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STRUCTURAL CALCULATION REPORT

CITY OF COMPTON

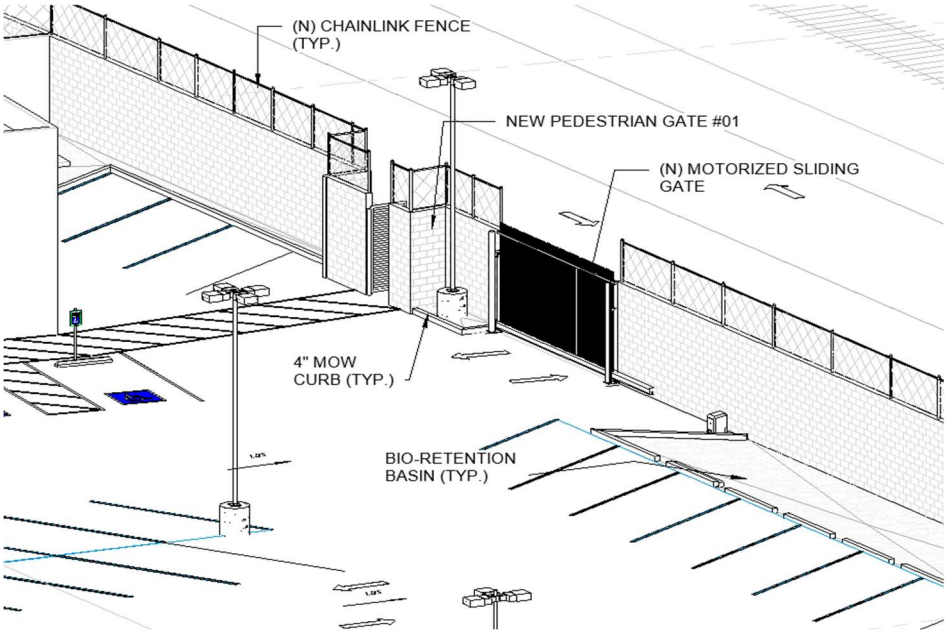
STRUCTURAL ANALYSIS

FOR PROJECT

COMPTON COMMUNITY SECURITY SERVICES
DEMOLITION AND PARKING LOT IMPROVEMENTS

PROJECT ADDRESS

404 N ALAMEDA ST. COMPTON, CA 90221



PER
ASCE 7-22

The structure is located in **404 N Alameda St, Compton, CA 90221, USA** categorized as **Exposure C** (assumed to be homogeneous for the selected wind direction). The wind load calculation for the structure - Solid freestanding walls and attached signs - is based on the Directional Procedure (Chapter 29) of ASCE 7.

REGISTERED PROFESSIONAL ENGINEER
MOSTAFA H. BAYOUMI
No. C94270
Exp. 12-31-24
CIVIL
STATE OF CALIFORNIA

AFFILIATIONS

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS
CONTRACTORS STATE LICENSE BOARD
SEI STRUCTURAL ENGINEERING INSTITUTE
AWS American Welding Society

DESIGN BY: BEN HAMED, AM.ASCE.,AIA.
REVIEW BY: MOSTAFA BAYOUMI, P.E.

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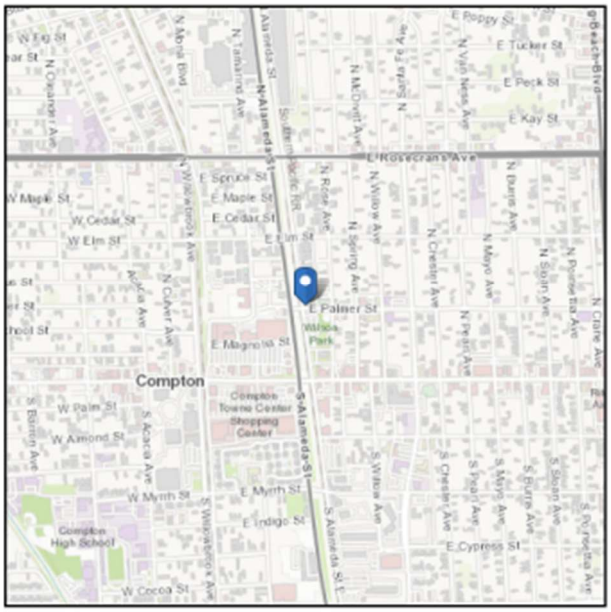
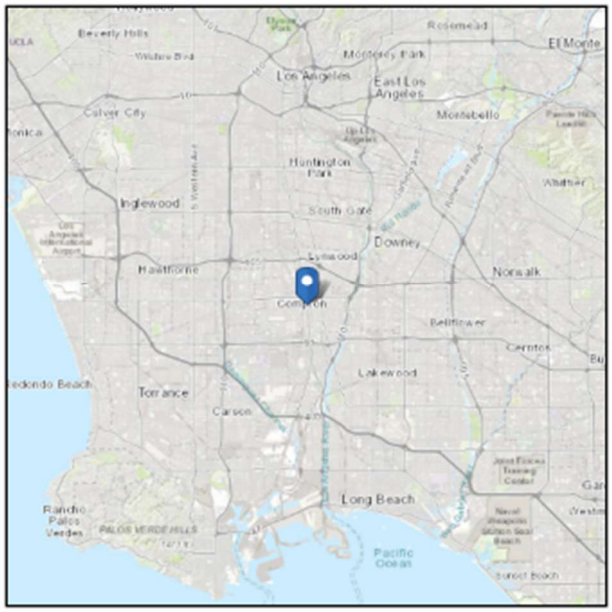
ASCE Hazards Report

