



PK ASSOCIATES
CONSULTING STRUCTURAL ENGINEERS

STRUCTURAL INTEGRITY | COLLABORATIVE SOLUTIONS

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PK ASSOCIATES LLC
7434 E McDonald Drive
Scottsdale, AZ 85250
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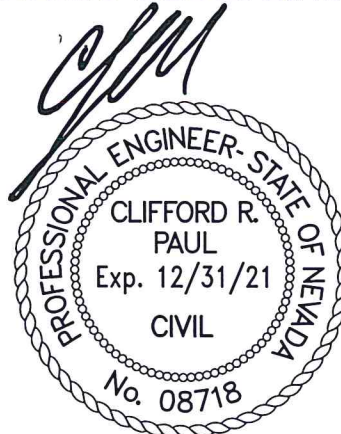
Job Name: Nevada Health - Administration
Job No.: Q-31596
By: NJC
Date: 05/24/2021

PROJECT DESCRIPTION:

ABSOLUTE STEEL

63'-5" x 18' x 8' SEMI CANTILEVER CP
Nevada Health - Administration
3325 Research Way
Carson City, NV 89706

BUILDING CODE: 2018 IBC



ORIGINAL

05/26/21

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480-922-8854

JOB TITLE Nevada Health Administrations

JOB NO. _____

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DATE _____

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CS2018 Ver 2018.09.10

www.struware.com

STRUCTURAL CALCULATIONS

FOR

Nevada Health Administrations

Carson City, NV

PK Associates, LLC

7434 E. McDonald Dr.

Scottsdale, AZ 85250

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Code Search**Code:** International Building Code 2018**Occupancy:**

Occupancy Group = U Utility & Miscellaneous

Risk Category & Importance Factors:

Risk Category = I

Wind factor = 1.00

Snow factor = 0.80

Seismic factor = 1.00

Type of Construction:

Fire Rating:

Roof = 0.0 hr

Floor = 0.0 hr

Building Geometry:Roof angle (θ) 0.25 / 12 1.2 deg

Building length (L) 63.0 ft

Least width (B) 18.0 ft

Mean Roof Ht (h) 9.0 ft

Parapet ht above grd 0.0 ft

Minimum parapet ht 0.0 ft

Live Loads:

Roof 0 to 200 sf: 20 psf use 20.0 psf
200 to 600 sf: 20 psf
over 600 sf: 20 psf

Floor:

Typical Floor 50 psf

Partitions 15 psf

Lobbies & first floor corridors 100 psf

Corridors above first floor 80 psf

Balconies (1.5 times live load) 75 psf

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Wind Loads :

ASCE 7- 16

Ultimate Wind Speed 115 mph
Nominal Wind Speed 89.1 mph
Risk Category I
Exposure Category C
Enclosure Classif. Open Building
Internal pressure +/-0.00
Directionality (Kd) 0.85
Kh case 1 0.849
Kh case 2 0.849
Type of roof Monoslope

Topographic Factor (Kzt)

Topography Flat
Hill Height (H) 80.0 ft
Half Hill Length (Lh) 100.0 ft
Actual H/Lh = 0.80
Use H/Lh = 0.50
Modified Lh = 160.0 ft
From top of crest: x = 50.0 ft
Bldg up/down wind? downwind

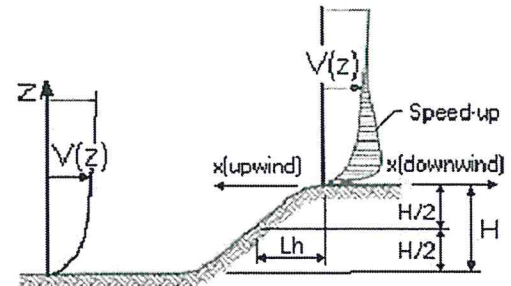
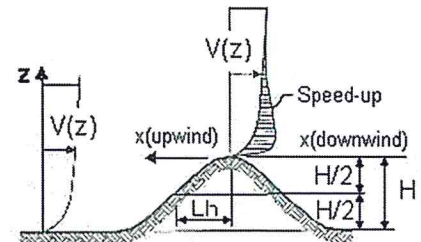
$$H/Lh = 0.50 \quad K_1 = 0.000$$

$$x/Lh = 0.31 \quad K_2 = 0.792$$

$$z/Lh = 0.09 \quad K_3 = 1.000$$

At Mean Roof Ht:

$$K_{zt} = (1 + K_1 K_2 K_3)^2 = 1.00$$

**ESCARPMENT****2D RIDGE or 3D AXISYMMETRICAL HILL****Gust Effect Factor**

h = 9.0 ft
B = 18.0 ft
/z (0.6h) = 15.0 ft

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

If building h/B > 4 then may be flexible and should be investigated.

h/B = 0.50 Rigid structure (low rise bldg)

G = 0.85 Using rigid structure default

Rigid Structure

$\bar{\theta} = 0.20$
 $\ell = 500$ ft
 $z_{min} = 15$ ft
c = 0.20
 $g_Q, g_v = 3.4$
 $L_z = 427.1$ ft
Q = 0.95
 $I_z = 0.23$
G = 0.90 use G = 0.85

Flexible or Dynamically Sensitive Structure

34 rcy (η_1) = 0.0 Hz
Damping ratio (β) = 0
/b = 0.65
/a = 0.15
Vz = 97.1
N₁ = 0.00
R_n = 0.000
R_h = 28.282 $\eta = 0.000$ h = 9.0 ft
R_B = 28.282 $\eta = 0.000$
R_L = 28.282 $\eta = 0.000$
g_R = 0.000
R = 0.000
Gf = 0.000

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Wind Loads - Open Buildings: $0.25 \leq h/L \leq 1.0$

Ultimate Wind Pressures

Type of roof = Monoslope Free Roofs
Wind Flow = Clear

G = 0.85
Roof Angle = 1.2 deg

Main Wind Force Resisting System

Kz = Kh (case 2) = 0.85

Base pressure (qh) = **24.4 psf**

NOTE: The code requires the MWFRS be
designed for a minimum pressure of 16 psf.

Roof pressures - Wind Normal to Ridge

Wind Flow	Load Case		Wind Direction $\gamma = 0^\circ \text{ \& } 180^\circ$	
			Cnw	Cnl
Clear Wind Flow	A	Cn =	1.20	0.30
		p =	24.9 psf	6.2 psf
	B	Cn =	-1.10	-0.10
		p =	-22.8 psf	-2.1 psf

- NOTE: 1). Cnw and Cnl denote combined pressures from top and bottom roof surfaces.
2). Cnw is pressure on windward half of roof. Cnl is pressure on leeward half of roof.
3). Positive pressures act toward the roof. Negative pressures act away from the roof.

Roof pressures - Wind Parallel to Ridge, $\gamma = 90^\circ$

Procedure not allowed h/L is less than 0.25

Wind Flow	Load Case		Horizontal Distance from Windward Edge		
			$\leq h$	$>h \leq 2h$	$> 2h$
Clear Wind Flow	A	Cn =	-0.80	-0.60	-0.30
		p =	-16.6 psf	-12.5 psf	-6.2 psf
	B	Cn =	0.80	0.50	0.30
		p =	16.6 psf	10.4 psf	6.2 psf

h = 9.0 ft
2h = 18.0 ft

Fascia Panels -Horizontal pressures

qp = 24.4 psf

Windward fascia: 36.6 psf (GCpn = +1.5)
Leeward fascia: -24.4 psf (GCpn = -1.0)

Components & Cladding - roof pressures

Kz = Kh (case 1) = 0.85
Base pressure (qh) = **24.4 psf**
G = 0.85

a = 3.0 ft $a^2 = 9.0 \text{ sf}$
 $4a^2 = 36.0 \text{ sf}$

	Effective Wind Area	Clear Wind Flow					
		zone 3		zone 2		zone 1	
		positive	negative	positive	negative	positive	negative
C_N	$\leq 9 \text{ sf}$	2.53	-3.44	1.90	-1.76	1.26	-1.15
	$>9, \leq 36 \text{ sf}$	1.90	-1.76	1.90	-1.76	1.26	-1.15
	$> 36 \text{ sf}$	1.26	-1.15	1.26	-1.15	1.26	-1.15
Wind pressure	$\leq 9 \text{ sf}$	52.5 psf	-71.5 psf	39.4 psf	-36.6 psf	26.2 psf	-23.8 psf
	$>9, \leq 36 \text{ sf}$	39.4 psf	-36.6 psf	39.4 psf	-36.6 psf	26.2 psf	-23.8 psf
	$> 36 \text{ sf}$	26.2 psf	-23.8 psf	26.2 psf	-23.8 psf	26.2 psf	-23.8 psf

Project Title:
 Engineer:
 Project ID:
 Project Descr:

