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DESIGN CALCULATIONS

FOR

CIRCLE K #9831
MID: REPL FACES AT PYLON
US HWY 90 & Centurion Ct – Lake City

GENERAL NOTES:

1. Design is in accordance with the Florida Building Code 7th Edition (2020) for use within and outside the High Velocity Hurricane Zone (HVHZ).

2. Wind loads have been calculated per the requirements of ASCE 7-16 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 2015 Aluminum Design Manual, Part 1-A. 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.

Digitally signed by Christian Langley
Date: 2022.10.10 21:59:25 -04'00'

Index:

Engineer's signature and seal valid for pages 1 through 3

CHRISTIAN LANGLEY
LICENSE
No. 67382
★
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

Oct 10 2022

Christian Langley   PE # 67382
Easy Seals   Cert Auth # 31124

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ASCE 7-16 Design Wind Loads
FREESTANDING SOLID SIGNS (ELEVATED)

Building Specs

V =	**120 mph**	*Basic wind speed (Vult)*
Exposure	**C**	

Risk Category 1 Structure

ASD Load Combo Coeff: **0.6**

Calculations

$\alpha = 9.5$ *3-sec gust speed power law exponent*

$z_g = 900'$ *Nominal ht. of atmos. boundary layer*

$G = 0.85$

K_d =	0.85	*Directionality factor*
K_{zt} =	**1.0**	*Topographic factor*
K_e =	1.0	*Ground elevation factor*
C_f =	**1.85**	*Force Coefficient*

...Width / Height ratio = 0.2 to 10

120 mph - Exp "C"
Elevated Signs
W/Ht Ratio = 0.2 to 2.0

SIGN HEIGHT	DESIGN WIND PRESSURES		$K_h = K_z$	q_z
15 ft	±	25.1 psf	0.85	16.0
18 ft	±	26.1 psf	0.88	16.6
20 ft	±	26.7 psf	0.90	17.0
30 ft	±	**29.0 psf**	0.98	18.5
35 ft	±	30.0 psf	1.01	19.1
40 ft	±	30.9 psf	1.04	19.6
45 ft	±	31.6 psf	1.07	20.1
50 ft	±	32.3 psf	1.09	20.6
55 ft	±	33.0 psf	1.12	21.0
60 ft	±	33.6 psf	1.14	21.4
70 ft	±	34.7 psf	1.17	22.1
80 ft	±	35.7 psf	1.21	22.7
90 ft	±	36.6 psf	1.24	23.3
100 ft	±	37.4 psf	1.27	23.8
110 ft	±	38.2 psf	1.29	24.3
120 ft	±	38.9 psf	1.32	24.7
130 ft	±	39.5 psf	1.34	25.1
140 ft	±	40.2 psf	1.36	25.5
150 ft	±	40.8 psf	1.38	25.9
175 ft	±	42.1 psf	1.42	26.8
200 ft	±	43.3 psf	1.46	27.5
250 ft	±	45.4 psf	1.53	28.9

Foundation Design Check (Existing Structure)

Comparison of Reactions Under Proposed Signage vs Existing Signage

Structure Dimensions & Loading

Design wind pressure:	$P =$	29.0	psf	
Overturning Safety Factor:	$\Omega =$	1.5		... FBC 1807.2.3

Existing Signage

Sign area 1:	$A1 =$	73.2	sq ft	... tributary area 1 for each footer (e.g. sign)
Height of applied force above grade:	$h1 =$	15.8	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:

$$Mne = P*(A1*h1+A2*h2)$$

Mne =   **33.6**   **kip-ft**

Proposed Signage

Sign area 1:	$A1 =$	73.2	sq ft	... tributary area 1 for each footer (e.g. sign)
Height of applied force above grade:	$h1 =$	15.8	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:

$$Mnp = P*(A1*h1+A2*h2)$$

Mnp =   **33.6**   **kip-ft**   **Mnp < Mne**   **OK**