Address:
404 N Alameda St
Compton, California
90221

Standard: ASCE/SEI 7-22
Risk Category: II
Soil Class: Default

Latitude: 33.898434
Longitude: -118.220173
Elevation: 69.87962420793268 ft (NAVD 88)





Wind

Results:

Wind Speed	95 Vmph
10-year MRI	66 Vmph
25-year MRI	71 Vmph
50-year MRI	76 Vmph
100-year MRI	81 Vmph
300-year MRI	89 Vmph
700-year MRI	95 Vmph
1,700-year MRI	101 Vmph
3,000-year MRI	105 Vmph
10,000-year MRI	115 Vmph
100,000-year MRI	132 Vmph
1,000,000-year MRI	150 Vmph

Data Source: ASCE/SEI 7-22, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Tue May 14 2024

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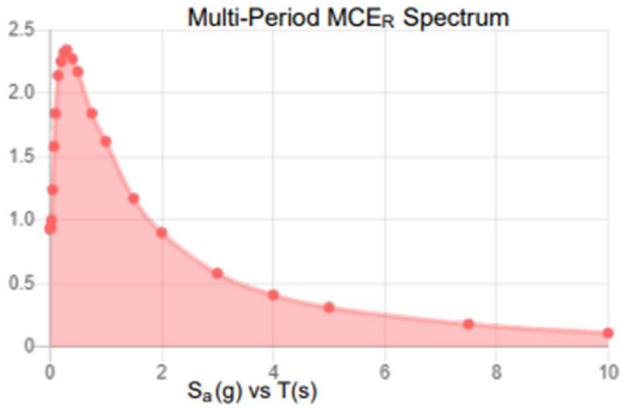
Seismic

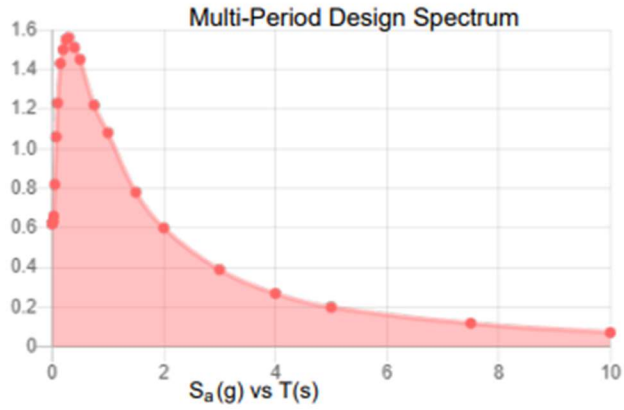
Site Soil Class: Default

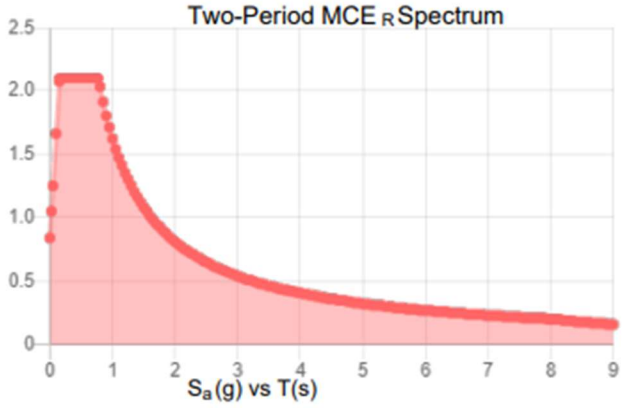
Results:

