GEED CIVIL
ENGINEERING

STRUCTURAL REPORT CALCULATION

MARCH 30, 2022

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Date: 2022.04.05 15:43:42 -04'00'

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1. Design data

A. Codes & Standards

2020 Florida Residential Code (CRC)

2020 Florida Building Code (CBC)

ASCE 7-16: Minimum Design Loads and Associated Criteria for Buildings and Other Structures

ACI 318-19: Building Code Requirements for Structural Concrete

B. Location

195 SW Knight Terrace, Fort White, FL 32038, USA

C. Material Data

Concrete:

Footings; Slab	Grade C3000			
Compressive strength of the concrete age of 28 days	$f_{c'}$	=	3000	*psi*
Elastic modulus	E_c	=	3.1E+06	*psi*
Reinforcement:	ASTM A615 - Grade 60			
Yield strength, min	f_y	=	60000	*psi*
Elastic modulus	E_y	=	2.9E+07	*psi*
Allowable soils bearing pressure	B	=	2000	*psf*

2. Load

A. Vertical loads

	Roof	Floor	
Dead load:	7	10	psf
Live load:	20	40	psf

B. Site Seismic Data

Risk Category :	II							
Site Class :	D							
Importance Factor	=	1.0						
S_s	=	0.077	S_{DS}	=	0.083	F_a	=	1.6
S_1	=	0.047	S_{D1}	=	0.075	F_v	=	2.4

C. Site Wind Data

Basic wind speed :	150 mph
Risk category :	II
Exposure category :	C
Enclosure classification :	Open buildings

D. Snow load

Based from USGS map

According to ASCE 7-16

Snow load on the roof	p_f	=	0.00	psf

Hazards by Location

Search Information

Address: 195 SW Knight Terrace, Fort White, FL 32038, Hoa Kỳ

Coordinates: 29.87018699999999, -82.742305

Elevation: 77 ft

Timestamp: 2022-03-31T14:27:39.597Z

Hazard Type: Snow

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ASCE 7-16

Ground Snow Load ..... 0 lb/sqft

ASCE 7-10

Ground Snow Load ..... 0 lb/sqft

ASCE 7-05

Ground Snow Load ..... 0 lb/sqft

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer.

