Lr	3.418	16.404	5.930
+D+0.750S	5.079	24.377	8.812
+D+0.60W	3.786	18.172	6.569
+D+0.750Lr+0.450W	4.489	21.548	7.790
+D+0.750S+0.450W	6.150	29.521	10.672
+0.60D+0.60W	2.843	13.647	4.933
+0.60D	1.414	6.788	2.454
Lr Only	1.414	6.788	2.454
S Only	3.629	17.418	6.296
W Only	2.382	11.431	4.132



## Steel Column

Project File: 2023.05 - smokes4less - building addition.ec6

LIC#: KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

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**DESCRIPTION:** C-2 Column at roof beam

### Code References

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10  
Load Combinations Used : ASCE 7-10

### General Information

Steel Section Name : <b>HSS4x4x1/4</b>	Overall Column Height : 12.0 ft
Analysis Method : Allowable Strength	Top & Bottom Fixity : Top Fixed, Bottom Fixed
Steel Stress Grade : A-992HighStrengthLowAlloyFy=50ksi	Brace condition :
Fy : Steel Yield : 50.0 ksi	Fully braced against buckling ABOUT X-X Axis
E : Elastic Bending Modulus : 29,000.0 ksi	Fully braced against buckling ABOUT Y-Y Axis

### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 146.520 lbs \* Dead Load Factor  
AXIAL LOADS . . .  
Axial Load at 12.0 ft, D = 11.30, LR = 6.80, L = 11.40, S = 17.40 k  
BENDING LOADS . . .  
, W = 0.3080

### DESIGN SUMMARY

#### Bending & Shear Check Results

**PASS** Max. Axial+Bending Stress Ratio = **0.3275** : 1  
 Load Combination : +D+0.750L+0.750S  
 Location of max.above base : 0.0 ft  
 At maximum location values are . . .  
 Pa : Axial : 33.047 k  
 Pn / Omega : Allowabl : 100.898 k  
 Ma-x : Applied : 0.0 k-ft  
 Mn-x / Omega : Allowable : 11.702 k-ft  
 Ma-y : Applied : 0.0 k-ft  
 Mn-y / Omega : Allowable : 11.702 k-ft

**Maximum Load Reactions . .**  
 Top along X-X : 0.0 k  
 Bottom along X-X : 0.0 k  
 Top along Y-Y : 0.0 k  
 Bottom along Y-Y : 0.0 k

**Maximum Load Deflections . . .**  
 Along Y-Y : 0.0 in at 0.0 ft above base  
 for load combination :  
 Along X-X : 0.0 in at 0.0 ft above base  
 for load combination :

**PASS** Maximum Shear Stress Ratio = **0.0** : 1  
 Load Combination : 0.0  
 Location of max.above base : 0.0 ft  
 At maximum location values are . . .  
 Va : Applied : 0.0 k  
 Vn / Omega : Allowable : 0.0 k

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cbx	Cby	KxLx/Ry	KyLy/Rx	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
D Only	0.113	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+L	0.226	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+Lr	0.181	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+S	0.286	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+0.750Lr+0.750L	0.249	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+0.750L+0.750S	0.328	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+0.60W	0.113	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D-0.60W	0.113	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+0.750Lr+0.750L+0.45C	0.249	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+0.750Lr+0.750L-0.450	0.249	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+0.750L+0.750S+0.450	0.328	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+D+0.750L+0.750S-0.450	0.328	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+0.60D+0.60W	0.068	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+0.60D-0.60W	0.068	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	
+0.60D	0.068	PASS	0.00 ft	1.00	1.00	0.00	0.00	0.000	PASS	0.00 ft	

**Steel Column**

Project File: 2023.05 - smokes4less - building addition.ec6

LIC# : KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

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**DESCRIPTION:** C-2 Column at roof beam

**Maximum Reactions**

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	11.447										
+D+L	22.847										
+D+Lr	18.247										
+D+S	28.847										
+D+0.750Lr+0.750L	25.097										
+D+0.750L+0.750S	33.047										
+D+0.60W	11.447										
+D+0.750Lr+0.750L+0.450W	25.097										
+D+0.750L+0.750S+0.450W	33.047										
+0.60D+0.60W	6.868										
+0.60D	6.868										
Lr Only	6.800										
L Only	11.400										
S Only	17.400										
W Only											