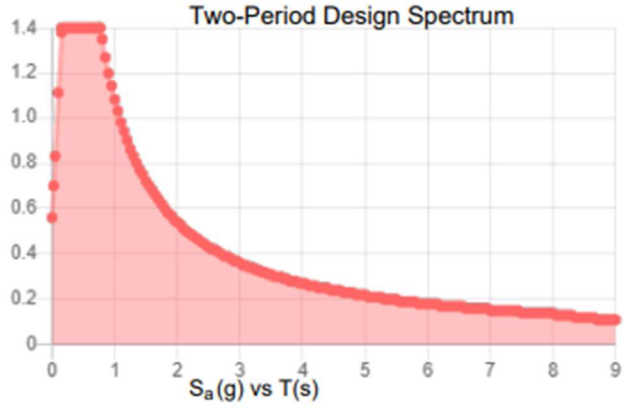
PGA_M :	0.83	T_L :	8
S_{MS} :	2.1	S_S :	1.96
S_{M1} :	1.62	S_1 :	0.78
S_{DS} :	1.4	V_{S30} :	260
S_{D1} :	1.08		

Seismic Design Category: E









MCER Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

E.,AIA.
P.E.

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SEISMIC LOAD CALCUALTION PER ASCE 7-22		
Site Classification= (Default)	D	ASCE 7-22 Section 11.4.2
Risk Category=	II	ASCE 7-22 Table 1.5-1
Seismic Design Category=	SDC	ASCE 7-22 Section 11.6
Importance Factor= I=	1	ASCE 7-22 Section 11.5 Table 1.5-2
Response Modification Factor R=	2	ASCE 7-22 Table 12.2-1 (ordinary reinforced shear walls)
System Overstrength Factor Ω_o=	2.5	ASCE 7-22 Table 12.2-1
Deflection Amplification Factor C_d=	1.75	ASCE 7-22 Table 12.2-1
Rho Factor (ρ) ρ=	1.3	ASCE 7-22 Section 12.3.4.2 Reliability Redundancy Factor
Approximate Fundamental Period T =	0.14	ASCE 7-22 Section 12.8-2
Long Period T_L=	8	ASCE 7-22 Figure 22-14 to 22-17 ASCE 7 Hazard Report
Spectral Response Short Period S_s=	1.96	ASCE 7-22 Chapter 22 ASCE 7 Hazard Report
Spectral Response Long Period S_1=	0.78	ASCE 7-22 Chapter 22 ASCE 7 Hazard Report
Short Period Site Coefficient F_a=	1. 1	ASCE 7-22 Section 11.4.4 Site Coefficients MCER
Long Period Site Coefficient F_V=	2.5	ASCE 7-22 Section 11.4.4 Site Coefficients MCER
Spectral Response Accelerations Short S_{MS}=FaS_s=	2.1	ASCE 7-22 Section 11.4.4 Site Coefficients MCE_R
Spectral Response Accelerations Long S_{M1}=FvS_1=	1.62	ASCE 7-22 Section 11.4.4 Site Coefficients MCER
Spectral Response Short Period **S_{DS}=**	**1.4**	ASCE 7-22 Section 11.4.5 Design Spectral Acceleration.
Spectral Response Long Period S_{D1}=	1.08	ASCE 7-16 Section 11.4.5 Design Spectral Acceleration
$T_s = (S_{D1} / S_{DS})$ T_S=	0.809	ASCE 7-22 Section 11.4.6 .095<1.5xT_S=0.830*
Coefficient as determined from table 12.8-2 C_t =	0.02	ASCE 7-22 table 12.8-2
Structural Height as defined in section 11.2 h_n =	14	ASCE 7-22 table 12.8-2
Coefficient as determined from table 12.8-2 x =	0.75	ASCE 7-22 Section 12.8-2
Approximate Fundamental Period $T_a = (Ct * h_n^x)$ =	0.14	ASCE 7-22 Section 12.8-8
Seismic Response Coefficient Cs =	**0.54**	ASCE 7-22 Eq. 12.8-2 Seismic Response Coefficient
Maximum Seismic Response Coefficient Cs_{max} =		ASCE 7-22 Eq. 12.8-3 Maximum
Minimum Seismic Response Coefficient	0.484	ASCE 7-22 Eq. 12.8-5 or 12.8-6 Minimum
*Site specific ground motion analysis is not required per ASCE 7-22 Section 11.4.8 Exception 2 Seismic Design Category specified from Table 11.4-2		

Seismic Coefficient (C_s):

$$C_s = \frac{S_{D1}}{T \cdot R/I_e} = \frac{1.08}{0.14 \cdot 2} = 0.54$$

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Dead Load that Contributes to Seismic Calculations: Weight of the Wall + weight of the Chainlink Fence.

