PEAK Engineering & Construction Consulting, LLC
P.O. Box 238121, Port Orange, FL 32123-8121
Phone: (808) 264-7214
Email: dustin.dipersia@gmail.com

Name:	Don Bell Signs
Project:	City of South Daytona (2200807) - Gateway Entry Sign
Description:	**Column / Pole Design and Footing Design**

Specifications:

1. 2020 Florida Building Code, 7th Edition
2. ACI 318-08, ASCE 7-16
3. ASTM F1554 Grade 36, ASTM A307 Anchor Bolts, (Heavy Hex on Bottom, not "L" bolts, UNO)
4. ASTM A36 Structural Steel
5. ASTM A325 Connection Bolts, Snug Tight
6. ASTM A500 Grade B, Structural Steel Tubing, F_y = 46 ksi
7. ASTM A449 Hex Cap Screws, Bolts & Studs, Steel, Heat Treated, Fy = 120, 105, 90 minimum
8. Will comply with National Electrical Coded (NEC) 2017
9. ASTM 6053, 6061-T6 Structural Aluminum Tubing, F_y = 20 ksi min.
10. ASTM A53, Grade B, Type E or S, Structural Piping, F_y = 35 ksi
11. Rebar, Grade 60 for #6 or Larger, Grade 40 for #5 or Smaller
12. ASTM A992 / A572 Grade 50 - Standard I-Beams, F_y = 50 ksi
13. ASTM A307 Carbon Steel Bolts & Studs
14. ASTM C-920 Elastomeric Joint Sealant
15. Digital Signatures (F.A.C. 61G15-23.004): This item has been electronically signed and sealed by Dustin DiPersia, PE, on this date using a Digital Signature. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

CERTIFICATION: To the best of my knowledge, I certify this analysis meets structural requirements of: 2020 Florida Building Code, 7th Edition

LIMITATION: Valid for two (2) signs, at specified location. In case of conflict, structural requirements, scope of work, and installer, mfg, owner responsibilities control.

THIS SEAL FOR STRUCTURAL ONLY
DUSTIN DIPERSIA, P.E. FL 77276
CERTIFICATE OF AUTHORIZATION: 33209

Dustin Lee DiPersia LICENSE No 77276 STATE OF FLORIDA PROFESSIONAL ENGINEER

Digitally signed by Dustin L DiPersia
Date: 2023.03.09 12:36:01 -06'00'

Signature:
Date: 3/9/2023

Printed Date:	3/9/2023
Drawn By:	Dustin DiPersia, P.E.
Checked By:	Dustin DiPersia, P.E.

Special Notes:
1.Sign Location: US 1, South Daytona, FL
2. Column Specs 1: 4.50" O.D. X 0.25", fy = 29.1 ksi - 6061-T6 Aluminum
3. Requ. Foot. Size = 2.00 ft dia. @ 3.25 ft depth
4. Assumed soil bearing capacity = 2200 psf, sides = 200 psf per foot depth (Field Verify)

Assumption:

1. Design Wind Speed, V_{ult} =	140 mph	Per 2020 FBC Wind Maps
2. Concrete Strength, f_c' =	3000 psi	min. compressive strength
3. Wind Loads Per =	ASCE 7-16	
4. Wind Exposure =	C	Verify in Field
a) Z_g =	900	ASCE 7-16
B) α =	9.5	ASCE 7-16
C) K_d =	0.85	ASCE 7-16
5. Risk Category =	II	MRI = 900 years
a) I =	1.00	ASCE 7-16, For Category II Buildings

6. Columns / Pipes = 4.50" O.D. X 0.25", f_y = 29.1 ksi - 6061-T6 Aluminum

a) d =	0.250 in				
b) O.D. =	4.500 in				
c) I.D. =	4.000 in	f) # Columns =	4		
d) S_{act} =	3.36 in3	=	204.15 lbs	X 4 =	204.15 lbs
e) Weight =	3.93 lbs / ft			**Total Weight =**	**204.15 lbs**