**Extreme Reactions**

Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	33.047										
"	Minimum											
Reaction, X-X Axis Base	Maximum	11.447										
"	Minimum	11.447										
Reaction, Y-Y Axis Base	Maximum	11.447										
"	Minimum	11.447										
Reaction, X-X Axis Top	Maximum	11.447										
"	Minimum	11.447										
Reaction, Y-Y Axis Top	Maximum	11.447										
"	Minimum	11.447										
Moment, X-X Axis Base	Maximum	11.447										
"	Minimum	11.447										
Moment, Y-Y Axis Base	Maximum	11.447										
"	Minimum	11.447										
Moment, X-X Axis Top	Maximum	11.447										
"	Minimum	11.447										
Moment, Y-Y Axis Top	Maximum	11.447										
"	Minimum	11.447										

**Maximum Deflections for Load Combinations**

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+Lr	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+S	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.60W	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L+0.450W	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L+0.750S+0.450W	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D+0.60W	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
Lr Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
S Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
W Only	0.0000 in	0.000 ft	0.000 in	0.000 ft

**Steel Section Properties :** HSS4x4x1/4

**Steel Section Properties :** HSS4x4x1/4



**Steel Column**

Project File: 2023.05 - smokes4less - building addition.ec6

LIC# : KW-06017584, Build:20.23.08.01

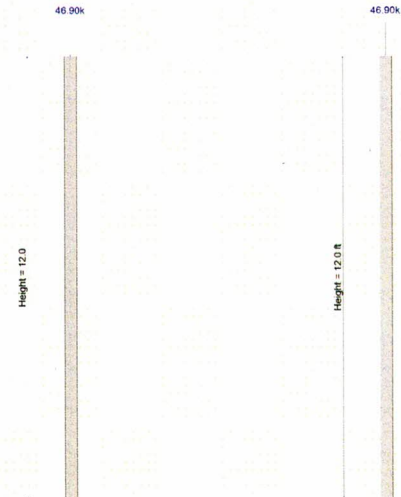
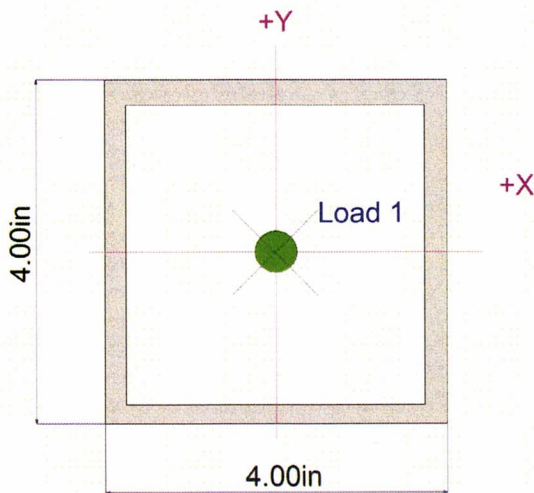
EcoGreen Architects LLC

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**DESCRIPTION: C-2 Column at roof beam**

Depth	=	4.000 in	I xx	=	7.80 in <sup>4</sup>	J	=	12.800 in <sup>4</sup>
Design Thick	=	0.233 in	S xx	=	3.90 in <sup>3</sup>			
Width	=	4.000 in	R xx	=	1.520 in			
Wall Thick	=	0.250 in	Zx	=	4.690 in <sup>3</sup>			
Area	=	3.370 in <sup>2</sup>	I yy	=	7.800 in <sup>4</sup>	C	=	6.560 in <sup>3</sup>
Weight	=	12.210 plf	S yy	=	3.900 in <sup>3</sup>			
			R yy	=	1.520 in			
Ycg	=	0.000 in						

**Sketches**



**General Footing**

Project File: 2023.05 - smokes4less - building addition.ec6

LIC# : KW-06017584, Build:20.23.08.01

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**DESCRIPTION: F-1 Column Footings**

**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	=	3.0 ksi
$f_y$ : Rebar Yield	=	60.0 ksi
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
$\phi$ Values Flexure	=	0.90
Shear	=	0.750

**Soil Design Values**

Allowable Soil Bearing	=	2.0 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