ASCE Seismic Base Shear

Lic. # : KW-06004221

File: Calcs.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.17
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DESCRIPTION: Seismic

Seismic

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "I" : Buildings and other structures that represent a low hazard to human life in the event of failure. ASCE 7-16, Page 4, Table 1.5-1

Seismic Importance Factor = 1 ASCE 7-16, Page 5, Table 1.5-2
 ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping :

$S_S = 2.602$ g, 0.2 sec response
 $S_1 = 0.9381$ g, 1.0 sec response

Latitude = 39.200 deg North
 Longitude = 119.727 deg West
 Location : Carson City, NV 89706

Site Class, Site Coeff. and Design Category

Site Classification "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (Based on Testing) ASCE 7-16 Table 20.3-1

Site Coefficients F_a & F_v $F_a = 1.00$ ASCE 7-16 Table 11.4-1 & 11.4-2
 (using straight-line interpolation from table values) $F_v = 1.70$

Maximum Considered Earthquake Acceleration $S_{MS} = F_a * S_s = 2.602$ ASCE 7-16 Eq. 11.4-1
 $S_{M1} = F_v * S_1 = 1.595$ ASCE 7-16 Eq. 11.4-2

Design Spectral Acceleration $S_{DS} = S_{MS}^{2/3} = 1.735$ ASCE 7-16 Eq. 11.4-3
 $S_{D1} = S_{M1}^{2/3} = 1.063$ ASCE 7-16 Eq. 11.4-4

Seismic Design Category = **E** $S_1 \geq 0.75$ ASCE 7-16 Table 11.6-1 & -2

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . **Steel systems not specifically detailed for seismic resistance, excluding cantilever column systems**
Steel Systems Not Specifically Detailed for Seismic Resistance (except cantilevers)

Response Modification Coefficient "R" = 3.00 Building height Limits :
 System Overstrength Factor "Wo" = 3.00 Category "A & B" Limit: No Limit
 Deflection Amplification Factor "Cd" = 3.00 Category "C" Limit: No Limit
 Category "D" Limit: Not Permitted
 Category "E" Limit: Not Permitted
 Category "F" Limit: Not Permitted

NOTE! See ASCE 7-16 for all applicable footnotes.

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calculation : All Other Structural Systems

"Ct" value = 0.020 "hn" : Height from base to highest level = 8.167 ft
 "x" value = 0.75
 "Ta" Approximate fundamental period using Eq. 12.8-7 : $T_a = C_t * (h_n^x) = 0.097$ sec
 "TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 6.000 sec

= 0.097 sec

"Cs" Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response = 1.735 From Eq. 12.8-2, Preliminary C_s = 0.578
 "R" : Response Modification Factor = 3.00 From Eq. 12.8-3 & 12.8-4, C_s need not exceed = 3.668
 "I" : Seismic Importance Factor = 1 From Eq. 12.8-5 & 12.8-6, C_s not be less than = 0.156

C_s : Seismic Response Coefficient = 0.5782

Seismic Base Shear

ASCE 7-16 Section 12.8.1

$C_s = 0.5782$ from 12.8.1.1

W (see Sum W_i below) = 2.27 k

Seismic Base Shear $V = C_s * W = 1.31$ k

Project Title:
 Engineer:
 Project ID:
 Project Descr:

ASCE Seismic Base Shear

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DESCRIPTION: Seismic

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

"k": hx exponent based on $T_a = 1.00$

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
1	2.27	8.00	18.14	1.0000	1.31	1.31	0.00
Sum Wi =		2.27 k	Sum Wi * Hi =	18.14 k-ft	Total Base Shear =	1.31 k	Base Moment = 10.5 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
1	2.27	1.31	1.31	2.27	1.31	0.79	1.57	1.31	1.31

Wpx Weight at level of diaphragm and other structure elements attached to it.

Fi Design Lateral Force applied at the level.

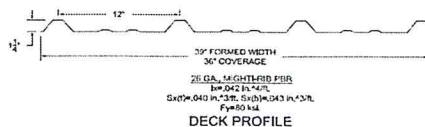
Sum Fi Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level $0.20 * S_{DS} * W_{px}$

MAX Req'd Force @ Level $0.40 * S_{DS} * W_{px}$

Fpx : Design Force @ Level $W_{px} * \text{SUM}(x \rightarrow n) Fi / \text{SUM}(x \rightarrow n) wi$, x = Current level, n = Top Level

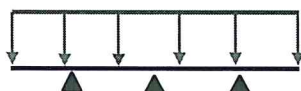
Job Name: Nevada Health - Admin
 Job Number: Q-31596
 Date: 5/21/2021
 Designer: NJC



Roof Deck Design - 26 ga Mighti-Rib PBR

Deck Overhang Dim = 2.00 ft
 Roof Deck Span = 4.66 ft
 Dead Load (D) = 2 psf
 Live Load (Lr) = 20 psf
 Overhang Live Load (Lr) = 20 psf
 Snow Load (S) = 30 psf
 Wind Load Up (Wu) = -23.8 psf
 Wind Load Dn (Wd) = 26.2 psf

$S_x(b) = 0.043 \text{ in}^3$
 $I_x(b) = 0.038 \text{ in}^4$
 $S_x(t) = 0.040 \text{ in}^3$
 $I_x(t) = 0.042 \text{ in}^4$
 2 span minimum
 $F_y = 80 \text{ ksi}$
 width = 3 ft



FBD for Deck at Overhang

Load Case	M_{max_b}	$S_{req'd}$	Check	M_{max_t}	$S_{req'd}$	Check	Δ_{actual}	L/Δ
D+S	0.055 kft	0.014 in ³	OK	0.071 kft	0.018 in ³	OK	0.150 in	320
D+0.75S+0.45Wdn	0.059 kft	0.015 in ³	OK	0.076 kft	0.019 in ³	OK	0.160 in	300
D+0.75S+0.45Wup	0.027 kft	0.007 in ³	OK	0.034 kft	0.009 in ³	OK	0.073 in	658
D+0.6Wdn	0.026 kft	0.007 in ³	OK	0.034 kft	0.009 in ³	OK	0.071 in	676
0.6D+0.6Wup	0.024 kft	0.006 in ³	OK	0.018 kft	0.005 in ³	OK	0.050 in	960

Check Attachment to Purlin

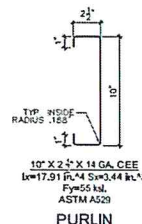
6#12 screws each end & 3#12 screws intermediate
 15 #12 screws total per sheet
 55 lb tension capacity per screw

$T_{applied} = 399 \text{ lbs}$ $T_{allow} = 825 \text{ lbs}$ OK

Center Canopy Purlin Design

Max Purlin Span = 18.00 ft
 Tributary Width = 4.67 ft
 Dead Load (D) = 2 psf
 Live Load (Lr) = 20 psf
 Snow Load (S) = 30 psf
 Wind Load Up (Wu) = -23.8 psf
 Wind Load Dn (Wd) = 26.2 psf

$S_x = 3.44 \text{ in}^3$
 $I_x = 17.91 \text{ in}^4$
 $F_y = 55 \text{ ksi}$



*Load Case takes into account the effects of lateral torsional buckling along bottom fiber

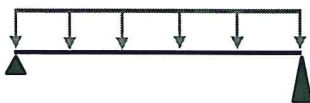
Load Case	M_{max_b}	M_n/Ω	Check	V_{max}	V_n/Ω	Check	Δ_{actual}	L/Δ
D+S	6.052 kft	9.441 kft	OK	0.149 k	3.710 kft	OK	0.194 in	1113
D+0.75S+0.45Wdn	6.864 kft	9.441 kft	OK	0.169 k	3.710 kft	OK	0.351 in	615
D+0.75S+0.45Wup	2.608 kft	3.283 kft	OK	0.064 k	3.710 kft	OK	0.087 in	2483
0.6D+0.6Wup	-2.474 kft	3.283 kft	OK	0.061 k	3.710 kft	OK	0.024 in	9000
D+0.6Wdn	3.351 kft	9.441 kft	OK	0.083 k	3.710 kft	OK	-0.108 in	2000

Check Connection Purlin to Rafter (Detail 5)

Connect with 4 #12 screws in 12 ga material

$V_{applied} = 1.675 \text{ k}$ $V_{allow} = 2.896 \text{ k}$ (724 lbs/screw)
 $T/C_{applied} = 0.169 \text{ k}$ $T_{allow} = 1.192 \text{ k}$ (298 lbs/screw)

Interaction = 0.721 OK

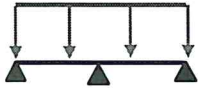
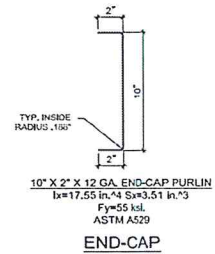