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Hazards by Location

Search Information

Address: 195 SW Knight Terrace, Fort White, FL 32038, Hoa Kỳ

Coordinates: 29.87018699999999, -82.742305

Elevation: 77 ft

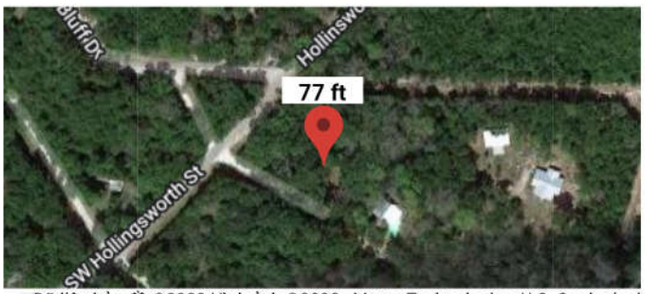
Timestamp: 2022-03-31T14:28:08.393Z

Hazard Type: Seismic

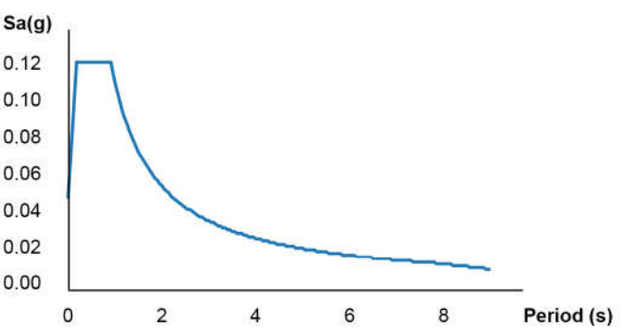
Reference Document: ASCE7-16

Risk Category: II

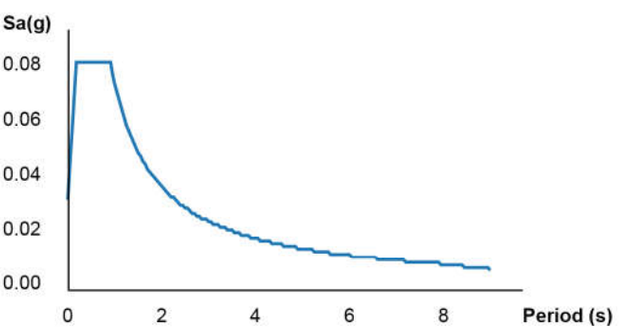
Site Class: D-default



MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.077	MCE_R ground motion (period=0.2s)
S_1	0.047	MCE_R ground motion (period=1.0s)
S_{MS}	0.124	Site-modified spectral acceleration value
S_{M1}	0.113	Site-modified spectral acceleration value
S_{DS}	0.083	Numeric seismic design value at 0.2s SA
S_{D1}	0.075	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	B	Seismic design category
F_a	1.6	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.92	Coefficient of risk (0.2s)
CR_1	0.892	Coefficient of risk (1.0s)
PGA	0.037	MCE_G peak ground acceleration
F_{PGA}	1.6	Site amplification factor at PGA
PGA_M	0.059	Site modified peak ground acceleration
T_L	8	Long-period transition period (s)
SsRT	0.077	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.084	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.047	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.053	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

	Project				Job Ref.	
	CLARENCE PENDER					
	Section				Sheet no./rev.	
	SEIMIC ANALYSIS				1	
	Calc. by	Date	Chk'd by	Date	App'd by	Date

SEISMIC FORCES (ASCE 7-16)

Site parameters

Site class	D
Mapped acceleration parameters (Section 11.4.1)	
at short period	S_S = **0.077**
at 1 sec period	S_1 = **0.049**
Site coefficientat short period (Table 11.4-1)	F_a = **1.600**
at 1 sec period (Table 11.4-2)	F_v = **2.400**

Spectral response acceleration parameters

at short period (Eq. 11.4-1)	$S_{MS} = F_a \times S_S$ = **0.123**
at 1 sec period (Eq. 11.4-2)	$S_{M1} = F_v \times S_1$ = **0.118**

Design spectral acceleration parameters (Sect 11.4.4)

at short period (Eq. 11.4-3)	$S_{DS} = 2 / 3 \times S_{MS}$ = **0.082**
at 1 sec period (Eq. 11.4-4)	$S_{D1} = 2 / 3 \times S_{M1}$ = **0.078**

Seismic design category

Risk category	II
Seismic design category (Table 11.6-1 only)	A

Seismic base shear (Sect 11.7)

Effective seismic weight of the structure;	W (kips)
Seismic base shear (Eq. 1.4-1);	$V = 0.01 \times W$ (kips)

;

	Project				Job Ref.	
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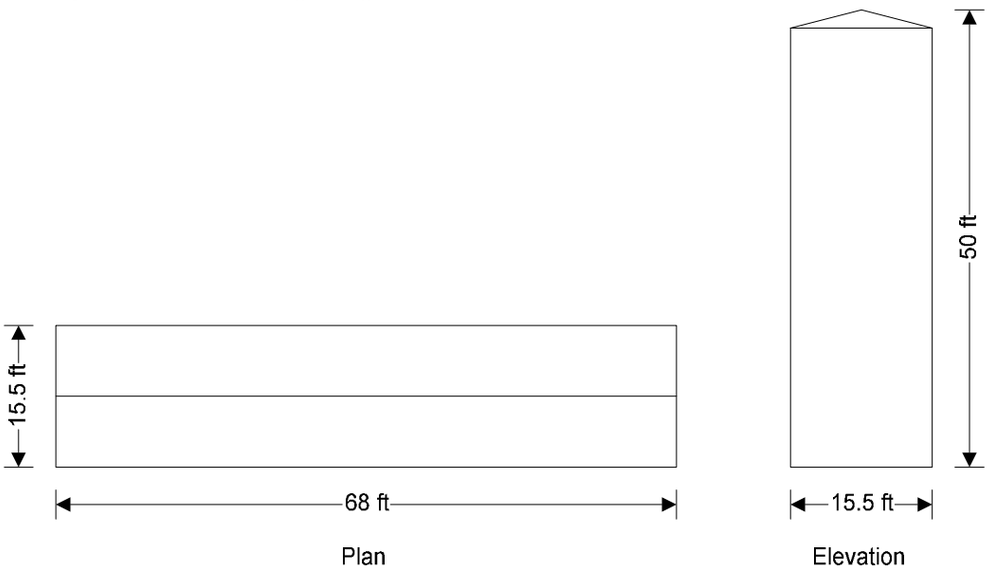
	WIND LOAD ANALYSIS				1	
	Calc. by	Date	Chk'd by	Date	App'd by	Date