**Analysis Settings**

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1

**Increases based on footing Depth**

Footing base depth below soil surface	=	4.0 ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

**Increases based on footing plan dimension**

Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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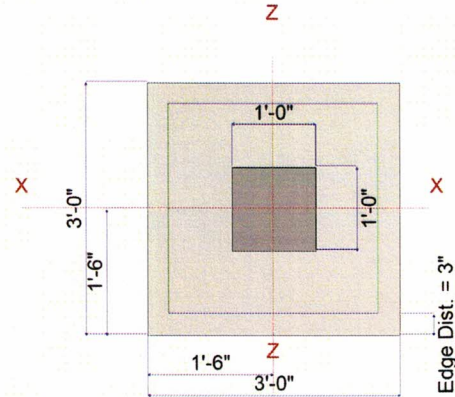
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	Yes
Use Pedestal wt for stability, mom & shear	:	No

**Dimensions**

Width parallel to X-X Axis	=	3.0 ft
Length parallel to Z-Z Axis	=	3.0 ft
Footing Thickness	=	12.0 in

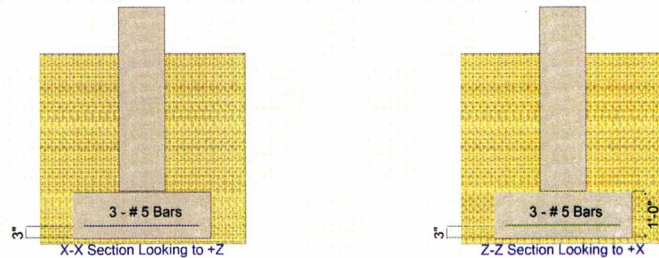
**Pedestal dimensions...**

px : parallel to X-X Axis	=	12.0 in
pz : parallel to Z-Z Axis	=	12.0 in
Height	=	48.0 in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



**Reinforcing**

Bars parallel to X-X Axis	=	
Number of Bars	=	3.0
Reinforcing Bar Size	=	# 5
Bars parallel to Z-Z Axis	=	
Number of Bars	=	3.0
Reinforcing Bar Size	=	# 5
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	=	4.090	2.454		6.296	4.132	k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



**General Footing**

Project File: 2023.05 - smokes4less - building addition.ec6

LIC#: KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

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**DESCRIPTION: F-1 Column Footings**

**DESIGN SUMMARY**

**Design OK**

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8440	Soil Bearing	1.688 ksf	2.0 ksf	+D+0.750S+0.450W about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.07944	Z Flexure (+X)	0.9637 k-ft/ft	12.131 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.07944	Z Flexure (-X)	0.9637 k-ft/ft	12.131 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.07944	X Flexure (+Z)	0.9637 k-ft/ft	12.131 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.07944	X Flexure (-Z)	0.9637 k-ft/ft	12.131 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.05214	1-way Shear (+X)	4.283 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.05214	1-way Shear (-X)	4.283 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.05214	1-way Shear (+Z)	4.283 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.05214	1-way Shear (-Z)	4.283 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.09267	2-way Punching	15.227 psi	164.317 psi	+1.20D+1.60S+0.50W

**Detailed Results**

**Soil Bearing**

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.0	n/a	0.0	0.9572	0.9572	n/a	n/a	0.479
X-X, +D+Lr	2.0	n/a	0.0	1.230	1.230	n/a	n/a	0.615
X-X, +D+S	2.0	n/a	0.0	1.657	1.657	n/a	n/a	0.829
X-X, +D+0.750Lr	2.0	n/a	0.0	1.162	1.162	n/a	n/a	0.581
X-X, +D+0.750S	2.0	n/a	0.0	1.482	1.482	n/a	n/a	0.741
X-X, +D+0.60W	2.0	n/a	0.0	1.233	1.233	n/a	n/a	0.617
X-X, +D+0.750Lr+0.450W	2.0	n/a	0.0	1.368	1.368	n/a	n/a	0.684
X-X, +D+0.750S+0.450W	2.0	n/a	0.0	1.688	1.688	n/a	n/a	0.844
X-X, +0.60D+0.60W	2.0	n/a	0.0	0.8498	0.8498	n/a	n/a	0.425
X-X, +0.60D	2.0	n/a	0.0	0.5743	0.5743	n/a	n/a	0.287
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.9572	0.9572	0.479
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.230	1.230	0.615
Z-Z, +D+S	2.0	0.0	n/a	n/a	n/a	1.657	1.657	0.829
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.162	1.162	0.581
Z-Z, +D+0.750S	2.0	0.0	n/a	n/a	n/a	1.482	1.482	0.741
Z-Z, +D+0.60W	2.0	0.0	n/a	n/a	n/a	1.233	1.233	0.617
Z-Z, +D+0.750Lr+0.450W	2.0	0.0	n/a	n/a	n/a	1.368	1.368	0.684
Z-Z, +D+0.750S+0.450W	2.0	0.0	n/a	n/a	n/a	1.688	1.688	0.844
Z-Z, +0.60D+0.60W	2.0	0.0	n/a	n/a	n/a	0.8498	0.8498	0.425
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.5743	0.5743	0.287