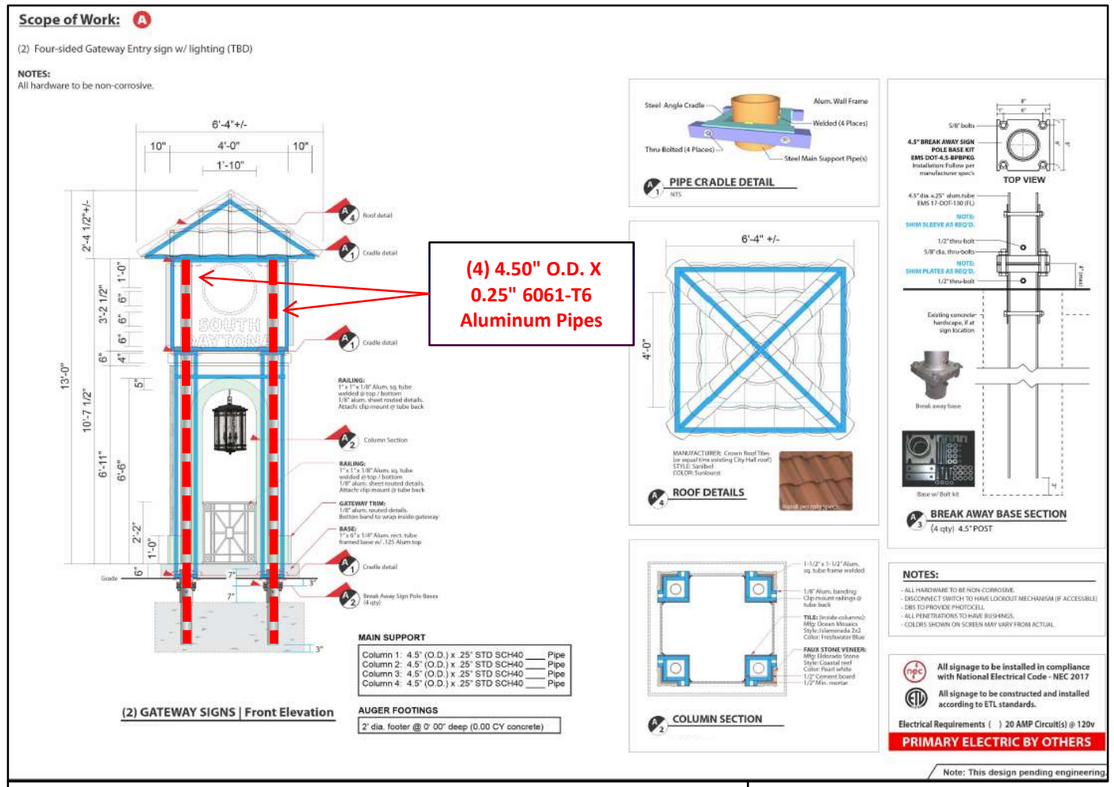
7. Sign Dimensions =

	Height (ft)	Width (ft)	Area (ft^2)	Each	Area$_T$ (ft^2)
a) Adv. Cabinet1 =	13.00	4.00	52.00	1	52.00
b) Adv. Cabinet2 =	0.00	0.00	0.00	1	0.00
c) Adv. Cabinet3 =	0.00	0.00	0.00	1	0.00
				Total Area =	**52.00 ft2**

8. Sign Weight =

	Unit Weight (lb/ft^2)		Weight (lbs)
a) Adv. Cabinet1 =	3.00	=	156.00
b) Adv. Cabinet2 =	3.00	=	0.00
c) Adv. Cabinet3 =	5.00	=	0.00
		Total Weight =	**156.00 lbs**

9. Soil must be verified by sign installer. Calculations are based off the assumption that the soil bearing capacity is a minimum of 2200 psf and sides of 200 psf per foot depth (1.3 for wind). If there is a question about bearing capacity of the soil, it is recommended that a soil test be performed before sign installation. (Field Verify)



Footing Option:
2'-0" Diameter Footing @ 3'-3" (1.70 CU YDS Concrete)

NOT TO SCALE

Drawing Sheet S-1

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Name:	Don Bell Signs
Project:	City of South Daytona (2200807) - Gateway Entry Sign
Description:	**Additional Details**

Specifications:

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Printed Date:	3/9/2023
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Checked By:	Dustin DiPersia, P.E.

