JONES
ENGINEERING & CONSULTING, LLC

# WIND LOAD CALCULATIONS

# FOR

## CAMBRIDGE PREP ACADEMY

## SIGN REPLACEMENT

## PROJECT NO.: J221127CPA

**January 29, 2023**

Columbia County Building Department
Plans Reviewed for Code Compliance
State of Florida

**GENERAL NOTES**

1. WHERE SITE CONDITIONS DEVIATE FROM THOSE NOTED HEREIN, REVISIONS MAY BE REQUIRED OR A SEPARATE SITE-SPECIFIC ENGINEERING EVALUATION PERFORMED.

2.DESIGN IS IN ACCORDANCE WITH THE FLORIDA BUILDING CODE 7TH EDITION (2020).

3.WIND LOADS HAVE BEEN CALCULATED PER THE REQUIREMENTS OF ASCE 7-16 AS SHOWN HEREIN, EXCEPT WHERE NOTED OTHERWISE.

4.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.

5.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.

6.ALUMINUM COMPONENTS IN CONTACT WITH STEEL OR EMBEDDED IN CONCRTE 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. AI, INDEMNIFIES AND SAVES HARMLESS THIS ENGINEER FOR ALL COSTS & DAMAGES INCLUDING LEGAL FEES & APPELLATE FEES RESULTING FROM DEVIATION FROM THIS DESIGN.

Christopher L Jones
2023.01.29 20:59:48
-05'00'

CHRISTOPHER LANCE JONES
LICENSE
No. 88477
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

This item has been digitally signed and sealed by C. Lance Jones, 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.

**CHRISTOPHER LANCE JONES, PE**
**FLORIDA REGISTRATION NO.: 88477**

Job # J221127CPA
Project Cambridge Prep Academy Sign Replacement
Job Location 2658 SW Main Boulevard
Lake City, FL 32025
20'-0" Pole Sign, 6' x 14' Cabinet and 3' x 8' Cabinet
# of Supports 2

**INPUT DATA**

| | | | |
|---|---|---|---|
| Exposure Category (B, C, or D) | = | C | |
| Risk Category | = | II | |
| Ultimate Design Windspeed | $V_{ULT}$ = | 120 | MPH |
| Nominal Design Windspeed | $V_{ASD}$ = | 93 | MPH |
| Topographic Factor | $K_{zt}$ = | 1.00 | FLAT |
| Wind directionality factor (Table 26.6-1, page 266) | $K_d$ = | 0.85 | |
| $K_z$ = velocity pressure exposure coefficient (Table 26.10-1) | $K_z$ = | 0.91 | |
| $K_e$ = ground elevation factor, see (Table 26.9-1, page 268) | $K_e$ = | 1.00 | |
| Gust effect factor (Sec. 26.11-1, page 269) | G = | 0.85 | |
| Net force coefficient (Fig. 29.3-1, page 323) | $C_f$ = | 1.8 | |
| **Velocity Pressure at height h (Eq. 26.10-1 page 268)** | **qz = .00256kz*kzt*kd*V2 =** | **28.51** | PSF |
| **Max horizontal wind pressure =** | **$p = q_z G C_f$ =** | **43.63** | PSF |
| Height of the sign | h = | 20 | FT |
| Average Vertical dimension (for wall, s = h) | s = | 6 | FT |
| Horizontal dimension | B = | 14 | FT |

**ANALYSIS**

ASCE 7-10, Load Case = 0.6W +D

| | | | |
|---|---|---|---|
| Allowable Stress Design Wind Factor | ϕ = | 1 | |
| Design Wind Pressure | ϕ x p = | 43.63 | PSF |

| Sign | Top Elev. (FT) | Height (FT) | Length (FT) | Centroid (FT) | $Area_{Trib}$ ($FT^2$) | P = Force (LBS) | Moment (FT-LBS) |
|---|---|---|---|---|---|---|---|
| Top Sign | 20.00 | 6.00 | 14.00 | 17.00 | 42.00 | 1832 | 31150 |
| Bottom Sign | 14.00 | 3.00 | 8.00 | 12.50 | 12.00 | 524 | 6544 |
| Poles | 14.00 | 14.00 | 1.67 | 7.00 | 11.67 | 509 | 3563 |
| | | | | | **Totals** | **2865** | **41256** |

**FOOTING DESIGN (NON CONSTRAINED 1807.3.2.1)**

| | | | |
|---|---|---|---|
| Lateral Load = P | P = | 2864.83 | LBS |
| Height of applied force above grade = h | h = | 14.40 | FT |
| Base Diameter = | b = | 3.92 | FT |
| Soil Pressure = | qb = | 150.00 | PSF/FT |
| Trial Depth = | d = | 5.67 | FT |
| S1 = | S1 = | 567.00 | PSF/FT |
| $A = (2.34P/(S_1 b)$ | A = | 3.02 | FT |
| Required Embedment Depth = $d = 0.5A \{1+ [1 + (4.36\ h/A)]^{\wedge 1/2}\}$ | d = | 5.40 | FT |
| | **Design Depth =** | **6.00** | **FT** |

**Note: Used allowable stress design wind factor of 1 instead of 0.6 due to unknowns**

**FOUNDATION DESIGN CHECK AGAINST EXISTING STRUCTURE**

**EXISTING STRUCTURE DIMENSIONS & LOADING**

| | | | |
|---|---|---|---|
| **Design Wind Pressure** | P = | 28.19 | PSF |
| **Overturning Safety Factor** | FS = | 1.5 | |

**Existing Signage Area and Location of Applied Load**

| | | | |
|---|---|---|---|
| Top | A1 = | 42.00 | SF |
| | h1 = | 28.00 | FT |
| Bottom | A2 = | 23.25 | SF |
| | h2 = | 9.00 | FT |
| Pole | A3 = | 20.83 | SF |
| | h3 = | 12.50 | FT |

**Overturning Moment = Me = P*(A1h1 + A2h2 + A3h3)**

**Me = 46391.34 FT-LB**

**PROPOSED STRUCTURE DIMENSIONS & LOADING**

| | | | |
|---|---|---|---|
| **Design Wind Pressure** | P = | 26.18 | PSF |
| **Overturning Safety Factor** | FS = | 1.5 | |

**Proposed Signage Area and Location of Applied Load**

| | | | |
|---|---|---|---|
| Top | A1 = | 42.00 | SF |
| | h1 = | 17.00 | FT |
| Bottom | A2 = | 12.00 | SF |
| | h2 = | 12.50 | FT |
| Pole | A3 = | 11.67 | SF |
| | h3 = | 7.00 | FT |

**Overturning Moment = Me = P*(A1h1 + A2h2 + A3h3)**

**Mp = 24757.55 FT-LB**

**Mp < Me OK**

**FS = 1.87**