FBD for Purlin

PURLIN END CAP DESIGN

Max Purlin Span = 14.00 ft
 Purlin Overhang = 0.00 ft
 Tributary Area = 4.50 ft
 Dead Load (D) = 2 psf
 Live Load (Lr) = 20 psf
 Snow Load (S) = 30 psf
 Wind Load Up (Wu) = -23.8 psf
 Wind Load Dn (Wd) = 26.2 psf

Sx = 3.51 in³
 Ix = 17.55 in⁴
 Fy = 55 ksi



FBD for Purlin at End

Load Case	Mmax _b	Mn/Ω	Check	Mmax _t	Mn/Ω	Check	Δactual	L/Δ
D+S	-3.528 kft	9.441 kft	OK	1.976 k	9.441 kft	OK	0.316 in	532
D+0.75S+0.45Wdn	-4.001 kft	9.441 kft	OK	2.241 k	9.441 kft	OK	0.284 in	592
D+0.75S+0.45Wup	-1.520 kft	3.283 kft	OK	0.851 k	9.441 kft	OK	0.136 in	1235
0.6D+0.6Wup	1.442 kft	9.441 kft	OK	-0.808 k	9.441 kft	OK	-0.129 in	1302
D+0.6Wdn	-1.954 kft	3.283 kft	OK	1.094 k	9.441 kft	OK	0.197 in	853

Load Case	Vmax	Vn/Ω	Check	M & V Interaction	Check
D+S	1.008 k	3.710 k	OK	0.343	OK
D+0.75S+0.45Wdn	1.143 k	3.710 k	OK	0.389	OK
D+0.75S+0.45Wup	0.434 k	3.710 k	OK	0.148	OK
0.6D+0.6Wup	0.412 k	3.710 k	OK	0.140	OK
D+0.6Wdn	0.558 k	3.710 k	OK	0.190	OK

Check Connection To Purlin (Detail 6)

Connect with 2 #12 screws in 12 ga material

V_{applied} = 1.143 k V_{allow} = 1.448 k (724 lbs/screw)
 T/C_{applied} = 0 k T_{allow} = 0.596 k (298 lbs/screw)

Interaction = 0.7895 OK

Canopy Purlin Capacities

Lateral-Torsional Buckling Strength of Open Cross-Section Members (AISI-S100 C3.1.2.1)

A =	1.33 in ²	ro =	4.22 in
Sf =	3.44 in ³	Cb =	1.00
E =	29500 ksi	Kt =	0.5 (Pin-Pin)
G =	11346 ksi	Lt =	17.2 ft
J =	0.002 in ⁴	Ky =	1.0 (Pin-Pin)
Cw =	21.827 in ⁶	Ly =	17.2 ft
ry =	0.8736 in	Fy =	55 ksi

$$\sigma_{ey} = 5.24 \text{ ksi} \quad (\text{Eq. C3.1.2.1-8})$$

$$\sigma_t = 26.25 \text{ ksi} \quad (\text{Eq. C3.1.2.1-9})$$

$$F_e = 19.13 \text{ ksi} \quad (\text{Eq. C3.1.2.1-4})$$

$$0.56F_y = 30.80 \text{ ksi} \quad \geq F_e$$

$$2.78F_y = 152.90 \text{ ksi} \quad > F_e$$

$$F_c = 19.13 \text{ ksi} \quad (\text{Eq. C3.1.2.1-3})$$

$$R = 1.00 \quad (\text{Sec. D6.1.1})$$

$$M_n = 5.483 \text{ kft} \quad (\text{Eq. D6.1.1-1})$$

$$\Omega_b = 1.67 \text{ (ASD)}$$

Shear Strength of Webs without holes (AISI-S100 C3.2.1)

$$h = 10 \text{ in}$$

$$t = 0.0747 \text{ in}$$

$$E = 29500 \text{ ksi}$$

$$F_y = 55 \text{ ksi}$$

$$k_v = 5.34$$

$$h/t = 133.87$$

$$\sqrt{E k_v / F_y} = 53.52 \quad > h/t$$

$$1.51 \sqrt{E k_v / F_y} = 80.81 \quad > h/t$$

$$F_v = 7.95 \text{ ksi} \quad (\text{Eq. C3.2.1-4b})$$

$$A_w = 0.747 \text{ in}^2 \quad (\text{Eq. C3.2.1-5})$$

$$V_n = 5.936 \text{ k} \quad (\text{Eq. C3.2.1-1})$$

$$\Omega_v = 1.60 \text{ (ASD)}$$

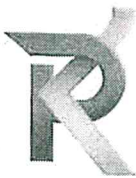
Nominal Section Strength (AISI-S100 C3.1.1)

$$S_e = 3.44 \text{ in}^3$$

$$F_y = 55 \text{ ksi}$$

$$M_n = 15.767 \text{ kft} \quad (\text{Eq. 3.1.1-1})$$

$$\Omega_b = 1.67 \text{ (ASD)}$$



PR ASSOCIATES
CONSULTING STRUCTURAL ENGINEERS

Job Name Admin

Job No. _____ Sheet No. _____

By _____ Date _____

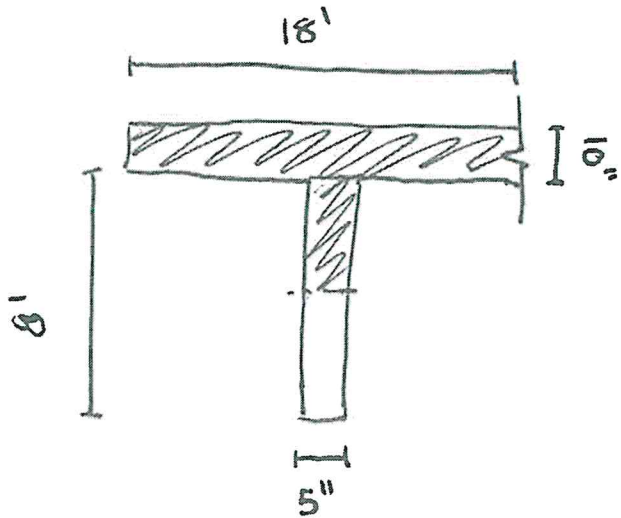
Lateral Loads

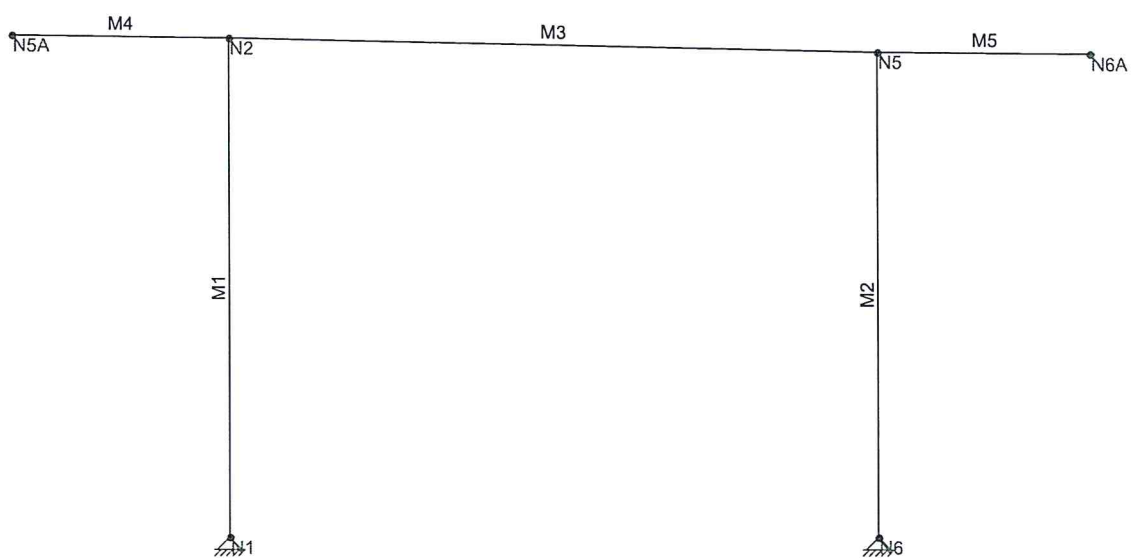
Seismic: Total Shear

$$V_{EQ} = 1.31 \text{ k}$$

$$V_{\text{per frame}} = (18' \times 18') (2 \text{ psf}) (0.578) = 0.375 \text{ k}$$

$$\text{Wind: } \left[\underbrace{\left(18' \times \frac{10''}{12''} \right)}_{\text{purlin surface area}} + \underbrace{\left(\frac{5''}{12} \times \frac{8'}{2} \right)}_{\text{column surface area}} \right] \times 16 \text{ psf} = 0.27 \text{ k}$$