WIND LOADING (ASCE7-16)

In accordance with ASCE7-16

Using the components and cladding design method



Building data

Type of roof;	Gable
Length of building;	b = **68.00** ft
Width of building;	d = **15.50** ft
Height to eaves;	H = **48.00** ft
Pitch of roof;	α_0 = **14.5** deg
Mean height;	h = **49.00** ft

General wind load requirements

Basic wind speed;	V = **150.0** mph
Risk category;	II
Velocity pressure exponent coeff (Table 26.6-1);	K_d = **0.85**
Exposure category (cl.26.7.3);	C
Enclosure classification (cl.26.10);	Enclosed buildings
Internal pressure coef +ve (Table 26.11-1);	GC_{pi_p} = **0.18**
Internal pressure coef –ve (Table 26.11-1);	GC_{pi_n} = **-0.18**

Gust effect factor for rigid structures

Terrain exposure constants (Table 26.9-1)	
Integral length scale factor;	l = **500.0** ft
Turbulence intensity factor;	c = **0.20**
Minimum equivalent height;	z_{min} = **15.0** ft
Peak factor for background response;	g_Q = **3.400**
Peak factor for wind response;	g_v = **3.400**
Integral length scale power law exponent;	$\bar{\varepsilon}$ = **0.200**
Equivalent height of the structure;	$\bar{z}$ = max (0.6 × h, z_{min}) = **29.40** ft
Intensity of turbulence (Eqn. 26.9-7);	$I_{\bar{z}}$ = c × (33 ft / $\bar{z}$)$^{1/6}$ = **0.20**
Integral length scale of turbulence (Eqn. 26.9-9);	$L_{\bar{z}}$ = l × ($\bar{z}$ / 33 ft) $^{\bar{\varepsilon}}$ = **488.59** ft
Background response (Eqn. 26.9-8);	Q = $\sqrt{(1 / (1 + 0.63 \times ((\min(B, L) + h) / L_{\bar{z}})^{0.63}))}$ = **0.922**
Gust effect factor (Eqn. 26.9-6);	G = G_f = 0.925 × (1 + 1.7 × g_Q × $I_{\bar{z}}$ × Q) / (1 + 1.7 × g_v × $I_{\bar{z}}$) = **0.89**

Topography

Topography factor not significant;	K_{zt} = 1.0

Velocity pressure

Velocity pressure coefficient (T.30.3-1);	K_z = **1.09**
Velocity pressure;	q_h = 0.00256 × K_z × K_{zt} × K_d × V^2 × 1psf/mph^2 = **53.1** psf

Peak velocity pressure for internal pressure

Peak velocity pressure – internal (as roof press.);	q_i = **53.12** psf

Equations used in tables

Net pressure;	p = q_h × [GC_p - GC_{pi}];