- **Material:** Concrete Masonry Unit (CMU)
- **Density of CMU:** 125 lb/ft³ (standard value)
- **Wall Thickness:** 8 inches (0.667 ft)
- **Wall Height:** 10 feet
- **Chain Link Fence Height:** 4 feet

Volume of CMU Wall per Linear Foot:

$$\text{Volume} = \text{Height} \times \text{Thickness} \times \text{Length}$$
$$\text{Volume}_{\text{wall}} = 10\ \text{ft} \times 0.667\ \text{ft} \times 1\ \text{ft} = 6.67\ \text{ft}^3/\text{ft}$$

Weight of the CMU Wall per Linear Foot:

$$W_{\text{wall}} = \text{Volume wall} \times \text{Density CMU}$$
$$= 6.67\ \text{ft}^3/\text{ft} \times 125\ \text{lb/ft}^3 = 833.75\ \text{lb/ft}$$

Weight of the Chain Link Fence per Linear Foot:

- **Density:** 10 lb/ft² (standard value)
- **Area of Chain Link Fence per Linear Foot:**

$$\text{Area fence} = \text{Height} \times \text{Length}$$
$$= 4\ \text{ft} \times 1\ \text{ft} = 4\ \text{ft}^2/\text{ft}$$

- **Weight:**

$$W_{\text{fence}} = \text{Area fence} \times \text{Density fence} = 4\ \text{ft}^2/\text{ft} \times 10\ \text{lb/ft}^2 = 40\ \text{lb/ft}$$

Total Dead Load (Weight of Wall and Fence) per Linear Foot:

$$D = W_{\text{wall}} + W_{\text{fence}} = 833.75\ \text{lb/ft} + 40\ \text{lb/ft} = 873.75\ \text{lb/ft}$$

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- V = Base shear
- C_s = Seismic coefficient (0.54)
- W = Weight of the structure (excluding the weight of the footing)

Weight Calculation (W):

- **Total Combined Weight per Linear Foot (Wall and Fence Only):** 873.75 lbs/linear foot

$$V = 0.54 \cdot 873.75 = 471.825 \text{ lbs}$$

Design Seismic Force for 1 Linear Feet, A = 14 sq.ft V= Cs X W = 0.54x873.75-=471.825 lbs

CMU WALL WIND LOAD CALCULATIONS PER ASCE 7-22			
Risk Category For Wind Speed		II	ASCE 7-22 Figure 26.5-1
Wind Speed for Address using TIN Method	V =	96 mph	ASCE 7-22 Figure 26.5-1
Wind Directionality Factor	Kd =	0.85	ASCE 7-22 Table 26.6-1
Topographic Factor	Kzt =	1.0	ASCE 7-22 Section 26.8.1
Ground Elevation Factor	Ke =	0.9974	ASCE 7-22 section 26.9
Velocity Pressure Exposure Coefficient	Kz =	0.85115	ASCE 7-22 section 26.10
Velocity Pressure $q_h = 0.00256\, K_z\, K_{zt}\, K_e\, V^2$	qh =	24.356 p.s.f	ASCE 7-22 section 26.10.2
Gust Effect Factor	G =	0.85	ASCE 7-22 Section 26-11-1
Net force coefficients $\delta = 1 - (1 - \epsilon)^{1.5}$	Cf =	2.080 (worst Case)	ASCE 7-22 Figures 29.3-1
Wind Design Pressure	P =	30.099 p.s.f	
Design Wind Force for 1 Linear Feet, A = 14 sq.ft F= 30.09x14 = 421.26 lbs		421.26 lbs	$F = q_h\, K_d\, G\, C_{f,C}\, A_{s,s}$