Envelope Only Solution

SK - 1

May 21, 2021 at 12:05 PM

NV Health Admin.r2d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 13th(360-05): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI NAS-04: ASD
Wood Code	AWC NDS-15: ASD
Wood Temperature	< 100F
Concrete Code	CSA A23.3-14
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Cold Formed Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1E5 F)	Density[k/ft^3]	Yield[ksi]	Fu[ksi]
1	A570 Gr.33	29500	11346	.3	.65	.49	33	52
2	A607 C1 Gr.55	29500	11346	.3	.65	.49	55	70
3	Gr.55	29500	11346	.3	.65	.49	55	70
4	Gr.65	29500	11346	.3	.65	.49	65	80

Cold Formed Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [in...]	I (0,180) [in...]
1	CF1	Purlin Box	Beam	None	Gr.55	Typical	2.7	11.31	35.952
2	Tube 4	Tube 4	Beam	None	Gr.55	Typical	.874	.633	1.862
3	Column	(2)10x2.5x12GA	Beam	CU	Gr.65	Typical	2.66	11.262	35.813

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	0	9.25	0
3	N5	12	9	0
4	N6	12	0	0
5	N5A	-4	9.3	0
6	N6A	16	8.96	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N1	Reaction	Reaction	
2	N6	Reaction	Reaction	

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2		Column	Beam	CU	Gr.65	Typical
2	M2	N6	N5		Column	Beam	CU	Gr.65	Typical
3	M3	N2	N5		(2)10x2.5x12GA	Beam	None	Gr.55	Typical
4	M4	N5A	N2		(2)10x2.5x12GA	Beam	CU	Gr.55	Typical
5	M5	N5	N6A		(2)10x2.5x12GA	Beam	CU	Gr.55	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rati...	TOM	Inactive
1	M1						Yes			
2	M2						Yes			
3	M3						Yes			
4	M4						Yes			
5	M5						Yes			

Cold Formed Steel Design Parameters

	Label	Shape	Length[... Lb-out[ft]	Lb-in[ft]	Lcomp top..Lcomp bot[... K-out	K-in	Cm	Cb	R	Out s...In sw...
1	M1	Column	9.25			.65				
2	M2	Column	9			.65				
3	M3	(2)10x2.5...	12.003	5.25	5.25 5.25	.65				
4	M4	(2)10x2.5...	4	5.25	5.25 5.25	2.1				
5	M5	(2)10x2.5...	4	5.25	5.25 5.25	2.1				

Member Point Loads (BLC 6 : Eq)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M1	X	0	0

Member Distributed Loads (BLC 1 : Dead)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M3	Y	-.036	-.036	0	0
2	M4	Y	-.036	-.036	0	0
3	M5	Y	-.036	-.036	0	0

Member Distributed Loads (BLC 2 : Roof Live)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M3	Y	-.36	-.36	0	0
2	M4	Y	-.36	-.36	0	0
3	M5	Y	-.36	-.36	0	0

Member Distributed Loads (BLC 3 : Snow)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M3	Y	-.54	-.54	0	0
2	M4	Y	-.54	-.54	0	0
3	M5	Y	-.54	-.54	0	0

Member Distributed Loads (BLC 4 : Wind Down)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M3	y	-.448	-.448	0	6
2	M3	y	-.112	-.112	6	12
3	M4	y	-.448	-.448	0	0
4	M5	y	-.112	-.112	0	0

Member Distributed Loads (BLC 5 : Wind Up)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M3	y	.41	.41	0	6
2	M3	y	.038	.038	6	12
3	M4	y	.41	.41	0	0
4	M5	y	.038	.038	0	0

Joint Loads and Enforced Displacements (BLC 4 : Wind Down)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N5A	L	X	.27

Joint Loads and Enforced Displacements (BLC 5 : Wind Up)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N5A	L	X	.27

Joint Loads and Enforced Displacements (BLC 6 : Eq)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N5A	L	X	.375

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	Dead	DL					3
2	Roof Live	RLL					3
3	Snow	SL					3
4	Wind Down	WL			1		4
5	Wind Up	WL			1		4
6	Eq	EL			1	1	

Load Combinations

	Description	Sol..	PD..	SR...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...	BLC Fact...
1	IBC 16-8	Yes			DL	1												
2	IBC 16-10	Yes			DL	1	RLL	1										
3	IBC 16-10	Yes			DL	1	SL	1	SLN	1								
4	IBC 16-11	Yes			DL	1	LL	.75	LLS	.75	RLL	.75						
5	IBC 16-11	Yes			DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75				
6	IBC 16-12	Yes			DL	1	4	1										
7	IBC 16-13	Yes			DL	1	4	.75	LL	.75	LLS	.75	RLL	.75				
8	IBC 16-13	Yes			DL	1	4	.75	LL	.75	LLS	.75	SL	.75	SLN	.75		
9	IBC 16-15	Yes			DL	.6	4	1										
10	IBC 16-12				DL	1	4	1										
11	IBC 16-13	Yes			DL	1	4	.75	LL	.75	LLS	.75	RLL	.75				
12	IBC 16-13	Yes			DL	1	4	.75	LL	.75	LLS	.75	SL	.75	SLN	.75		
13	IBC 16-15	Yes			DL	.6	4	1										

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Moment [k-ft]	LC
1	N1	max	.166	3	7.459	12	0	13
2		min	.003	9	.36	1	0	1
3	N6	max	-.01	1	5.761	3	0	13
4		min	-.254	8	.36	1	0	1
5	Totals:	max	0	5	13.019	12		
6		min	-.173	6	.72	1		

Load Combination Design

	Description	ASIF	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless
1	IBC 16-8			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	IBC 16-10 (a)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	IBC 16-10 (b)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	IBC 16-11 (a)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	IBC 16-11 (b)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	IBC 16-12 (a)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	IBC 16-13 (a)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	IBC 16-13 (b)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	IBC 16-15			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	IBC 16-12 (a)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	IBC 16-13 (a)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	IBC 16-13 (b)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Load Combination Design (Continued)

	Description	ASIF	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless
13	IBC 16-15			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Envelope AISI NAS-04: ASD Cold Formed Steel Code Checks

Member	Shape	Code Check	Loc[ft]	LC	She...	Loc...	L...	Pn/Om...	Tn/Om...	Mn/O...	...	Eqn
1	M1 (2)10x...	.225	9.25	12	.008	0	3	38.036	103.533	23.793	1...	6 C5.2...
2	M2 (2)10x...	.241	9	12	.012	0	12	38.321	103.533	23.793	1...	6 C5.2...
3	M3 (2)10x...	.411	0	12	.202	0	12	38.643	87.605	20.595	1...	C3.3...
4	M4 (2)10x...	.334	4	12	.144	4	12	38.643	87.605	20.595	1...	C3.3...
5	M5 (2)10x...	.248	0	3	.107	0	3	38.643	87.605	20.595	1...	C3.3...

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Rotation [rad]	LC
1	N1	max	0	13	0	13	3.281e-04	3
2		min	0	1	0	1	-3.516e-04	9
3	N2	max	.04	13	0	1	-3.997e-05	1
4		min	-.003	3	-.011	8	-7.466e-04	8
5	N5	max	.039	13	0	1	7.091e-04	12
6		min	-.003	3	-.008	3	4.091e-05	1
7	N6	max	0	13	0	13	-1.634e-05	1
8		min	0	1	0	1	-6.941e-04	8
9	N5A	max	.04	13	0	1	3.805e-04	12
10		min	-.003	3	-.023	8	1.238e-05	1
11	N6A	max	.039	13	.004	13	1.075e-04	13
12		min	-.003	3	-.012	3	-1.829e-04	3

Project Title:
 Engineer:
 Project ID:
 Project Descr:

General Footing

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DESCRIPTION: Spread Footing (Gravity)

Code References

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

Load Combinations Used : ASCE 7-16

General Information

Material Properties

f _c : Concrete 28 day strength	=	4.50 ksi
f _y : Rebar Yield	=	40.0 ksi
E _c : Concrete Elastic Modulus	=	3,823.68 ksi
Concrete Density	=	145.0 pcf
φ Values	=	0.90
Flexure	=	
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.000180
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	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	Yes
Soil Passive Resistance (for Sliding)	=	100.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

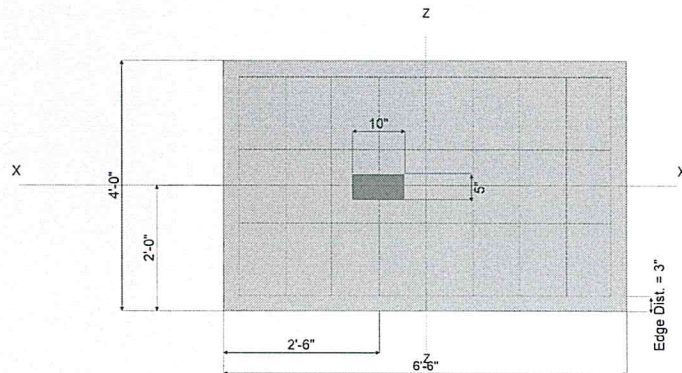
Footing base depth below soil surface	=	2.50 ft
Allow press. increase per foot of depth when footing base is below	=	ksf
	=	ft