Special Notes:
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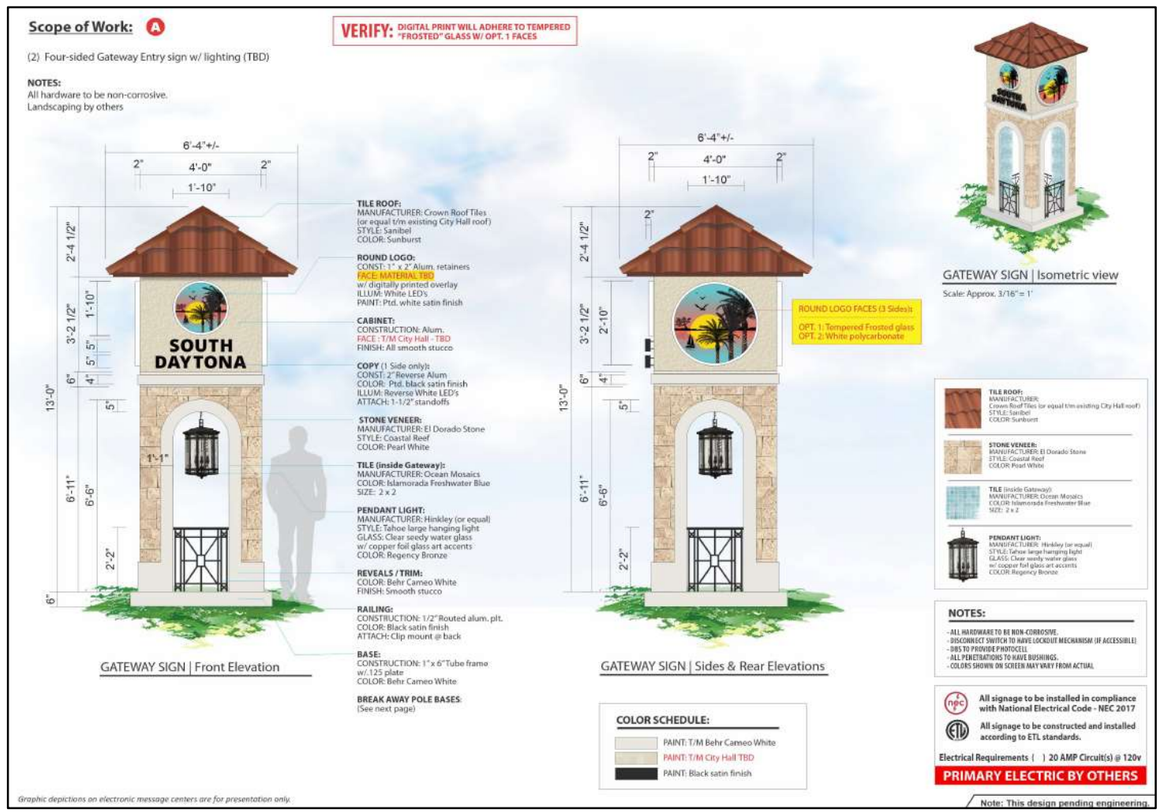
3. Requ. Foot. Size = 2.00 ft dia. @ ##########
4. Assumed soil bearing capacity = 2200.00 psf, sides = 200 psf per foot depth (Field Verify)

Details:



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Drawing Sheet S-2

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Name:	Don Bell Signs
Project:	City of South Daytona (2200807) - Gateway Entry Sign
Description:	**Additional Details**

Specifications:

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Signature:
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Printed Date:	3/9/2023
Drawn By:	Dustin DiPersia, P.E.
Checked By:	Dustin DiPersia, P.E.

Special Notes:
1.Sign Location: US 1, South Daytona, FL
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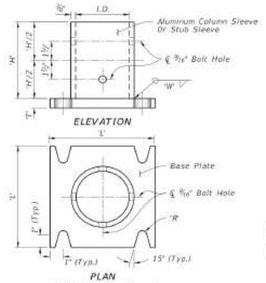
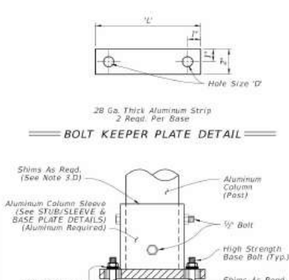
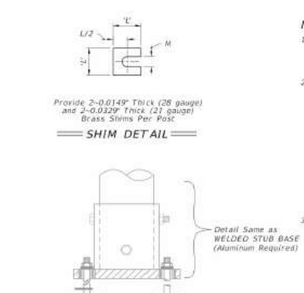
3. Requ. Foot. Size = 2.00 ft dia. @ ##########
4. Assumed soil bearing capacity = 2200.00 psf, sides = 200 psf per foot depth (Field Verify)

Details:

FDOT Breakaway Base







SLIP BASE DETAILS

Column (Post) Size		SLIP BASE DETAILS											
Outside Dia.	Wall Thickness	Sleeve I.D. (Max.)	Sleeve Height 'H'	Weld 'W'	Base Plate 'L'	Base Plate 'T'	Radius 'R'	Base Bolt Size	Base Bolt Length	Base Plate Torque ft-lbs	Base Plate Torque in-lbs	Hole Size 'D'	SHIM L	SHIM W
4"	¼"	4 1/16"	6"	½"	8"	⅜"	1 11/32"	⅝"	3"	29	345	1 1/16"	1 15/16"	1 15/16"
4½"	¼"	4 9/16"	6"	½"	8"	⅜"	1 11/32"	⅝"	3½"	29	345	1 1/16"	1 15/16"	1 15/16"
5"	¼"	5 1/16"	7"	½"	8"	⅜"	1 11/32"	⅝"	3½"	29	345	1 1/16"	1 15/16"	1 15/16"
6"	¼"	6 1/16"	8"	½"	9"	1"	1 13/32"	¾"	3½"	46	554	1 5/16"	1 15/16"	1 15/16"
8"	¼"	8 1/16"	10"	½"	11"	1"	1 13/32"	⅞"	3½"	53	640	1 5/16"	2½"	1 15/16"

SLIP BASE AND FOUNDATION DETAILS

NOT TO SCALE

Drawing Sheet S-3

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Name:	Don Bell Signs
Project:	City of South Daytona (2200807) - Gateway Entry Sign
Description:	**Calculate Wind Loads**

CERTIFICATION: To the best of my knowledge, I certify this analysis meets structural requirements of: 2020 Florida Building Code, 7th Edition

LIMITATION: Valid for two (2) signs, at specified location. In case of conflict, structural requirements, scope of work, and installer, mfg, owner responsibilities control.

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Signature
Date: 3/9/2023

Printed Date: 3/9/2023
Drawn By: Dustin DiPersia, P.E.
Checked By: Dustin DiPersia, P.E.

Special Notes:
1.Sign Location: US 1, South Daytona, FL
2. Column Specs 1: 4.50" O.D. X 0.25", fy = 29.1 ksi - 6061-T6 Aluminum
3. Requ. Foot. Size = 2.00 ft dia. @ 3.25 ft depth
4. Assumed soil bearing capacity = 2200.00 psf, sides = 200 psf per foot depth (Field Verify)

Sign Dimensions:
1. Sign Height, H, Z & s = 13.00 ft
2. Width, B = 4.00 ft
3. Height off Ground, h = 0.00 ft if h = 0, s = h

Analysis:

1. Wind Loads, ASCE 7-16

>Wind Force

a) Velocity Pressure, VP = $0.00256\ x\ Kz\ x\ Kzt\ x\ Kd\ x\ V^2$ x I, where

K_z = velocity pressure exposure coefficient = 0.85
K_{zt} = topographic speed up factor = 1.00
K_d = wind directional factor = 0.85
V = wind velocity = 140 mph
I = Importance Factor = 1.00

For Z < 15 ft: $K_z = 2.01(\frac{15}{Z_g})^{2/\alpha}$

For 15 ≤ Z ≤ Z_g: $K_z = 2.01(\frac{Z}{Z_g})^{2/\alpha}$

, where

Z = height above ground level
Z_g & α = terrain exposure constants (ASCE 7-16)

Therefore.... **Velocity Pressure = 36.20 psf**

b) Factored Wind Pressure, WP = $VP\ x$ G x C_f, where

G = gust-effect factor (0.85 for rigid struct) = 0.85
(otherwise use Equ. 26.9-6, ASCE 7-16)
C_f = force coeff (Fig. 29.4-1, ASCE 7-16) = 1.70
a) aspect ratio = B/s = 0.31
b) clearance ration = s/h = 1.00

Therefore.... **Factored Wind Pressure = 52.32 psf**

c) Wind Force, WF = $WP\ x$ A x $\frac{x^2}{L^2}$, where

x = 2/3 x L = 8.67 ft
A = area of sign = 52.00 sf

Therefore....

Wind Force (Shear Force) =	**1209.07 lbs**
Sign Weight (Axial Force) =	**360.15 lbs**

>Moment At Grade

a) Moment, M = $WF\ x$ h, where

h = moment arm = 0.5H = 6.50 ft

Therefore....

Moment at Sign Bottom =	**10.20 kips-ft**

2. Sign Column Bending, S (Section Modulus)

$$S = \frac{M}{f_b\ x\ NC}$$

M = Moment = 10.20 kips-ft
f_b = yield strength = 29.1 ksi
NC = # of Columns = 4.00

Therefore....