Design Wind Force for 1 Linear Feet, A = 14 sq.ft F= 30.09x14 = 421.26 lbs

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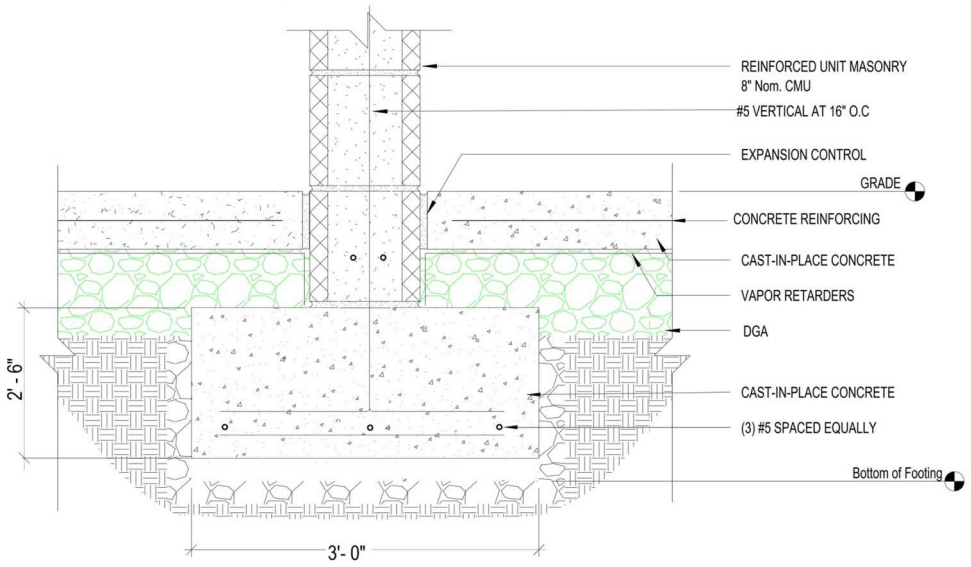
REGULAR SHAPE CONCRETE FOOTING DESIGN / DETAIL 09/S-003



Footing Design Load Check:

- Footing Width: 3 feet
- Footing Depth: 2.5 feet
- Footing Length: 1 foot (per linear foot of wall)
- Concrete Density: 150 lb/ft³ (standard value)

Volume of Footing per Linear Foot:

$$\text{Volume}_{\text{footing}} = \text{Width} \times \text{Depth} \times \text{Length} = 3 \text{ ft} \cdot 2.5 \text{ ft} \cdot 1 \text{ ft} = 7.5 \text{ ft}^3/\text{ft}$$

Weight of the Footing per Linear Foot:

$$W_{\text{footing}} = \text{Volume}_{\text{footing}} \times \text{Density}_{\text{concrete}} = 7.5 \text{ ft}^3/\text{ft} \cdot 150 \text{ lb/ft}^3 = 1125 \text{ lb/ft}$$

Total Dead Load Including Footing (D):

$$D = 873.75 \text{ lb/ft} + 1125 \text{ lb/ft} = 1998.75 \text{ lb/ft}$$

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Load Combination:

Gravity and Wind Load Combination:

$$1.2D + 1.6W = 1.2 \times 1998.75 + 1.6 \times 421.386 = 2398.5 + 674.218 = 3072.718 \text{ lbs/ft}$$

Gravity and Seismic Load Combination:

$$1.2D + 1.0E = 1.2 \times 1998.75 + 1.0 \times 393.336 = 2398.5 + 393.336 = 2791.836 \text{ lbs/ft}$$

Control Load (Higher of the two):

$$P_{total} = 3072.718 \text{ lbs/ft}$$

Footing Design and Stability Checks:

- Width: 3 feet
- Depth: 2.5 feet
- Length: Continuous along the wall length

Area of Footing (A_f):

$$A_f = \text{Width} \cdot \text{Length} = 3 \text{ ft} \cdot 1 \text{ ft} = 3 \text{ ft}^2$$

Pressure on Soil:

$$q = \frac{P_{total}}{A_f} = \frac{3072.718}{3} = 1024.239 \text{ psf}$$

Where:

- q = Pressure on soil
- P_{total} = Total load (3072.718 lbs/ft)
- A_f = Area of the footing (3 ft²)

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Stability Checks:

1. Overturning:

- Moment Due to Wind (M_w):

$$M_w = F_w \times \left(\frac{h_n}{2}\right) = 421.386 \times 7 = 2949.702 \text{ lb-ft}$$

Where:

- M_w = Moment due to wind
- F_w = Wind force (421.386 lbs)
- h_n = Height of the structure (14 ft), thus $\frac{h_n}{2} = 7$