Increases based on footing plan dimension

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

Dimensions

Width parallel to X-X Axis	=	6.50 ft
Length parallel to Z-Z Axis	=	4.0 ft
Footing Thickness	=	30.0 in
Load location offset from footing center...		
ex : Prl to X-X Axis	=	-9 in
	=	in
Pedestal dimensions...		
px : parallel to X-X Axis	=	10.0 in
pz : parallel to Z-Z Axis	=	5.0 in
Height	=	84.0 in
Rebar Centerline to Edge of Concrete...	=	3.0 in
at Bottom of footing	=	



Reinforcing

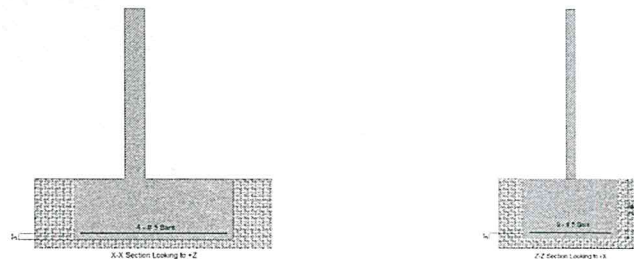
Bars parallel to X-X Axis	=	
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 5
Bars parallel to Z-Z Axis	=	
Number of Bars	=	9.0
Reinforcing Bar Size	=	# 5

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

Bars along Z-Z Axis

# Bars required within zone	76.2 %
# Bars required on each side of zone	23.8 %



Applied Loads

	D	L _r	L	S	W	E	H
P : Column Load	=	0.360	3.601		5.401	4.281	0.2910
OB : Overburden	=						k
							ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=		0.090		0.1170	0.1930	k

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 Engineer:
 Project ID:
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General Footing

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PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Gravity)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.4152	Soil Bearing	0.7733 ksf	1.863 ksf	+D+0.750S+0.450W+H about Z-Z axis
PASS	9.466	Overturning - X-X	1.283 k-ft	12.149 k-ft	+0.60D+0.70E+H
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	28.525	Sliding - Z-Z	0.1351 k	3.854 k	+0.60D+0.70E+H
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.06231	Z Flexure (+X)	1.557 k-ft/ft	24.984 k-ft/ft	+1.20D+1.60S+0.50W+1.60H
PASS	0.05786	Z Flexure (-X)	1.445 k-ft/ft	24.984 k-ft/ft	+1.20D+1.60S+0.50W+1.60H
PASS	0.02110	X Flexure (+Z)	0.7283 k-ft/ft	34.527 k-ft/ft	+1.20D+1.60S+0.50W+1.60H
PASS	0.0190	X Flexure (-Z)	0.6562 k-ft/ft	34.527 k-ft/ft	+1.20D+1.60S+0.50W+1.60H
PASS	0.008182	1-way Shear (+X)	0.8233 psi	100.623 psi	+1.20D+1.60S+0.50W+1.60H
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	n/a	1-way Shear (+Z)	0.0 psi	100.623 psi	n/a
PASS	n/a	1-way Shear (-Z)	0.0 psi	100.623 psi	n/a
PASS	n/a	2-way Punching	2.076 psi	100.623 psi	+1.20D+1.60S+0.50W+1.60H

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+H	1.863	n/a	0.0	0.3763	0.3763	n/a	n/a	0.202
X-X, +D+L+H	1.863	n/a	0.0	0.3763	0.3763	n/a	n/a	0.202
X-X, +D+Lr+H	1.863	n/a	0.7665	0.4660	0.5637	n/a	n/a	0.303
X-X, +D+S+H	1.863	n/a	0.0	0.5841	0.5841	n/a	n/a	0.314
X-X, +D+0.750Lr+0.750L+H	1.863	n/a	0.6163	0.4436	0.5168	n/a	n/a	0.278
X-X, +D+0.750L+0.750S+H	1.863	n/a	0.0	0.5321	0.5321	n/a	n/a	0.286
X-X, +D+0.60W+H	1.863	n/a	0.6478	0.4370	0.5132	n/a	n/a	0.276
X-X, +D+0.750Lr+0.450W+H	1.863	n/a	0.9504	0.4891	0.6195	n/a	n/a	0.333
X-X, +D+0.750S+0.450W+H	1.863	n/a	0.3808	0.5777	0.6348	n/a	n/a	0.341
X-X, +0.60D+0.60W+0.60H	1.863	n/a	0.9482	0.2865	0.3627	n/a	n/a	0.195
X-X, +D+0.70E+0.60H	1.863	n/a	1.542	0.3109	0.4575	n/a	n/a	0.246
X-X, +D+0.750L+0.750S+0.5250E+H	1.863	n/a	0.8258	0.4830	0.5930	n/a	n/a	0.318
X-X, +0.60D+0.70E+H	1.863	n/a	2.535	0.1603	0.3069	n/a	n/a	0.165
Z-Z, +D+H	1.863	-0.3311	n/a	n/a	n/a	0.3858	0.3669	0.207
Z-Z, +D+L+H	1.863	-0.3311	n/a	n/a	n/a	0.3858	0.3669	0.207
Z-Z, +D+Lr+H	1.863	-2.663	n/a	n/a	n/a	0.6193	0.4104	0.333
Z-Z, +D+S+H	1.863	-3.414	n/a	n/a	n/a	0.7359	0.4322	0.395
Z-Z, +D+0.750Lr+0.750L+H	1.863	-2.206	n/a	n/a	n/a	0.5609	0.3995	0.301
Z-Z, +D+0.750L+0.750S+H	1.863	-2.869	n/a	n/a	n/a	0.6484	0.4159	0.348
Z-Z, +D+0.60W+H	1.863	-2.134	n/a	n/a	n/a	0.5523	0.3979	0.297
Z-Z, +D+0.750Lr+0.450W+H	1.863	-3.114	n/a	n/a	n/a	0.6858	0.4228	0.368
Z-Z, +D+0.750S+0.450W+H	1.863	-3.618	n/a	n/a	n/a	0.7733	0.4392	0.415
Z-Z, +0.60D+0.60W+0.60H	1.863	-2.970	n/a	n/a	n/a	0.3980	0.2512	0.214
Z-Z, +D+0.70E+0.60H	1.863	-0.5079	n/a	n/a	n/a	0.3990	0.3693	0.214
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.863	-2.936	n/a	n/a	n/a	0.6583	0.4177	0.354
Z-Z, +0.60D+0.70E+H	1.863	-0.6218	n/a	n/a	n/a	0.2447	0.2226	0.131

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, +D+H	None	0.0 k-ft	Infinity	OK
X-X, +D+L+H	None	0.0 k-ft	Infinity	OK
X-X, +D+Lr+H	0.8550 k-ft	26.772 k-ft	31.312	OK
X-X, +D+S+H	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750Lr+0.750L+H	0.6413 k-ft	24.972 k-ft	38.942	OK
X-X, +D+0.750L+0.750S+H	None	0.0 k-ft	Infinity	OK
X-X, +D+0.60W+H	0.6669 k-ft	24.707 k-ft	37.048	OK
X-X, +D+0.750Lr+0.450W+H	1.141 k-ft	28.824 k-ft	25.253	OK
X-X, +D+0.750S+0.450W+H	0.5002 k-ft	31.524 k-ft	63.027	OK
X-X, +0.60D+0.60W+0.60H	0.6669 k-ft	16.879 k-ft	25.310	OK

Project Title:
 Engineer:
 Project ID:
 Project Descr:

General Footing

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PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Gravity)

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, +D+0.70E+0.60H	1.283 k-ft	19.977 k-ft	15.565	OK
X-X, +D+0.750L+0.750S+0.5250E+H	0.9626 k-ft	27.977 k-ft	29.064	OK
X-X, +0.60D+0.70E+H	1.283 k-ft	12.149 k-ft	9.466	OK
Z-Z, +D+H	None	31.531 k-ft	Infinity	OK
Z-Z, +D+L+H	None	31.531 k-ft	Infinity	OK
Z-Z, +D+Lr+H	None	40.534 k-ft	Infinity	OK
Z-Z, +D+S+H	None	45.034 k-ft	Infinity	OK
Z-Z, +D+0.750Lr+0.750L+H	None	38.283 k-ft	Infinity	OK
Z-Z, +D+0.750L+0.750S+H	None	41.658 k-ft	Infinity	OK
Z-Z, +D+0.60W+H	None	37.953 k-ft	Infinity	OK
Z-Z, +D+0.750Lr+0.450W+H	None	43.099 k-ft	Infinity	OK
Z-Z, +D+0.750S+0.450W+H	None	46.474 k-ft	Infinity	OK
Z-Z, +0.60D+0.60W+0.60H	None	25.340 k-ft	Infinity	OK
Z-Z, +D+0.70E+0.60H	None	32.041 k-ft	Infinity	OK
Z-Z, +D+0.750L+0.750S+0.5250E+H	None	42.040 k-ft	Infinity	OK
Z-Z, +0.60D+0.70E+H	None	19.428 k-ft	Infinity	OK