Bending, S_{req} =	**1.051 in3**
Bending, S_{act} =	**3.361 in3**
Sact < Sreq	**(OK)**

Data Taken From Machinery Handbook

Pipe Size = 4.500 in X 0.2500 in Rd. Aluminum Pipe, S = 3.3611 in3

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Drawing Sheet S-4

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Name:	Don Bell Signs
Project:	City of South Daytona (2200807) - Gateway Entry Sign
Description:	**Footing Design for Monument Sign**

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Drawn By:	Dustin DiPersia, P.E.
Checked By:	Dustin DiPersia, P.E.

Special Notes:
1.Sign Location: US 1, South Daytona, FL
2. Column Specs 1: 4.50" O.D. X 0.25", fy = 29.1 ksi - 6061-T6 Aluminum
3. Foot. Size = 2.00 ft dia. @ 3.25 ft depth
4. Assumed soil bearing capacity = 2200.00 psf, sides = 200 psf per foot depth (Field Verify)

Assumptions:

1. Unit Weight, Γ_{SAND} =	105.00 lbs / ft3
2. Friction Angle, ϕ =	30 degrees
3. Soil Bearing Capacity, q_s =	2200.00 lbs / ft2
4. Factor of Safety =	3.00

Analysis:

1. Broms Method

> Shear Force

$V_x = WF\frac{x^2}{L^2}$, where

W = Total Wind Force = 1209.07 lbs
x = $\frac{2}{3}$ x L = 8.67
L = Total Height of Sign = 13.00

Therefore... V_x = 537.37 lbs / 4 Columns = 134.34 lbs

> Diameter, D = $D = \frac{2Vx(e+L)}{\Gamma L^3 K_p}$, where

Diameter of Footing, D = 2.00 ft
Shear Wind Force, V_x = 134.34 lbs
Moment Arm, e = 6.50 ft
Requ. Embedment Depth, L_R = 3.25 ft
Exist Embed Depth, L_E = N/A
Unit Weight of Sand, Γ = 105.00 lbs / ft3
Passive Earth Coef., Kp = $K_p = 1 - sin\emptyset$ = 0.5
Depth Check = OK

Therefore... Required Dia. = 2.00 ft
Exist. Dia. = N/A

Therefore...

Footing Depth =	**3.25 ft**
Footing Diameter =	**2.00 ft**
Volume of Concrete =	**1.66 CU YDS**

X 145 lbs / ft^3 = 6514.11 lbs

> Bearing Pressure

$q_{actual} = \frac{W_{TOTAL} + \Pi r^2 X d X \Gamma_c}{\Pi r^2}$, where

$W_{TOTAL} = W_{SIGN} + W_{FOOTING} + W_{POLES}$ = 1718.56 lbs
r = 1.00 ft
$\Gamma_{concrete}$ = 145.00 pcf

q_{actual} = 275.0 lbs / ft2

$q_{allowable} = q_s[1+0.20(d-1)]$, where

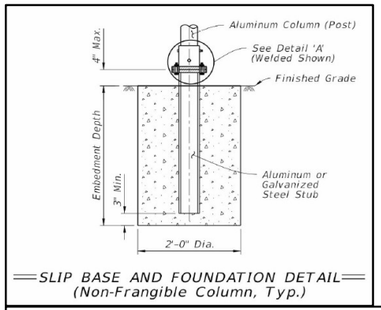
Soil Bearing Capacity, q_s = 2200.0 lbs / ft2

$q_{allowable}$ = 1063.3 lbs / ft2

Therefore... **$q_{allowable} > q_{actual}$ OK**

Footing Size = 2.00 ft dia. @ 3.25 ft depth

Footing Options:



SLIP BASE AND FOUNDATION DETAIL (Non-Frangible Column, Typ.)

Required Footing Option:
2'-0" Diameter Footing @ 3'-3" (1.70 CU YDS Concrete)

Notes:
1. In the event utilities are encountered during footing excavation/installation, stop work immediately & notify the engineer.
2. In the event utilities are encountered, there will be two options:
   a. Bottom of footing to be 3'-6" min. (horizontal distance) from top of pipe(s).
   b. Concrete encase utilities according to engineer's recommendation.
3. In the event construction debris andor other delitarious material encountered during footing excavation/insatllation, stop work immediately & notify the engineer.
4. Refer to 9. on S-1 for soil bearing capacity requirements. Soil must be capacted to RC = 98% min. around footing to extent 4' beyond footing diameter.
5. Concrete Volume calculations are based on neatline footings. Additional concrete may be necessary. Contractor will need to verify actual concrete volumes required.
6. In the event the footing to be hand dug and, therefore; the diameter is an approximation & not an exact shape.
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