- Resisting Moment Due to Weight (M_r):

$$M_r = (D + W_{\text{footing}}) \times \frac{\text{Width}}{2}$$

$$M_r = (873.75 + 1125) \times 1.5 = 1998.75 \times 1.5 = 2998.125 \text{ lb-ft}$$

- Overturning Safety Factor (SF_o):

$$SF_o = \frac{M_r}{M_w} = \frac{2998.125}{2949.702} \approx 1.02$$

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2. Sliding:

- Friction Force (F_f):

$$F_f = (D + W_{\text{footing}}) \times \mu = (873.75 + 1125) \times 0.5 = 1998.75 \times 0.5 = 999.375 \text{ lb}$$

Where:

- F_f = Friction force
- D = Dead load (873.75 lbs/ft)
- W_{footing} = Weight of the footing (1125 lbs/ft)
- μ = Coefficient of friction (assumed 0.5)

- Sliding Safety Factor (SF_s):

$$SF_s = \frac{F_f}{F_w} = \frac{999.375}{421.386} \approx 2.37$$ (Design (OK)

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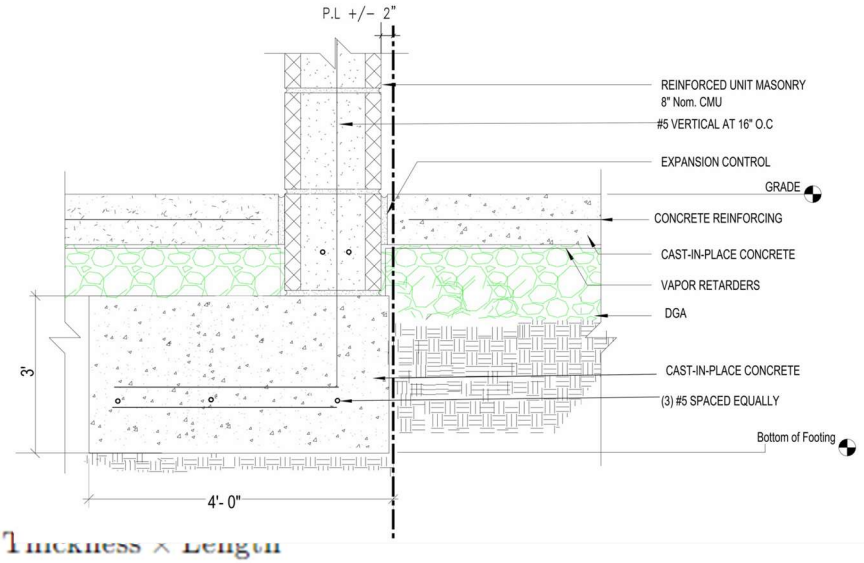
CANTILEVER SHAPE CONCRETE FOOTING DESIGN / DETAIL 03/S-003

Footing Design Loads Check:



- **Material:** Concrete Masonry Unit (CMU)
- **Density of CMU:** 125 lb/ft³ (standard value)
- **Wall Thickness:** 8 inches (0.667 ft)
- **Wall Height:** 10 feet
- **Chain Link Fence Height:** 4 feet

Volume of CMU Wall per Linear Foot:

$$\text{Volume} = \text{Height} \times \text{Thickness} \times \text{Length}$$

For the wall:

$$\text{Volume}_{\text{wall}} = 10 \text{ ft} \times 0.667 \text{ ft} \times 1 \text{ ft} = 6.67 \text{ ft}^3/\text{ft}$$

Weight of the CMU Wall per Linear Foot:

$$W_{\text{wall}} = \text{Volume}_{\text{wall}} \times \text{Density}_{\text{CMU}} = 6.67 \text{ ft}^3/\text{ft} \times 125 \text{ lb/ft}^3 = 833.75 \text{ lb/ft}$$

Weight of the Chain Link Fence per Linear Foot:

- **Density:** 10 lb/ft² (standard value)
- **Area of Chain Link Fence per Linear Foot:**

$$\text{Area}_{\text{fence}} = \text{Height} \times \text{Length} = 4 \text{ ft} \times 1 \text{ ft} = 4 \text{ ft}^2/\text{ft}$$

- **Weight:**

$$W_{\text{fence}} = \text{Area}_{\text{fence}} \times \text{Density}_{\text{fence}} = 4 \text{ ft}^2/\text{ft} \times 10 \text{ lb/ft}^2 = 40 \text{ lb/ft}$$

Total Dead Load (Weight of Wall and Fence) per Linear Foot:

$$D = W_{\text{wall}} + W_{\text{fence}} = 833.75 \text{ lb/ft} + 40 \text{ lb/ft} = 873.75 \text{ lb/ft}$$