**Overturing Stability**

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

**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	0.3375	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.40D	0.3375	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.50Lr	0.3575	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.50Lr	0.3575	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.50S	0.4642	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.50S	0.4642	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+1.60Lr	0.5074	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+1.60Lr	0.5074	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+1.60Lr+0.50W	0.6222	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+1.60Lr+0.50W	0.6222	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK



**General Footing**

Project File: 2023.05 - smokes4less - building addition.ec6

LIC# : KW-06017584, Build:20.23.08.01

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**DESCRIPTION: F-1 Column Footings**

**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, +1.20D+1.60S	0.8489	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+1.60S	0.8489	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+1.60S+0.50W	0.9637	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+1.60S+0.50W	0.9637	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.50Lr+W	0.5870	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.50Lr+W	0.5870	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.50S+W	0.6937	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.50S+W	0.6937	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.70S	0.5341	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +1.20D+0.70S	0.5341	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +0.90D+W	0.4465	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +0.90D+W	0.4465	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +0.90D	0.2170	+Z	Bottom	0.2592	AsMin	0.310	12.131	OK
X-X, +0.90D	0.2170	-Z	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.40D	0.3375	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.40D	0.3375	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.50Lr	0.3575	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.50Lr	0.3575	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.50S	0.4642	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.50S	0.4642	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+1.60Lr	0.5074	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+1.60Lr	0.5074	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+1.60Lr+0.50W	0.6222	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+1.60Lr+0.50W	0.6222	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+1.60S	0.8489	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+1.60S	0.8489	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+1.60S+0.50W	0.9637	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+1.60S+0.50W	0.9637	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.50Lr+W	0.5870	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.50Lr+W	0.5870	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.50S+W	0.6937	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.50S+W	0.6937	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.70S	0.5341	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +1.20D+0.70S	0.5341	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +0.90D+W	0.4465	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +0.90D+W	0.4465	+X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +0.90D	0.2170	-X	Bottom	0.2592	AsMin	0.310	12.131	OK
Z-Z, +0.90D	0.2170	+X	Bottom	0.2592	AsMin	0.310	12.131	OK

**One Way Shear**

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	1.50 psi	1.50 psi	1.50 psi	1.50 psi	1.50 psi	82.16 psi	0.02	OK
+1.20D+0.50Lr	1.59 psi	1.59 psi	1.59 psi	1.59 psi	1.59 psi	82.16 psi	0.02	OK
+1.20D+0.50S	2.06 psi	2.06 psi	2.06 psi	2.06 psi	2.06 psi	82.16 psi	0.03	OK
+1.20D+1.60Lr	2.26 psi	2.26 psi	2.26 psi	2.26 psi	2.26 psi	82.16 psi	0.03	OK
+1.20D+1.60Lr+0.50W	2.77 psi	2.77 psi	2.77 psi	2.77 psi	2.77 psi	82.16 psi	0.03	OK
+1.20D+1.60S	3.77 psi	3.77 psi	3.77 psi	3.77 psi	3.77 psi	82.16 psi	0.05	OK
+1.20D+1.60S+0.50W	4.28 psi	4.28 psi	4.28 psi	4.28 psi	4.28 psi	82.16 psi	0.05	OK
+1.20D+0.50Lr+W	2.61 psi	2.61 psi	2.61 psi	2.61 psi	2.61 psi	82.16 psi	0.03	OK
+1.20D+0.50S+W	3.08 psi	3.08 psi	3.08 psi	3.08 psi	3.08 psi	82.16 psi	0.04	OK
+1.20D+0.70S	2.37 psi	2.37 psi	2.37 psi	2.37 psi	2.37 psi	82.16 psi	0.03	OK
+0.90D+W	1.99 psi	1.99 psi	1.99 psi	1.99 psi	1.99 psi	82.16 psi	0.02	OK
+0.90D	0.96 psi	0.96 psi	0.96 psi	0.96 psi	0.96 psi	82.16 psi	0.01	OK