All units k

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, +D+H	0.0 k	4.186 k	No Sliding	OK
X-X, +D+L+H	0.0 k	4.186 k	No Sliding	OK
X-X, +D+Lr+H	0.0 k	5.266 k	No Sliding	OK
X-X, +D+S+H	0.0 k	5.806 k	No Sliding	OK
X-X, +D+0.750Lr+0.750L+H	0.0 k	4.996 k	No Sliding	OK
X-X, +D+0.750L+0.750S+H	0.0 k	5.401 k	No Sliding	OK
X-X, +D+0.60W+H	0.0 k	4.956 k	No Sliding	OK
X-X, +D+0.750Lr+0.450W+H	0.0 k	5.574 k	No Sliding	OK
X-X, +D+0.750S+0.450W+H	0.0 k	5.979 k	No Sliding	OK
X-X, +0.60D+0.60W+0.60H	0.0 k	3.782 k	No Sliding	OK
X-X, +D+0.70E+0.60H	0.0 k	4.247 k	No Sliding	OK
X-X, +D+0.750L+0.750S+0.5250E+H	0.0 k	5.447 k	No Sliding	OK
X-X, +0.60D+0.70E+H	0.0 k	3.072 k	No Sliding	OK
Z-Z, +D+H	0.0 k	4.967 k	No Sliding	OK
Z-Z, +D+L+H	0.0 k	4.967 k	No Sliding	OK
Z-Z, +D+Lr+H	0.090 k	6.047 k	67.189	OK
Z-Z, +D+S+H	0.0 k	6.587 k	No Sliding	OK
Z-Z, +D+0.750Lr+0.750L+H	0.06750 k	5.777 k	85.585	OK
Z-Z, +D+0.750L+0.750S+H	0.0 k	6.182 k	No Sliding	OK
Z-Z, +0.60D+0.60W+0.60H	0.07020 k	4.563 k	65.002	OK
Z-Z, +D+0.70E+0.60H	0.1351 k	5.028 k	37.216	OK
Z-Z, +D+0.750L+0.750S+0.5250E+H	0.1013 k	6.228 k	61.464	OK
Z-Z, +0.60D+0.70E+H	0.1351 k	3.854 k	28.525	OK
Z-Z, +D+0.60W+H	0.07020 k	5.737 k	81.728	OK
Z-Z, +D+0.750Lr+0.450W+H	0.1202 k	6.355 k	52.891	OK
Z-Z, +D+0.750S+0.450W+H	0.05265 k	6.760 k	128.393	OK

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+1.60H	0.03111	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.40D+1.60H	0.03111	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.1656	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.1101	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.1934	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.1934	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.4712	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.2935	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.6394	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.3895	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+1.60S+1.60H	0.5601	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+1.60S+1.60H	0.5601	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Lic. #: KW-06004221

File: Calcs.ec6
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PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Gravity)

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+0.50W+1.60H	0.7283	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.6562	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.5020	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.3021	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.5298	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.3855	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +0.90D+W+1.60H	0.3565	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +0.90D+W+1.60H	0.2121	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+0.20S+E+1.90H	0.2304	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+0.20S+E+1.90H	0.007755	-Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +0.90D+E+0.90H	0.1570	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +0.90D+E+0.90H	0.08110	-Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
Z-Z, +1.40D+1.60H	0.06497	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.40D+1.60H	0.06996	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.2878	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.3099	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.4038	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.4348	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.7983	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.8598	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	1.074	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	1.157	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+1.60S+1.60H	1.170	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+1.60S+1.60H	1.260	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	1.445	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	1.557	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.8396	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.9042	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.9556	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	1.029	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +0.90D+W+1.60H	0.5936	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +0.90D+W+1.60H	0.6392	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+0.20S+E+1.90H	0.2324	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+0.20S+E+1.90H	0.2503	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +0.90D+E+0.90H	0.07927	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +0.90D+E+0.90H	0.08537	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.04 psi	0.00 psi	0.00 psi	0.04 psi	100.62 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	0.00 psi	0.16 psi	0.00 psi	0.00 psi	0.16 psi	100.62 psi	0.00	OK
+1.20D+1.60L+0.50S+1.60H	0.00 psi	0.23 psi	0.00 psi	0.00 psi	0.23 psi	100.62 psi	0.00	OK
+1.20D+1.60Lr+L+1.60H	0.00 psi	0.45 psi	0.00 psi	0.00 psi	0.45 psi	100.62 psi	0.00	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.61 psi	0.00 psi	0.00 psi	0.61 psi	100.62 psi	0.01	OK
+1.20D+L+1.60S+1.60H	0.00 psi	0.67 psi	0.00 psi	0.00 psi	0.67 psi	100.62 psi	0.01	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.82 psi	0.00 psi	0.00 psi	0.82 psi	100.62 psi	0.01	OK
+1.20D+0.50Lr+L+W+1.60H	0.00 psi	0.48 psi	0.00 psi	0.00 psi	0.48 psi	100.62 psi	0.00	OK
+1.20D+L+0.50S+W+1.60H	0.00 psi	0.54 psi	0.00 psi	0.00 psi	0.54 psi	100.62 psi	0.01	OK
+0.90D+W+1.60H	0.00 psi	0.34 psi	0.00 psi	0.00 psi	0.34 psi	100.62 psi	0.00	OK
+1.20D+L+0.20S+E+1.90H	0.00 psi	0.13 psi	0.00 psi	0.00 psi	0.13 psi	100.62 psi	0.00	OK
+0.90D+E+0.90H	0.00 psi	0.05 psi	0.00 psi	0.00 psi	0.05 psi	100.62 psi	0.00	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.09 psi	201.25psi	0.000464	OK
+1.20D+0.50Lr+1.60L+1.60H	0.41 psi	201.25psi	0.002054	OK
+1.20D+1.60L+0.50S+1.60H	0.58 psi	201.25psi	0.002882	OK
+1.20D+1.60Lr+L+1.60H	1.15 psi	201.25psi	0.005698	OK
+1.20D+1.60Lr+0.50W+1.60H	1.54 psi	201.25psi	0.007667	OK
+1.20D+L+1.60S+1.60H	1.68 psi	201.25psi	0.008347	OK
+1.20D+1.60S+0.50W+1.60H	2.08 psi	201.25psi	0.01032	OK
+1.20D+0.50Lr+L+W+1.60H	1.21 psi	201.25psi	0.005992	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

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PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Gravity)

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.20D+L+0.50S+W+1.60H	1.37 psi	201.25psi	0.00682	OK
+0.90D+W+1.60H	0.85 psi	201.25psi	0.004236	OK
+1.20D+L+0.20S+E+1.90H	0.33 psi	201.25psi	0.001659	OK
+0.90D+E+0.90H	0.11 psi	201.25psi	0.000566	OK

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PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Uplift)

Code References

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

Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'_c : Concrete 28 day strength	=	4.50 ksi
f_y : Rebar Yield	=	40.0 ksi
E_c : Concrete Elastic Modulus	=	3,823.68 ksi
Concrete Density	=	145.0 pcf
ϕ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.000180
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	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	100.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

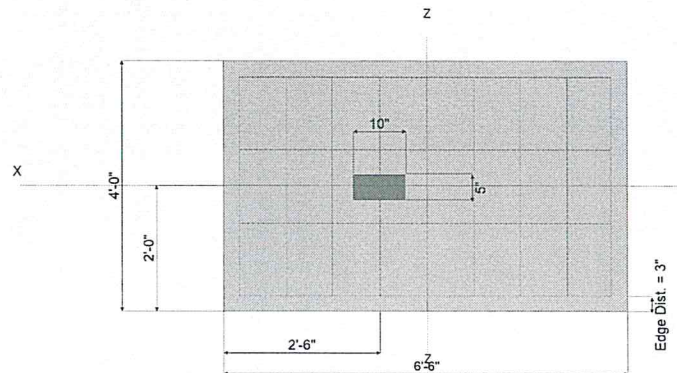
Footing base depth below soil surface	=	2.50 ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