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- **Footing Width:** 4 feet
- **Footing Depth:** 3 feet
- **Footing Length:** 1 foot (per linear foot of wall)
- **Concrete Density:** 150 lb/ft³ (standard value)

Volume of Footing per Linear Foot:

$$\text{Volume}_{\text{footing}} = \text{Width} \times \text{Depth} \times \text{Length} = 4 \text{ ft} \cdot 3 \text{ ft} \cdot 1 \text{ ft} = 12 \text{ ft}^3/\text{ft}$$

Weight of the Footing per Linear Foot:

$$W_{\text{footing}} = \text{Volume}_{\text{footing}} \times \text{Density}_{\text{concrete}} = 12 \text{ ft}^3/\text{ft} \cdot 150 \text{ lb/ft}^3 = 1800 \text{ lb/ft}$$

Step 3: Calculate the Load Combinations

Total Dead Load Including Footing (D):

$$D = 873.75 \text{ lb/ft} + 1800 \text{ lb/ft} = 2673.75 \text{ lb/ft}$$

Wind Load Calculation:

- Wind load previously calculated:

$$F_w = 421.386 \text{ lbs}$$

Seismic Load Calculation:

- Seismic load previously calculated:

$$F_e = 393.336 \text{ lbs}$$

Gravity and Wind Load Combination:

$$1.2D + 1.6W = 1.2 \times 2673.75 + 1.6 \times 421.386 = 3208.5 + 674.218 = 3882.718 \text{ lbs/ft}$$

Gravity and Seismic Load Combination:

$$1.2D + 1.0E = 1.2 \times 2673.75 + 1.0 \times 393.336 = 3208.5 + 393.336 = 3601.836 \text{ lbs/ft}$$

Control Load (Higher of the two):

$$P_{total} = 3882.718 \text{ lbs/ft}$$

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Cantilever Footing Design and Stability Checks:

Footing Dimensions (Cantilever Footing):

- Width: 4 feet
- Depth: 3 feet
- Extension Beyond Wall: Entire footing on one side of the wall

Area of Footing (A_f):

$$A_f = \text{Width} \cdot \text{Length} = 4 \text{ ft} \cdot 1 \text{ ft} = 4 \text{ ft}^2$$

Pressure on Soil:

$$q = \frac{P_{total}}{A_f} = \frac{3882.718}{4} = 970.68 \text{ psf}$$

Where:

- q = Pressure on soil
- P_{total} = Total load (3882.718 lbs/ft)
- A_f = Area of the footing (4 ft²)

Stability Checks:

1. Overturning:
   - Moment Due to Wind (M_w):

$$M_w = F_w \times \left(\frac{h_n}{2}\right) = 421.386 \times 7 = 2949.702 \text{ lb-ft}$$

Where:

- M_w = Moment due to wind
- F_w = Wind force (421.386 lbs)
- h_n = Height of the structure (14 ft), thus $\frac{h_n}{2} = 7$

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- Resisting Moment Due to Weight (M_r):

$$M_r = (D + W_{\text{footing}}) \times \frac{\text{Width}}{2}$$

$$M_r = (2673.75) \times 2 = 5347.5 \text{ lb-ft}$$

- Overturning Safety Factor (SF_o):

$$SF_o = \frac{M_r}{M_w} = \frac{5347.5}{2949.702} \approx 1.81$$

. Sliding:

- Friction Force (F_f):

$$F_f = (D + W_{\text{footing}}) \times \mu = (2673.75) \times 0.5 = 1336.875 \text{ lbs}$$

Where:

- F_f = Friction force
- D = Dead load (873.75 lbs/ft)
- W_{footing} = Weight of the footing (1800 lbs/ft)
- μ = Coefficient of friction (assumed 0.5)

- Sliding Safety Factor (SF_s):

$$SF_s = \frac{F_f}{F_w} = \frac{1336.875}{421.386} \approx 3.17$$ (Design (OK)