	Project				Job Ref.	
	CLARENCE PENDER					
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	WIND LOAD ANALYSIS				2	
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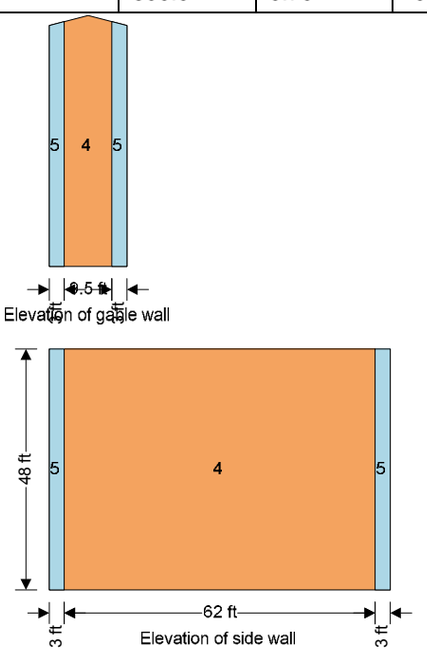
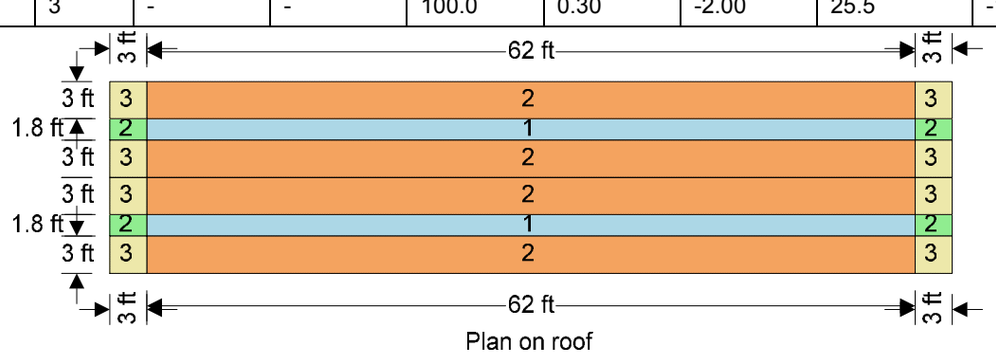
Components and cladding pressures - Wall (Figure 30.4-1)

Component	Zone	Length (ft)	Width (ft)	Eff. area (ft^2)	$+GC_p$	$-GC_p$	Pres (+ve) (psf)	Pres (-ve) (psf)
<10sf	4	-	-	10.0	1.00	-1.10	62.7	-68.0
50sf	4	-	-	50.0	0.88	-0.98	56.1	-61.4
200sf	4	-	-	200.0	0.77	-0.87	50.5	-55.8
>500sf	4	-	-	500.0	0.70	-0.80	46.7	-52.1
<10sf	5	-	-	10.0	1.00	-1.40	62.7	-83.9
50sf	5	-	-	50.0	0.88	-1.15	56.1	-70.8
200sf	5	-	-	200.0	0.77	-0.94	50.5	-59.5
>500sf	5	-	-	500.0	0.70	-0.80	46.7	-52.1



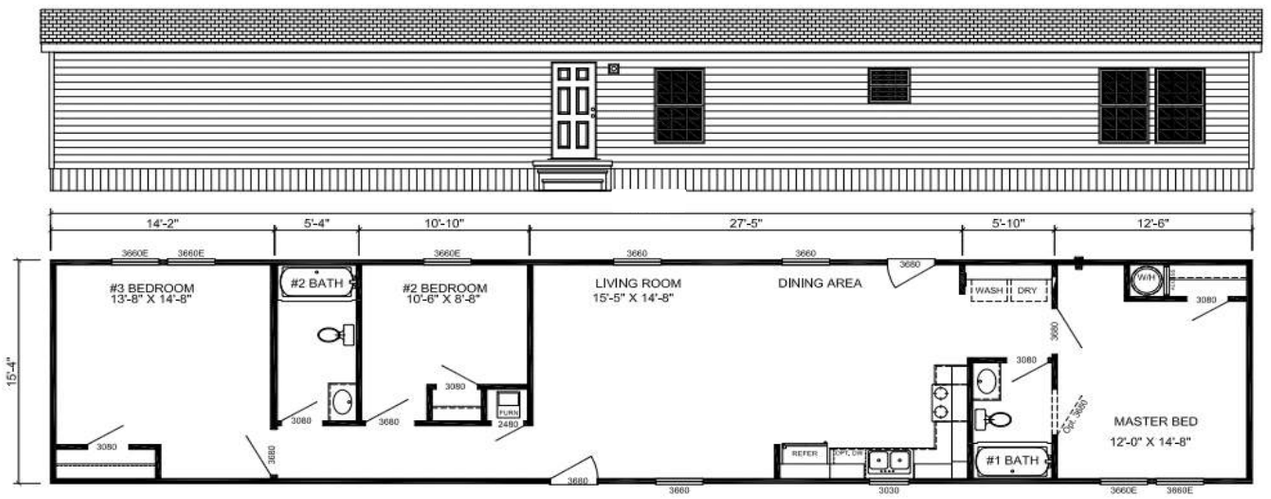
Components and cladding pressures - Roof (Figure 30.4-2B)