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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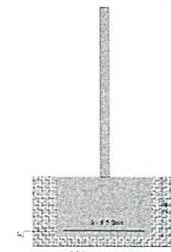
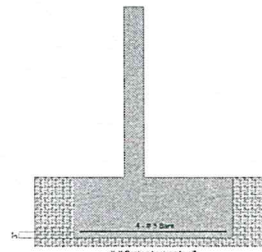
Dimensions

Width parallel to X-X Axis	=	6.50 ft
Length parallel to Z-Z Axis	=	4.0 ft
Footing Thickness	=	30.0 in
Load location offset from footing center... ex : Prl to X-X Axis	=	-9 in in
Pedestal dimensions...		
px : parallel to X-X Axis	=	10.0 in
pz : parallel to Z-Z Axis	=	5.0 in
Height	=	84.0 in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 5
Bars parallel to Z-Z Axis	=	
Number of Bars	=	9.0
Reinforcing Bar Size	=	# 5
Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		
Bars along Z-Z Axis		
# Bars required within zone		76.2 %
# Bars required on each side of zone		23.8 %



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	0.360	3.60	5.401	-3.858	0.290	k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=		0.090		0.1170	0.1930	k

Project Title:
 Engineer:
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 Project Descr:

General Footing

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 PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Uplift)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.4906	Soil Bearing	0.7359 ksf	1.50 ksf	+D+S+H about Z-Z axis
PASS	2.217	Overturning - X-X	5.297 k-ft	11.742 k-ft	+0.60D+0.60W+0.60H
PASS	2.078	Overturning - Z-Z	9.259 k-ft	19.243 k-ft	+0.60D+0.60W+0.60H
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	28.523	Sliding - Z-Z	0.1351 k	3.853 k	+0.60D+0.70E+H
PASS	2.536	Uplift	-2.315 k	5.871 k	+0.60D+0.60W+0.60H
PASS	0.05041	Z Flexure (+X)	1.260 k-ft/ft	24.984 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.04681	Z Flexure (-X)	1.170 k-ft/ft	24.984 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.01622	X Flexure (+Z)	0.5601 k-ft/ft	34.527 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.01622	X Flexure (-Z)	0.5601 k-ft/ft	34.527 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.006620	1-way Shear (+X)	0.6661 psi	100.623 psi	+1.20D+L+1.60S+1.60H
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	n/a	1-way Shear (+Z)	0.0 psi	100.623 psi	n/a
PASS	n/a	1-way Shear (-Z)	0.0 psi	100.623 psi	n/a
PASS	n/a	2-way Punching	1.680 psi	100.623 psi	+1.20D+L+1.60S+1.60H

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+H	1.50	n/a	0.0	0.3763	0.3763	n/a	n/a	0.251
X-X, +D+L+H	1.50	n/a	0.0	0.3763	0.3763	n/a	n/a	0.251
X-X, +D+Lr+H	1.50	n/a	0.7665	0.4660	0.5636	n/a	n/a	0.376
X-X, +D+S+H	1.50	n/a	0.0	0.5841	0.5841	n/a	n/a	0.389
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.6163	0.4436	0.5168	n/a	n/a	0.345
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	0.5321	0.5321	n/a	n/a	0.355
X-X, +D+0.60W+H	1.50	n/a	1.071	0.2492	0.3254	n/a	n/a	0.217
X-X, +D+0.750Lr+0.450W+H	1.50	n/a	1.274	0.3482	0.4786	n/a	n/a	0.319
X-X, +D+0.750S+0.450W+H	1.50	n/a	0.4961	0.4368	0.4939	n/a	n/a	0.329
X-X, +0.60D+0.60W+0.60H	1.50	n/a	2.250	0.09869	0.1749	n/a	n/a	0.117
X-X, +D+0.70E+0.60H	1.50	n/a	1.542	0.3108	0.4575	n/a	n/a	0.305
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.8258	0.4830	0.5930	n/a	n/a	0.395
X-X, +0.60D+0.70E+H	1.50	n/a	2.536	0.1603	0.3069	n/a	n/a	0.205
Z-Z, +D+H	1.50	-0.3311	n/a	n/a	n/a	0.3858	0.3669	0.257
Z-Z, +D+L+H	1.50	-0.3311	n/a	n/a	n/a	0.3858	0.3669	0.257
Z-Z, +D+Lr+H	1.50	-2.663	n/a	n/a	n/a	0.6192	0.4104	0.413
Z-Z, +D+S+H	1.50	-3.414	n/a	n/a	n/a	0.7359	0.4322	0.491
Z-Z, +D+0.750Lr+0.750L+H	1.50	-2.206	n/a	n/a	n/a	0.5609	0.3995	0.374
Z-Z, +D+0.750L+0.750S+H	1.50	-2.869	n/a	n/a	n/a	0.6484	0.4159	0.432
Z-Z, +D+0.60W+H	1.50	2.355	n/a	n/a	n/a	0.2358	0.3388	0.226
Z-Z, +D+0.750Lr+0.450W+H	1.50	-1.108	n/a	n/a	n/a	0.4483	0.3785	0.299
Z-Z, +D+0.750S+0.450W+H	1.50	-1.989	n/a	n/a	n/a	0.5359	0.3949	0.357
Z-Z, +0.60D+0.60W+0.60H	1.50	5.312	n/a	n/a	n/a	0.08145	0.1921	0.128
Z-Z, +D+0.70E+0.60H	1.50	-0.5073	n/a	n/a	n/a	0.3990	0.3693	0.266
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	-2.936	n/a	n/a	n/a	0.6583	0.4177	0.439
Z-Z, +0.60D+0.70E+H	1.50	-0.6208	n/a	n/a	n/a	0.2447	0.2226	0.163

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, +D+H	None	0.0 k-ft	Infinity	OK
X-X, +D+L+H	None	0.0 k-ft	Infinity	OK
X-X, +D+Lr+H	0.8550 k-ft	26.770 k-ft	31.310	OK
X-X, +D+S+H	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750Lr+0.750L+H	0.6413 k-ft	24.970 k-ft	38.940	OK
X-X, +D+0.750L+0.750S+H	None	0.0 k-ft	Infinity	OK
X-X, +D+0.60W+H	5.297 k-ft	19.570 k-ft	3.695	OK
X-X, +D+0.750Lr+0.450W+H	4.614 k-ft	24.970 k-ft	5.412	OK
X-X, +D+0.750S+0.450W+H	3.972 k-ft	27.672 k-ft	6.966	OK
X-X, +0.60D+0.60W+0.60H	5.297 k-ft	11.742 k-ft	2.217	OK

Project Title:
 Engineer:
 Project ID:
 Project Descr:

General Footing

Lic. #: KW-06004221

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PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Uplift)

Overtuning Stability

Rotation Axis & Load Combination...	Overtuning Moment	Resisting Moment	Stability Ratio	Status
X-X, +D+0.70E+0.60H	1.283 k-ft	19.976 k-ft	15.564	OK
X-X, +D+0.750L+0.750S+0.5250E+H	0.9626 k-ft	27.976 k-ft	29.063	OK
X-X, +0.60D+0.70E+H	1.283 k-ft	12.148 k-ft	9.465	OK
Z-Z, +D+H	None	31.531 k-ft	Infinity	OK
Z-Z, +D+L+H	None	31.531 k-ft	Infinity	OK
Z-Z, +D+Lr+H	None	40.531 k-ft	Infinity	OK
Z-Z, +D+S+H	None	45.034 k-ft	Infinity	OK
Z-Z, +D+0.750Lr+0.750L+H	None	38.281 k-ft	Infinity	OK
Z-Z, +D+0.750L+0.750S+H	None	41.658 k-ft	Infinity	OK
Z-Z, +D+0.60W+H	9.259 k-ft	32.071 k-ft	3.464	OK
Z-Z, +D+0.750Lr+0.450W+H	4.340 k-ft	38.281 k-ft	8.820	OK
Z-Z, +D+0.750S+0.450W+H	4.340 k-ft	41.658 k-ft	9.598	OK
Z-Z, +0.60D+0.60W+0.60H	9.259 k-ft	19.243 k-ft	2.078	OK
Z-Z, +D+0.70E+0.60H	None	32.039 k-ft	Infinity	OK
Z-Z, +D+0.750L+0.750S+0.5250E+H	None	42.039 k-ft	Infinity	OK
Z-Z, +0.60D+0.70E+H	None	19.426 k-ft	Infinity	OK