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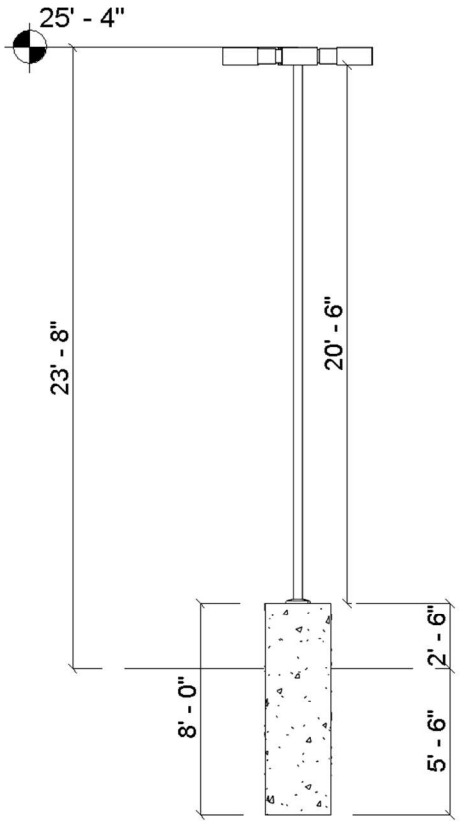
LIGHT FIXTURE POLE LOADS ANALYSIS PER ASCE 7-22



Effective Projected Area (EPA):

For a tapered pole with 8" (0.667 ft) diameter at the bottom and 6" (0.5 ft) diameter at the top:

$$\text{Average Diameter} = \frac{0.667 \text{ ft} + 0.5 \text{ ft}}{2} = 0.5835 \text{ ft}$$

$$\text{EPA} = \text{Average Diameter} \times \text{Height} = 0.5835 \text{ ft} \times 23 \text{ ft} = 13.4055 \text{ ft}^2$$

Wind Force on Pole:

$$F_w = q_h \times \text{EPA} = 24.356 \text{ psf} \times 13.4055 \text{ ft}^2 = 326.635 \text{ lbs}$$

Seismic Force Calculation:

$$F_e = S_a \times W = 1.4 \times 154 = 215.6 \text{ lbs}$$

Explanation of W

W represents the weight of the light pole and its fixtures. In this case:

$$W = 154 \text{ lbs}$$

Use ASCE 7-22 load combinations:

Gravity and Wind Load Combination:

$$1.2D + 1.6W = 1.2 \times 154 + 1.6 \times 326.635 = 184.8 + 522.616 = 707.416 \text{ lbs}$$

Gravity and Seismic Load Combination:

$$1.2D + 1.0E = 1.2 \times 154 + 1.0 \times 215.6 = 184.8 + 215.6 = 400.4 \text{ lbs}$$

Control Load (Higher of the two):

$$P_{total} = 707.416 \text{ lbs}$$

ACC & ENGINEERING
Design | Engineering | Construction
951-903-2284
714-844-2140
www.accandengineering.com
Ben@accandengineering.com
1130 N Kraemer Blvd #I, Anaheim, CA 92806
DIR | PW-LR-1000801097 BPELSG | 39074 CSLB | 1073807

Footing Design and Stability Checks:

Footing Dimensions:

- Diameter: 30 inches (2.5 ft)
- Depth: 8 ft (5'4" below ground, rest above ground)

Bearing Capacity:

Assume soil bearing capacity $q_{allow} = 2000$ psf.

Area of Footing A_f:

$$A_f = \pi \left(\frac{2.5}{2}\right)^2 = \pi \left(1.25\right)^2 = 4.91 \text{ ft}^2$$

Pressure on Soil:

$$q = \frac{P_{total}}{A_f} = \frac{707.416}{4.91} = 144.11 \text{ psf}$$

Depth Check:

Minimum depth to resist overturning and uplift forces is satisfied as footing is 8 ft deep.

Stability Checks:

1. Overturning:
   - Moment Due to Wind (M_w):

$$M_w = F_w \times (h_n/2) = 326.635 \times 11.5 = 3756.3025 \text{ lb-ft}$$

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- Resisting Moment Due to Weight (M_r):

$$M_r = (154 + 5890.5) \times 4 = 6044.5 \times 4 = 24178 \text{ lb-ft}$$

- Overturning Safety Factor (SF_o):

$$SF_o = \frac{M_r}{M_w} = \frac{24178}{3756.3025} \approx 6.44$$

2. Sliding:

- Friction Force (F_f):

$$F_f = (154 + 5890.5) \times 0.5 = 3022.25 \text{ lbs}$$

- Sliding Safety Factor (SF_s):

$$SF_s = \frac{F_f}{F_w} = \frac{3022.25}{326.635} \approx 9.25$$

(Design (OK)

END OF REPORT

REGARDS

DESIGN BY : BEN, HAMED, AM.ASCE,AIA
REVIEW BY : M.BAYOUMI, P.E.,ASCE.