CKR
ENGINEERS
CONSULTING STRUCTURAL ENGINEERS

1295 North State Street ▪ Orem, Utah 84057
Phone: 801-222-0922 ▪ Fax: 801-222-0902

STRUCTURAL CALCULATIONS

Mo'Bettahs - Lee's Summit
NW Chipman Rd & NW Ward Rd
Lee's Summit, MO

Project: 23150

April 10, 2023

Daniel D Goodrich

Digitally signed by Daniel D Goodrich
DN: cn=Daniel D Goodrich, c=US, o=Utah, email=dang@ckrengineers.com
Date: 2023.04.10 15:04:24 -06'00'

Scope of Work

-Gravity analysis
-Lateral analysis
-Structural design to resist gravity and lateral forces
-Calculations are valid only at the above address
-Sign drawings attached for reference only
-Design of sign cabinets not included

Design Summary

Project: **Mo'Bettahs - Lee's Summit**
Job #: **23150**
Date: **4/10/2023**

Sign Pole

A standard **6** in Schedule 40 pipe is adequate for strength and deflection.

Sign Foundation

A **3** ft diameter x **5** ft deep unreinforced concrete footing under the sign is adequate.

Design Criteria:

2018 International Building Code

Project: Mo'Bettahs - Lee's Summit
Address: NW Chipman Rd & NW Ward Rd
City, State: Lee's Summit, MO
Job #: 23150
Date: 4/10/2023

Design Loads per ASCE/SEI 7-16

Minimum Design Loads for Buildings and Other Structures

General (Chapter 1)

Risk Category = II Table 1.5-1

Dead Load (Chapter 3)

ASD Level

Sign Weight 5 psf

Wind Load (Chapters 26-31)

Strength Level

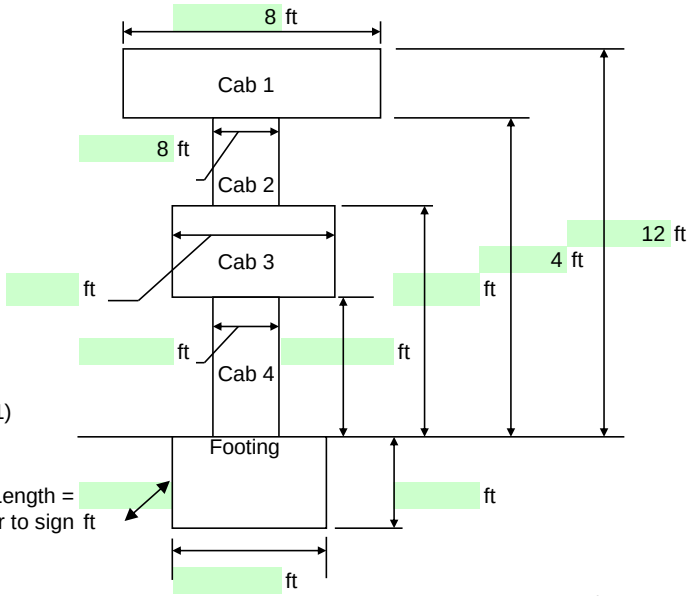
V = **109** mph Figure 26.5-1, or value from https://hazards.atcouncil.org

V_{asd} = **84** mph IBC Section 1609.3.1

Exposure: **B** Section 26.7

Sign Pole & Foundation Design

Project: Mo'Bettahs - Lee's Summit
Location: Lee's Summit, MO
Job #: 23150



ASCE 7-16 Wind		Chapter 26
V =	109	Mph
Elevation =	1000	(ft)
K_d =	0.85	Table 26.6-1
Exp.	B	Section 26.7.3
Sign Top Height =	12	(ft)
K_z =	0.57	Table 27.3-1
K_{zt} =	1	Figure 26.8-1
G =	0.85	Section 26.9.1
K_e =	0.96	Section 26.10
q_z =	**14.3**	(psf) - LRFD - Eqn. (26.10-1)
q_z =	**8.6**	(psf) - ASD - Eqn. (26.10-1)
Soil Passive Pres. =	150	pcf
Pole F_y =	35	ksi
Pole E =	29000	ksi
Pole =	PIPE6STD	

Only round sections are currently supported

Footing Volume = 0.00 yd^3

Sign Forces (ASD)

Cabinet	B (ft)	S (ft)	h (ft)	B/s	s/h	Ybar (ft)	Area (ft^2)	C_f Fig. 29.4-1	Force (lbf)	Pole Moment (k*ft)	Ftg Moment (k*ft)
1	8	8	12	1.00	0.67	8	64	1.65	772	6.2	6.2
2	8	4	4	2.00	1.00	2.2	32	1.8	421	0.9	0.9
3	0	0	0	0.00	0.00	0	0		0	0.0	0.0
4	0	0	0	0.00	0.00	0	0		0	0.0	0.0
									1192.7	7.1	7.1

Pole Analysis (ASD)

Assume Pole extends up to bottom of Cab 1

Cabinet	Cab WT (psf)	Cab WT (lbf)
1	10.0	640
2	10.0	320
3		0
4		0
		960

Pole Section Properties

A =	5.58	in^2
I =	28.1	in^4
S =	8.5	in^3
Z =	11.3	in^3
r =	2.25	in
D/t =	23.7	
K =	2.1	
L =	12	ft
E/F_y =	828.57	

Column Capacity

KL/r =	134.40	***
F_e =	15.85	ksi
Q =	1	
F_{cr} =	13.89	ksi
$\Omega_b = \Omega_c$ =	1.67	
Ω_c*Pn =	46.40	kips
Ω_b*Mn =	19.74	k*ft
Unity =	**0.370**	
Deflection at Top =	0.51	in
0.025 * L =	3.6	in

*** KL/r > 200 is permitted, but not recommended.