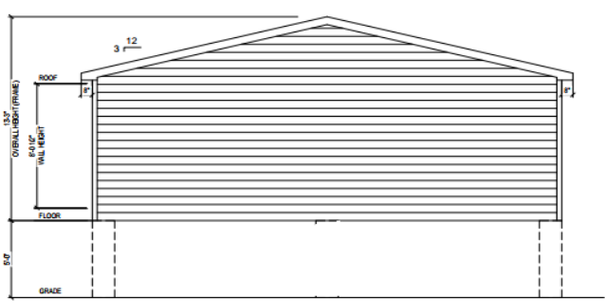
Component	Zone	Length (ft)	Width (ft)	Eff. area (ft^2)	$+GC_p$	$-GC_p$	Pres (+ve) (psf)	Pres (-ve) (psf)
<10sf	1	-	-	10.0	0.50	-0.90	36.1	-57.4
25sf	1	-	-	25.0	0.42	-0.86	31.9	-55.3
50sf	1	-	-	50.0	0.36	-0.83	28.7	-53.7
>100sf	1	-	-	100.0	0.30	-0.80	25.5	-52.1
<10sf	2	-	-	10.0	0.50	-1.70	36.1	-99.9
25sf	2	-	-	25.0	0.42	-1.50	31.9	-89.3
50sf	2	-	-	50.0	0.36	-1.35	28.7	-81.3
>100sf	2	-	-	100.0	0.30	-1.20	25.5	-73.3
<10sf	3	-	-	10.0	0.50	-2.60	36.1	-147.7
25sf	3	-	-	25.0	0.42	-2.36	31.9	-135.0
50sf	3	-	-	50.0	0.36	-2.18	28.7	-125.4
>100sf	3	-	-	100.0	0.30	-2.00	25.5	-115.8



