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DESIGN CALCULATIONS

FOR

RUSSELL'S
FREESTANDING SIGN

7015 W US Hwy 90 – Lake City

GENERAL NOTES:

1. Design is in accordance with the Florida Building Code 8th Edition (2023) for use within and outside the High Velocity Hurricane Zone (HVHZ).
2. Wind loads have been calculated per the requirements of ASCE 7-22 as shown herein, except where noted otherwise.
3. These engineering calculations pertain only to the structural integrity of those systems, components, and/or other construction explicitly specified herein and/or in accompanying engineering drawings. The existing host structure (if any) is assumed to be in good condition, capable of supporting the loaded system, subject to building department approval. No warranty, either expressed or implied, is contained herein.
4. System components shall be as noted herein. All references to named components and installation shall conform to manufacturer's or industry specifications as summarized herein.
5. Where site conditions deviate from those noted herein, revisions may be required or a separate site-specific engineering evaluation performed.
6. Aluminum components in contact with steel or embedded in concrete shall be protected as prescribed in the 2020 Aluminum Design Manual. Steel components in contact with, but not encased in, concrete shall be coated, painted, or otherwise protected against corrosion.
7. Engineer seal affixed hereto validates structural design as shown only. Use of this specification by contractor, et. Al, indemnifies and saves harmless this engineer for all costs & damages including legal fees & apellate fees resulting from deviation from this design.

This item has been digitally signed and sealed by Christian Langley PE on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.
Serial: 4A 49 8F 53 22 18 30 0D 22 9D 96 67

Digitally signed by Christian Langley
Date: 2025.07.10 12:08:54 -04'00'

Index:

Engineer's signature and seal valid for pages 1 through 4

CHRISTIAN LANGLEY LICENSE No. 67382 STATE OF FLORIDA PROFESSIONAL ENGINEER

Jul 10 2025

Christian Langley PE # 67382
Easy Seals Cert Auth # 31124

ASCE 7-22 Design Wind Loads

FREESTANDING SOLID SIGNS (AT GRADE)

Building Specs

V =	130 mph	*Basic wind speed (Vult)*	ASD Load Combo Coeff:	0.6	
Exposure	C		Risk Category:	I	←***Tornado load eval not req'd***
Ae =	N/A	*Effective plan area (sqft)*			
VT =	N/A	*Tornado speed (Vult)*			
VT/V =	N/A				

Calculations

α =	9.8	*3-sec gust speed power law exponent*	Kd =	0.85	*Directionality factor*
z_g =	2460'	*Nominal ht. of atmos. boundary layer*	Kzt =	1.0	*Topographic factor*
G =	0.85		Ke =	1.0	*Ground elevation factor*
			Cf =	1.55	*Force Coefficient*
					…Width / Height ratio ≥ 0.5

V=130mph - Exp C

Signs at grade

W/Ht Ratio ≤ 0.5

SIGN HEIGHT	DESIGN WIND PRESSURES	Kh = Kz	q_z
15 ft	**± 24.7 psf**	0.85	22.1
18 ft	**± 25.7 psf**	0.88	22.9
20 ft	**± 26.2 psf**	0.90	23.4
25 ft	**± 27.5 psf**	0.94	24.5
30 ft	**± 28.5 psf**	0.98	25.5
40 ft	**± 30.2 psf**	1.04	27.0

Footing Design for Freestanding Signs

Structure Dimensions & Loading

Design wind pressure:	P =	24.7	psf	
Overturning Safety Factor:	Ω =	1.5		… FBC 1807.2.3
Sign area 1:	A1 =	37.9	sq ft	… tributary area 1 for each footer (e.g. sign)
Height of applied force above grade:	h1 =	8.2	ft	… height of area 1 centroid
Sign area 2:	A2 =	0.0	sq ft	… tributary area 2 for each footer (e.g. post)
Height of applied force above grade:	h2 =	0.0	ft	… height of area 2 centroid

Overturning Moment: Mn = P*(A1*h1+A2*h2)

Mn = 7.7 kip-ft

Round	Footing Diameter:	B =	2	ft		
	Footing depth:	d =	5.5	ft	Soil cover: ds =	0 ft

Superstructure weight:	Dr =	200	lb	
Soil cover weight:	Ds =	0	lb	… = 100pcf*π*B^2/4*ds
Footing weight:	Df =	2592	lb	… = 150pcf*π*B^2/4*d
Total weight:	D =	2792	lb	… = Dr + Ds + Df

Soil Strength

…FBC Tables 1806.2, 1819.6

Soil class:	4. Sand, silty sand, silty gravel		
Lateral bearing strength:	Plat =	150	psf/ft
Vertical bearing strength:	Pbrg =	2000	psf

Check Lateral Soil Bearing Pressures

(Empirical Method) *…FBC Sect 1807.3.2.1*

Unconstrained

(No rigid floor or pavement at ground surface)

Allowable lateral soil bearing pressure at 1/3 depth:

S_1 = 2*Plat * (d+ds)/3

S_1 = 550 psf

Total applied lateral load: Ptot = 0.94 kips

Equiv ht of applied load: heq = 8.21 ft

As = 2.34*Ptot/(S1*B)

As = 2.0 ft

dreq = As/2 * [1 + √(1+4.36*heq/As)]

dreq = 5.34 ft dreq < d **OK**

Wood Post in Flexure

Allowable Stress Design per NDS 2018

WOOD POST SPECS

G =	0.55	Southern Pine, Grade 2						
Nominal size:	8x8	b =	7.25''	d =	7.25''	Fb =	1.20	ksi
		S =	63.51	in^3		E =	1600	ksi
						Emin =	580	ksi
Cd =	1.6	Load duration factor						
Cm =	0.85	Wet service factor						
Ct =	1.0	Temperature factor	… T ≤ 100°F					
Cf =	1.0	Size factor	… included in tabulated values					
Cl =	1.0	Beam stability factor						
		le =	16.59 ft	*lu* =	16.42 ft			
		Rb =	*5.2*	*Fbe* =	*69.9*	ksi		

Allowable Bending Moment

Mr = Fb*Cd*Cm*Ct*Cf*Cl * S

Mr = 8.6 kip-ft Allowable bending moment

MEMBER LOADING

Design wind pressure:	P =	24.7	psf	End Supports: Cantiliever
Sign area:	A1 =	37.9	sq ft	… tributary area for each post (e.g. sign+post)
Eccentricity of applied force:	e1 =	8.2	ft	… distance to area centroid (weighted avg h1,h2)

Bending Moments

Mz = P*A1*e1

Mz = 7.7 **kip-ft** Bending momemt developed in member Mz < Mr **OK**