**Two-Way "Punching" Shear**

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	5.33 psi	164.32psi	0.03246	OK
+1.20D+0.50Lr	5.65 psi	164.32psi	0.03438	OK
+1.20D+0.50S	7.34 psi	164.32psi	0.04464	OK
+1.20D+1.60Lr	8.02 psi	164.32psi	0.0488	OK
+1.20D+1.60Lr+0.50W	9.83 psi	164.32psi	0.05983	OK
+1.20D+1.60S	13.41 psi	164.32psi	0.08163	OK
+1.20D+1.60S+0.50W	15.23 psi	164.32psi	0.09267	OK

## General Footing

Project File: 2023.05 - smokes4less - building addition.ec6

LIC# : KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

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### DESCRIPTION: F-1 Column Footings

#### Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.20D+0.50Lr+W	9.28 psi	164.32psi	0.05645	OK
+1.20D+0.50S+W	10.96 psi	164.32psi	0.06671	OK
+1.20D+0.70S	8.44 psi	164.32psi	0.05136	OK
+0.90D+W	7.06 psi	164.32psi	0.04294	OK
+0.90D	3.43 psi	164.32psi	0.02087	OK



## General Footing

Project File: 2023.05 - smokes4less - building addition.ec6

LIC# : KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

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**DESCRIPTION:** F-2 Column Footing

### Code References

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10  
 Load Combinations Used : IBC 2018

### General Information

#### Material Properties

fc : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : 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

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	:	No

#### Soil Design Values

Allowable Soil Bearing	=	2.0 ksf
Soil Density	=	110.0 pcf
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	=	4.0 ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

#### Increases based on footing plan dimension

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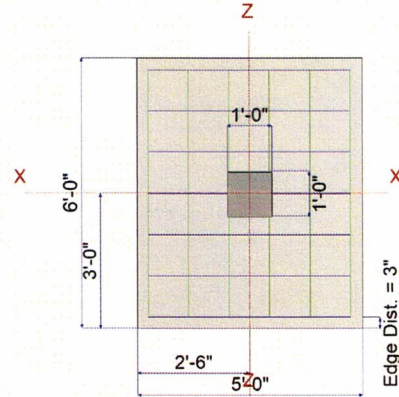
### Dimensions

Width parallel to X-X Axis	=	5.0 ft
Length parallel to Z-Z Axis	=	6.0 ft
Footing Thickness	=	12.0 in

#### Pedestal dimensions...

px : parallel to X-X Axis	=	12.0 in
pz : parallel to Z-Z Axis	=	12.0 in
Height	=	48.0 in

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



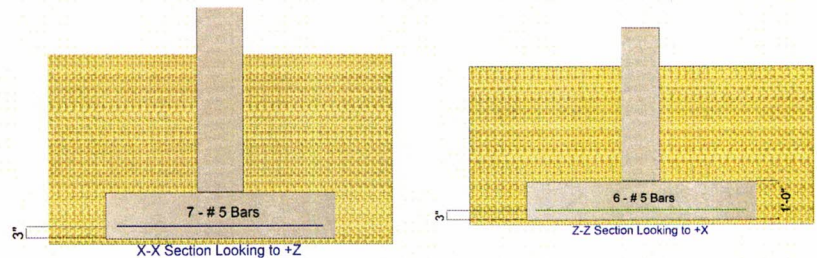
### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	7
Reinforcing Bar Size	=	# 5
Bars parallel to Z-Z Axis	=	
Number of Bars	=	6
Reinforcing Bar Size	=	# 5

#### Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

		Bars along X-X Axis
# Bars required within zone	=	90.9 %
# Bars required on each side of zone	=	9.1 %



### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	11.313	6.788		17.418	11.431	k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



**General Footing**

Project File: 2023.05 - smokes4less - building addition.ec6

LIC# : KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

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**DESCRIPTION: F-2 Column Footing**

**DESIGN SUMMARY**

**Design OK**

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7335	Soil Bearing	1.467 ksf	2.0 ksf	+D+0.750S+0.450W about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.2249	Z Flexure (+X)	3.164 k-ft/ft	14.070 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.2249	Z Flexure (-X)	3.164 k-ft/ft	14.070 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.3420	X Flexure (+Z)	4.943 k-ft/ft	14.455 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.3420	X Flexure (-Z)	4.943 k-ft/ft	14.455 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.2229	1-way Shear (+X)	18.310 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.2229	1-way Shear (-X)	18.310 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.3102	1-way Shear (+Z)	25.488 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.3102	1-way Shear (-Z)	25.488 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.3419	2-way Punching	56.186 psi	164.317 psi	+1.20D+1.60S+0.50W

**Detailed Results**

**Soil Bearing**

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.0	n/a	0.0	0.8604	0.8604	n/a	n/a	0.430
X-X, +D+Lr	2.0	n/a	0.0	1.087	1.087	n/a	n/a	0.544
X-X, +D+S	2.0	n/a	0.0	1.441	1.441	n/a	n/a	0.721
X-X, +D+0.750Lr	2.0	n/a	0.0	1.030	1.030	n/a	n/a	0.515
X-X, +D+0.750S	2.0	n/a	0.0	1.296	1.296	n/a	n/a	0.648
X-X, +D+0.60W	2.0	n/a	0.0	1.089	1.089	n/a	n/a	0.545
X-X, +D+0.750Lr+0.450W	2.0	n/a	0.0	1.202	1.202	n/a	n/a	0.601
X-X, +D+0.750S+0.450W	2.0	n/a	0.0	1.467	1.467	n/a	n/a	0.734
X-X, +0.60D+0.60W	2.0	n/a	0.0	0.7449	0.7449	n/a	n/a	0.373
X-X, +0.60D	2.0	n/a	0.0	0.5163	0.5163	n/a	n/a	0.258
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.8604	0.8604	0.430
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.087	1.087	0.544
Z-Z, +D+S	2.0	0.0	n/a	n/a	n/a	1.441	1.441	0.721
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.030	1.030	0.515
Z-Z, +D+0.750S	2.0	0.0	n/a	n/a	n/a	1.296	1.296	0.648
Z-Z, +D+0.60W	2.0	0.0	n/a	n/a	n/a	1.089	1.089	0.545
Z-Z, +D+0.750Lr+0.450W	2.0	0.0	n/a	n/a	n/a	1.202	1.202	0.601
Z-Z, +D+0.750S+0.450W	2.0	0.0	n/a	n/a	n/a	1.467	1.467	0.734
Z-Z, +0.60D+0.60W	2.0	0.0	n/a	n/a	n/a	0.7449	0.7449	0.373
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.5163	0.5163	0.258

**Overturing Stability**

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

**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	1.686	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.40D	1.686	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.50Lr	1.799	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.50Lr	1.799	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.50S	2.352	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.50S	2.352	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+1.60Lr	2.577	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+1.60Lr	2.577	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+1.60Lr+0.50W	3.172	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+1.60Lr+0.50W	3.172	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK



**General Footing**

Project File: 2023.05 - smokes4less - building addition.ec6

LIC#: KW-06017584, Build:20.23.08.01

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**DESCRIPTION: F-2 Column Footing**