3. Building Dimensions

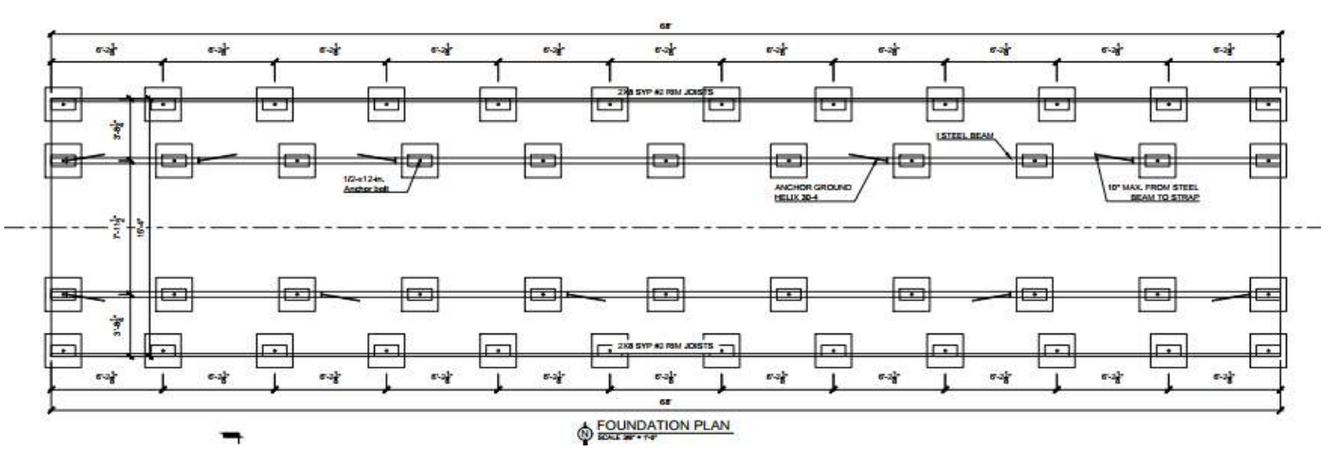
Plan and elevation





LEFT ELEVATION

ACCESS TO GRADE BY SITE CONTRACTOR
SITE CONTRACTOR IS RESPONSIBLE FOR DESIGN AND INSTALLATION OF FOUNDATION



FOUNDATION PLAN

4. Analysis & Design of Wood Framing

In accordance with the ANSI/AF&PA NDS-2018 using the ASD method

SUMMARY OF DESIGN

Member	Results	Current solution
Beam	Passed	1 piece(s) 2 x 8 SYP No.2

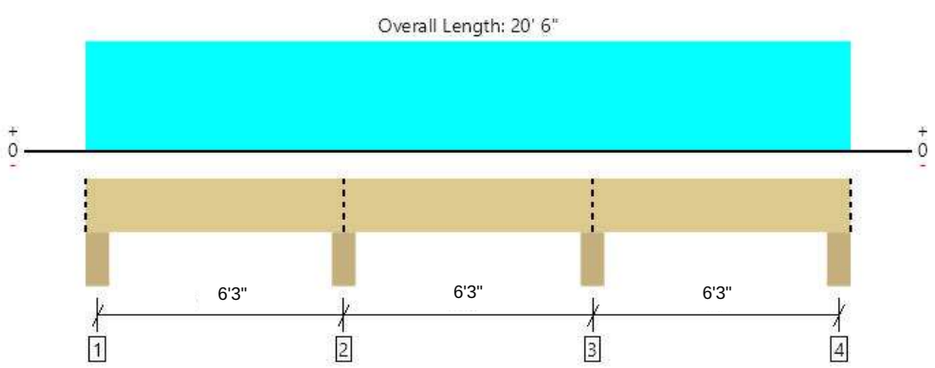
FORTE WEB

MEMBER REPORT

PASSED

Level, Floor: Drop Beam

1 piece(s) 2 x 8 SP No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	798 @ 6' 11"	5085 (6.00")	Passed (16%)	--	1.0 D + 1.0 L (Adj Spans)
Shear (lbs)	325 @ 6' 3/4"	1269	Passed (26%)	1.00	1.0 D + 1.0 L (Adj Spans)
Moment (Ft-lbs)	-505 @ 6' 11"	1013	Passed (50%)	1.00	1.0 D + 1.0 L (Adj Spans)
Live Load Defl. (in)	0.038 @ 3' 6 1/16"	0.218	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.045 @ 3' 5 9/16"	0.327	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - SYP	6.00"	6.00"	1.50"	68	266/-27	334/-27	Blocking
2 - Column - SYP	6.00"	6.00"	1.50"	165	633	798	Blocking
3 - Column - SYP	6.00"	6.00"	1.50"	165	633	798	Blocking
4 - Column - SYP	6.00"	6.00"	1.50"	68	266/-27	334/-27	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	20' 6" o/c	
Bottom Edge (Lu)	17' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 20' 6"	N/A	2.8	--	
1 - Uniform (PSF)	0 to 20' 6" (Front)	2'	10.0	40.0	Default Load

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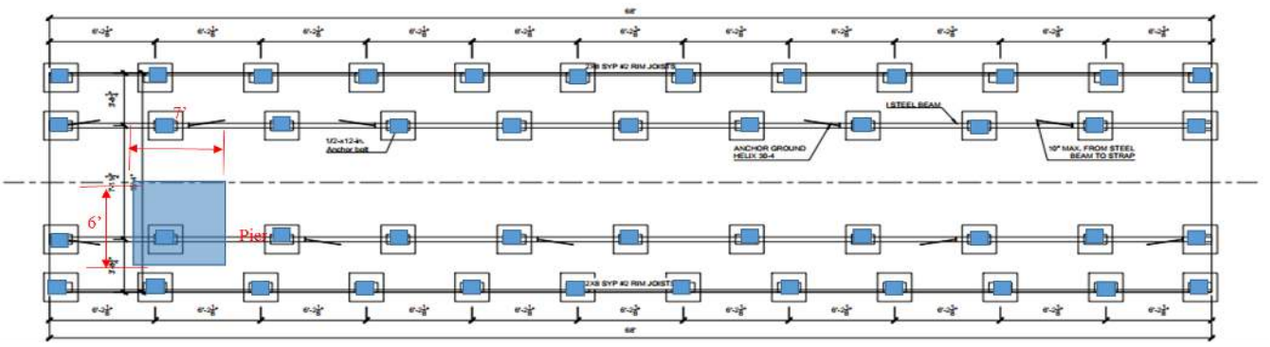
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