All units k

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, +D+H	0.0 k	4.186 k	No Sliding	OK
X-X, +D+L+H	0.0 k	4.186 k	No Sliding	OK
X-X, +D+Lr+H	0.0 k	5.266 k	No Sliding	OK
X-X, +D+S+H	0.0 k	5.806 k	No Sliding	OK
X-X, +D+0.750Lr+0.750L+H	0.0 k	4.996 k	No Sliding	OK
X-X, +D+0.750L+0.750S+H	0.0 k	5.401 k	No Sliding	OK
X-X, +D+0.60W+H	0.0 k	3.491 k	No Sliding	OK
X-X, +D+0.750Lr+0.450W+H	0.0 k	4.475 k	No Sliding	OK
X-X, +D+0.750S+0.450W+H	0.0 k	4.880 k	No Sliding	OK
X-X, +0.60D+0.60W+0.60H	0.0 k	2.317 k	No Sliding	OK
X-X, +D+0.70E+0.60H	0.0 k	4.246 k	No Sliding	OK
X-X, +D+0.750L+0.750S+0.5250E+H	0.0 k	5.446 k	No Sliding	OK
X-X, +0.60D+0.70E+H	0.0 k	3.072 k	No Sliding	OK
Z-Z, +D+H	0.0 k	4.967 k	No Sliding	OK
Z-Z, +D+L+H	0.0 k	4.967 k	No Sliding	OK
Z-Z, +D+Lr+H	0.090 k	6.047 k	67.186	OK
Z-Z, +D+S+H	0.0 k	6.587 k	No Sliding	OK
Z-Z, +D+0.750Lr+0.750L+H	0.06750 k	5.777 k	85.581	OK
Z-Z, +D+0.750L+0.750S+H	0.0 k	6.182 k	No Sliding	OK
Z-Z, +0.60D+0.60W+0.60H	0.07020 k	3.098 k	44.133	OK
Z-Z, +D+0.70E+0.60H	0.1351 k	5.028 k	37.214	OK
Z-Z, +D+0.750L+0.750S+0.5250E+H	0.1013 k	6.228 k	61.462	OK
Z-Z, +0.60D+0.70E+H	0.1351 k	3.853 k	28.523	OK
Z-Z, +D+0.60W+H	0.07020 k	4.272 k	60.859	OK
Z-Z, +D+0.750Lr+0.450W+H	0.1202 k	5.256 k	43.745	OK
Z-Z, +D+0.750S+0.450W+H	0.05265 k	5.661 k	107.524	OK

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+1.60H	0.03111	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.40D+1.60H	0.03111	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.1655	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.110	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.1934	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.1934	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.4711	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.2934	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.3881	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.1382	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+1.60S+1.60H	0.5601	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+1.60S+1.60H	0.5601	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Lic. #: KW-06004221

File: Calcs.ec6
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PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Uplift)

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+0.50W+1.60H	0.4771	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.4050	-Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.000431	+Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.2003	-Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.02740	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.1170	-Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +0.90D+W+1.60H	0.1460	+Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +0.90D+W+1.60H	0.2903	-Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+0.20S+E+1.90H	0.2303	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +1.20D+L+0.20S+E+1.90H	0.007817	-Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +0.90D+E+0.90H	0.1570	+Z	Bottom	0.06480	Min Temp %	0.4292	34.527	OK
X-X, +0.90D+E+0.90H	0.08117	-Z	Top	0.06480	Min Temp %	0.4292	34.527	OK
Z-Z, +1.40D+1.60H	0.06497	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.40D+1.60H	0.06996	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.2877	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.3098	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.4038	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.4348	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.7981	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.8595	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.5495	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.5918	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+1.60S+1.60H	1.170	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+1.60S+1.60H	1.260	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.9209	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.9918	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.2096	-X	Top	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.2257	+X	Top	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.09352	-X	Top	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.1007	+X	Top	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +0.90D+W+1.60H	0.4555	-X	Top	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +0.90D+W+1.60H	0.4906	+X	Top	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+0.20S+E+1.90H	0.2323	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +1.20D+L+0.20S+E+1.90H	0.2502	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +0.90D+E+0.90H	0.07914	-X	Bottom	0.06480	Min Temp %	0.310	24.984	OK
Z-Z, +0.90D+E+0.90H	0.08523	+X	Bottom	0.06480	Min Temp %	0.310	24.984	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.04 psi	0.00 psi	0.00 psi	0.04 psi	100.62 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	0.00 psi	0.16 psi	0.00 psi	0.00 psi	0.16 psi	100.62 psi	0.00	OK
+1.20D+1.60L+0.50S+1.60H	0.00 psi	0.23 psi	0.00 psi	0.00 psi	0.23 psi	100.62 psi	0.00	OK
+1.20D+1.60Lr+L+1.60H	0.00 psi	0.45 psi	0.00 psi	0.00 psi	0.45 psi	100.62 psi	0.00	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.31 psi	0.00 psi	0.00 psi	0.31 psi	100.62 psi	0.00	OK
+1.20D+L+1.60S+1.60H	0.00 psi	0.67 psi	0.00 psi	0.00 psi	0.67 psi	100.62 psi	0.01	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.52 psi	0.00 psi	0.00 psi	0.52 psi	100.62 psi	0.01	OK
+1.20D+0.50Lr+L+W+1.60H	0.00 psi	0.12 psi	0.00 psi	0.00 psi	0.12 psi	100.62 psi	0.00	OK
+1.20D+L+0.50S+W+1.60H	0.00 psi	0.05 psi	0.00 psi	0.00 psi	0.05 psi	100.62 psi	0.00	OK
+0.90D+W+1.60H	0.00 psi	0.26 psi	0.00 psi	0.00 psi	0.26 psi	100.62 psi	0.00	OK
+1.20D+L+0.20S+E+1.90H	0.00 psi	0.13 psi	0.00 psi	0.00 psi	0.13 psi	100.62 psi	0.00	OK
+0.90D+E+0.90H	0.00 psi	0.05 psi	0.00 psi	0.00 psi	0.05 psi	100.62 psi	0.00	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.09 psi	201.25 psi	0.000464	OK
+1.20D+0.50Lr+1.60L+1.60H	0.41 psi	201.25 psi	0.002053	OK
+1.20D+1.60L+0.50S+1.60H	0.58 psi	201.25 psi	0.002882	OK
+1.20D+1.60Lr+L+1.60H	1.15 psi	201.25 psi	0.005696	OK
+1.20D+1.60Lr+0.50W+1.60H	0.79 psi	201.25 psi	0.003922	OK
+1.20D+L+1.60S+1.60H	1.68 psi	201.25 psi	0.008347	OK
+1.20D+1.60S+0.50W+1.60H	1.32 psi	201.25 psi	0.006573	OK
+1.20D+0.50Lr+L+W+1.60H	0.30 psi	201.25 psi	0.001496	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

File: Calcs.ec6

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PAUL KOEHLER ENGINEERS

DESCRIPTION: Spread Footing (Uplift)

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.20D+L+0.50S+W+1.60H	0.13 psi	201.25psi	0.000667	OK
+0.90D+W+1.60H	0.65 psi	201.25psi	0.003251	OK
+1.20D+L+0.20S+E+1.90H	0.33 psi	201.25psi	0.001658	OK
+0.90D+E+0.90H	0.11 psi	201.25psi	0.000565	OK

Job Name: Elko Health Centers
 Job Number: Q-31597
 Date: 5/21/2021
 Designer: NJC

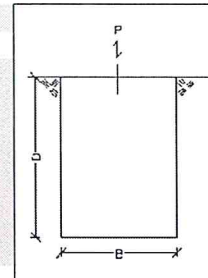
Caisson Footing Check

D = 48 in Design Bearing Capacity, $q = 1500$ psf
 B (dia) = 24 in Density of Concrete, $\rho = 150$ pcf

1) Uplift

$P_{UP}^* = 3.858 \text{ k} / 1.0$ * Taken from RISA Report Joint Reactions
 $P_{UP} = 3.858 \text{ k}$
 Bearing Capacity = 333 psf
 Surface Area = 25.13 in²
 Capacity = 8.38 k

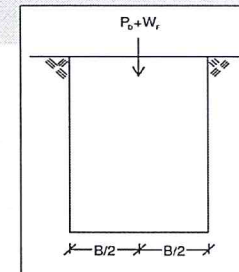
8.38 k > 3.858 k OK



2) Gravity

$P_{DN} = 5.184 \text{ k}$ (Dead + Snow) * Trib Area
 $P_{DN} = 5.18 \text{ k}$
 Bearing Capacity = 250 psf
 Surface Area = 25.13 in²
 Capacity = 6.283 k

6.28 k > 5.18 k OK



FORMULAS

Bearing Capacity (Uplift) (psf) = $q \cdot (1/6) \cdot (4/3)$ ← (4/3) comes from Temp Wind

Bearing Capacity (Gravity) (psf) = $q \cdot (1/6)$

Surface Area (ft²) = $\pi \cdot (D/12) \cdot (B/12)$

$P_{DN} = (\text{Dead} + \text{Roof Live}) \cdot (\text{Trib Area}) / 1000$

$W_F (k) = \rho \cdot (D/12) \cdot \pi \cdot (B/2/12)^2$

Capacity = Bearing Capacity * Surface Area

$M_R = (P_{DN} + W_F) \cdot (B/2/12)$