**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, +1.20D+1.60S	4.348	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+1.60S	4.348	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+1.60S+0.50W	4.943	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+1.60S+0.50W	4.943	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.50Lr+W	2.989	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.50Lr+W	2.989	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.50S+W	3.543	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.50S+W	3.543	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.70S	2.715	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +1.20D+0.70S	2.715	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +0.90D+W	2.275	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +0.90D+W	2.275	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +0.90D	1.084	+Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
X-X, +0.90D	1.084	-Z	Bottom	0.2592	AsMin	0.3720	14.455	OK
Z-Z, +1.40D	1.079	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.40D	1.079	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.50Lr	1.151	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.50Lr	1.151	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.50S	1.506	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.50S	1.506	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+1.60Lr	1.649	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+1.60Lr	1.649	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+1.60Lr+0.50W	2.030	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+1.60Lr+0.50W	2.030	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+1.60S	2.783	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+1.60S	2.783	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+1.60S+0.50W	3.164	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+1.60S+0.50W	3.164	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.50Lr+W	1.913	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.50Lr+W	1.913	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.50S+W	2.268	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.50S+W	2.268	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.70S	1.738	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +1.20D+0.70S	1.738	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +0.90D+W	1.456	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +0.90D+W	1.456	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +0.90D	0.6938	-X	Bottom	0.2592	AsMin	0.3617	14.070	OK
Z-Z, +0.90D	0.6938	+X	Bottom	0.2592	AsMin	0.3617	14.070	OK

**One Way Shear**

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	6.25 psi	6.25 psi	8.69 psi	8.69 psi	8.69 psi	82.16 psi	0.11	OK
+1.20D+0.50Lr	6.66 psi	6.66 psi	9.27 psi	9.27 psi	9.27 psi	82.16 psi	0.11	OK
+1.20D+0.50S	8.71 psi	8.71 psi	12.13 psi	12.13 psi	12.13 psi	82.16 psi	0.15	OK
+1.20D+1.60Lr	9.54 psi	9.54 psi	13.28 psi	13.28 psi	13.28 psi	82.16 psi	0.16	OK
+1.20D+1.60Lr+0.50W	11.75 psi	11.75 psi	16.35 psi	16.35 psi	16.35 psi	82.16 psi	0.20	OK
+1.20D+1.60S	16.11 psi	16.11 psi	22.42 psi	22.42 psi	22.42 psi	82.16 psi	0.27	OK
+1.20D+1.60S+0.50W	18.31 psi	18.31 psi	25.49 psi	25.49 psi	25.49 psi	82.16 psi	0.31	OK
+1.20D+0.50Lr+W	11.07 psi	11.07 psi	15.41 psi	15.41 psi	15.41 psi	82.16 psi	0.19	OK
+1.20D+0.50S+W	13.12 psi	13.12 psi	18.27 psi	18.27 psi	18.27 psi	82.16 psi	0.22	OK
+1.20D+0.70S	10.06 psi	10.06 psi	14.00 psi	14.00 psi	14.00 psi	82.16 psi	0.17	OK
+0.90D+W	8.43 psi	8.43 psi	11.73 psi	11.73 psi	11.73 psi	82.16 psi	0.14	OK
+0.90D	4.02 psi	4.02 psi	5.59 psi	5.59 psi	5.59 psi	82.16 psi	0.07	OK

**Two-Way "Punching" Shear**

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	19.17 psi	164.32psi	0.1166	OK
+1.20D+0.50Lr	20.45 psi	164.32psi	0.1244	OK
+1.20D+0.50S	26.74 psi	164.32psi	0.1627	OK
+1.20D+1.60Lr	29.28 psi	164.32psi	0.1782	OK
+1.20D+1.60Lr+0.50W	36.05 psi	164.32psi	0.2194	OK
+1.20D+1.60S	49.42 psi	164.32psi	0.3008	OK
+1.20D+1.60S+0.50W	56.19 psi	164.32psi	0.3419	OK

All units k



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21316 Quarry Road  
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Project Title: Smokes4Less  
Engineer: David D. Holstrom, PE, AIA  
Project ID: 2023.05  
Project Descr: Building Addition

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## General Footing

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LIC# : KW-06017584, Build:20.23.08.01

EcoGreen Architects LLC

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### DESCRIPTION: F-2 Column Footing

#### Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.20D+0.50Lr+W	33.98 psi	164.32 psi	0.2068	OK
+1.20D+0.50S+W	40.27 psi	164.32 psi	0.2451	OK
+1.20D+0.70S	30.86 psi	164.32 psi	0.1878	OK
+0.90D+W	25.85 psi	164.32 psi	0.1573	OK
+0.90D	12.32 psi	164.32 psi	0.07498	OK