5 Foundation design

5.1 Footing design

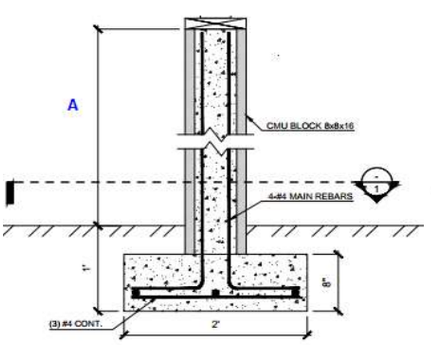
In accordance with ACI 318-14



	Roof	Floor	
Dead load:	7	10	psf
Live load:	20	40	psf

Foundation Plan

Basic Dimensions

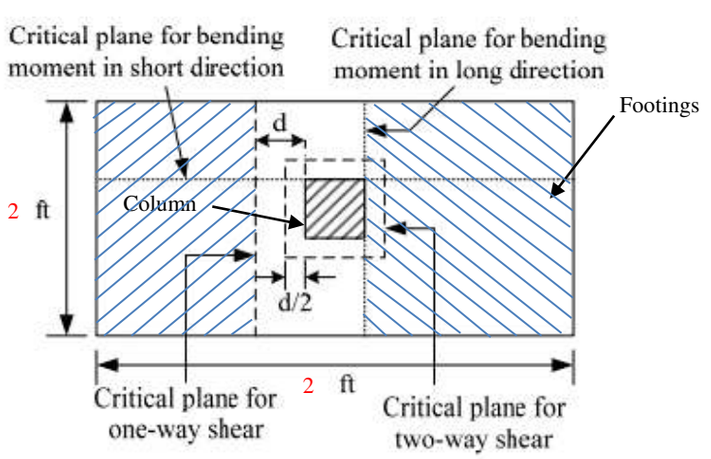


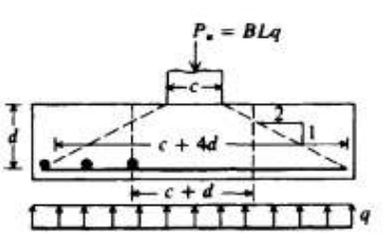
Foundation dimentions

Foundation base width:	=	24.00	in
Foundation base length:	=	24.00	in
Foundation base height	=	8.00	in

Column dimensions

Column width	=	8.00	in
Column length	=	16.00	in





Shear and Flexure in two - way.

Reinforcement

Longitudinal rebar:

Diameter of reinforcement	=	#4	
Spacing of reinforcement	=	10.00	in
Concrete cover thickness	=	3.00	in
Number	=	3.00	bars
Reinforcement area	=	0.20	in2

Transverse rebar:

Diameter of reinforcement	=	#4	in
Spacing of reinforcement	=	10.00	in
Concrete cover thickness	=	3.00	in
Number	=	3.00	bars
Reinforcement area	=	0.20	in2

5.1.1. Check the load capacity of the foundation soil

Applied loading Dead self-weight of foundation

Loads of column Dead full UDL

Live full UDL

Load combination:

1	D
2	D + L
3	D + (Lr or S)
4	D + 0.75L + 0.75(Lr or S)
5	D + 0.75L + 0.75(Lr or S) +0.6W
6	D + 0.75L + 0.7E
7	D + 0.6W
8	D + 0.6E

Analysis results

Compressive pressure at the base of the foundation:

Q_{s1} =	353.6	psf
Q_{s2} =	773.6	psf
Q_{s3} =	210.0	psf
Q_{s4} =	826.1	psf
Q_{s5} =	**986.8**	**psf**
Q_{s6} =	668.6	psf
Q_{s7} =	514.3	psf
Q_{s8} =	353.6	psf
Max ($Q_{s1;}$ $Q_{s2....}$ Q_{S8}) =	**Q_s =**	**986.8 psf**

Soil bearing capacity:

F_{soil} =	2000.0	psf

Check: **OK**

5.1.2. Check the shear resistance in 1-way of the foundation base

Load combination:

1	1.4D
2	1.2D + 1.6L +0.5(Lr or S)
3	1.2D + 1.6(Lr or S) + L
4	1.2D + 1.6(Lr or S) + 0.5W
5	1.2D + 1W + 1L + 0.5(Lr or S)
6	1.2D + 1E + L

Combination 4 results: 1.2D + 1.6(Lr or S) + 0.5W

Foundation width based on the small edge — b = 24.0 in

Calculated shear force — V_u = 1622.8 lb

Shear resistance of concrete

$$\phi V_c = \phi 2\sqrt{f_c'} b_w d$$

Distance from reinforcement to the edge of compressed concrete — d = 5.0 in

ϕV_c = 11173.5 lb

Check: **OK**

5.1.3. Check the bending resistance of the foundation base along the length

Distance from edge of base to edge of column — l = 4.0 in

Calculated bending moment — M_u = 135.2 lb_ft

Shear resistance of concrete

$$M_u = \phi M_n = \phi A_s f_y j d$$

Distance from reinforcement to the edge of compressed concrete — d = 5.0 in

j = 1.765

ϕM_n = 23823.5 lb_ft

Check: **OK**

Check the spacing of reinforcement : Min (3h, 18in) = 18 in

OK

5.1.4. Check the bearing capacity of vertical reinforcement

Distance from edge of base to edge of column — l = 8.0 in

Calculated bending moment — M_u = 540.9 lb_ft

Shear resistance of concrete

$$M_u = \phi M_n = \phi A_s f_y j d$$

Distance from reinforcement to the edge of compressed concrete — d = 5.0 in

j = 1.765

ϕM_n = 23823.5 lb_ft

Check: **OK**

Check the spacing of reinforcement : Min (3h, 18in) = 18 in

OK

5.2 Ground anchor design

Wind load on the wall = Area*Pwind=544 (ft2)*(46.7+52.1)/2 (psf) = 26873.6 (lbs)

Load capacity of ground anchor: (Helix 30-4) = 2400 (lbs)

Minimum number of anchors: n > 11 (pieces)

Helical Screw Auger Anchors

Helix15-4

- Helix OD: 4"
- Length: 15"
- Rod OD: 1/2"
- Finish: Painted Red
- Approx. Dense Soil

Holding Capacity 800 lbs.*

Helix30-4

- Helix OD: 4"
- Length: 30"
- Rod OD: 1/2"
- Finish: Painted Red
- Approx. Dense Soil

Holding Capacity 2,400 lbs.*

Helix40-6

- Helix OD: 6"
- Length: 40"
- Rod OD: 5/8"
- Finish: Painted Red
- Approx. Dense Soil

Holding Capacity 3,500 lbs.*

Helix48-6

- Helix OD: 6"
- Length: 48"
- Rod OD: 5/8"
- Finish: Painted Red
- Approx. Dense Soil

Holding Capacity 4,000 lbs.*

Helix4-54

- Helix OD: 4"
- Length: 54"
- Rod OD: 3/4"
- Finish: Galvanized

Approx. Holding Capacities (see Soil Classifications):
Class 5: 4,500 lbs.
Class 6: 3,000 lbs.
Class 7: 1,500 lbs.

Helix6-66

- Helix OD: 6"
- Length: 66"
- Rod OD: 3/4"
- Finish: Galvanized

Approx. Holding Capacities (see Soil Classifications):
Class 5: 6,500 lbs.
Class 6: 5,000 lbs.
Class 7: 2,500 lbs.

Helix8-66

- Helix OD: 8"
- Length: 66"
- Rod OD: 1"
- Finish: Galvanized

Approx. Holding Capacities (see Soil Classifications):
Class 5: 11,000 lbs.
Class 6: 9,000 lbs.
Class 7: 6,000 lbs.

Helix10-66

- Helix OD: 10”
- Length: 66"
- Rod OD: 1-1/4"
- Finish: Galvanized

Approx. Holding Capacities (see Soil Classifications):
Class 5: 13,000 lbs.
Class 6: 10,000 lbs.
Class 7: 7,000 lbs.

Helix10-96

- Helix OD: 10”
- Length: 96"
- Rod OD: 1-1/4"
- Finish: Galvanized

Approx. Holding Capacities (see Soil Classifications):
Class 5: 13,000 lbs.
Class 6: 10,000 lbs.
Class 7: 7,000 lbs.