Easy Seals
easyseals.com

DESIGN CALCULATIONS

FOR

BURGER KING
Clearance Bar
Columbia County, FL

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.

Index:

Engineer's signature and seal valid for pages 1 through 5

Aug 30 2021

Christian Langley PE # 67382
Easy Seals Cert Auth # 31124

ASCE 7-16 Design Wind Loads

FREESTANDING SOLID SIGNS AND WALLS (AT GRADE)

Building Specs

V =	120 mph	*Basic wind speed*
Exposure	C	

Risk Category 1 Structure

ASD Load Combo Coeff: 0.6

Calculations

α =	9.5	*3-sec gust speed power law exponent*
z_g =	900'	*Nominal ht. of atmos. boundary layer*
G =	0.85	

Kd =	0.85	*Directionality factor*
Kzt =	1.0	*Topographic factor*
Ke =	1.0	*Ground elevation factor*
Cf =	1.55	*Force Coefficient*

...Width / Height ratio ≥ 0.5

120 mph - Exp "C"

Monuments at grade

W/Ht Ratio ≤ 0.5

SIGN HEIGHT	DESIGN WIND PRESSURES	Kh = Kz	q_z
15 ft	± 21.0 psf	0.85	16.0
18 ft	± 21.8 psf	0.88	16.6
20 ft	± 22.3 psf	0.90	17.0
30 ft	± 24.3 psf	0.98	18.5
35 ft	± 25.1 psf	1.01	19.1
40 ft	± 25.8 psf	1.04	19.6
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60 ft	± 28.2 psf	1.14	21.4
70 ft	± 29.1 psf	1.17	22.1
80 ft	± 29.9 psf	1.21	22.7
90 ft	± 30.7 psf	1.24	23.3
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200 ft	± 36.3 psf	1.46	27.5
250 ft	± 38.0 psf	1.53	28.9

Footing Design for Freestanding Signs and Flagpoles

Structure Dimensions & Loading

Design wind pressure:	P =	21.0	psf	
Overturning Safety Factor:	Ω =	1.5		… FBC 1807.2.3
Sign area 1:	A1 =	10.5	sq ft	… tributary area 1 for each footer (e.g. sign)
Height of applied force above grade:	h1 =	4.5	ft	… height of area 1 centroid
Sign area 2:	A2 =	4.6	sq ft	… tributary area 2 for each footer (e.g. post)
Height of applied force above grade:	h2 =	8.8	ft	… height of area 2 centroid

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

Mn = 1.9 kip-ft

Round — Footing Diameter: B = 3 ft

Footing depth: d = 3.5 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 =	3711	lb	… = 150pcf*π*B^2/4*d
Total weight:	D =	3911	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 = 350 psf

Total applied lateral load: Ptot = 0.32 kips

Equiv ht of applied load: heq = 5.81 ft

As = 2.34*Ptot/(S1*B)

As = 0.7 ft

dreq = As/2 * [1 + √(1+4.36*heq/As)]

dreq = 2.51 ft — dreq < d **OK**

Hollow Structural Pipe in Bending

Allowable Stress Design per 2016 AISC Spec for Structural Steel Buildings

Material Properties

Yield Stress, A53 Grd B Steel:	Fy =	35	ksi	Safety Factor =	1.67	Per Section B3.4
Modulus of Elasticity:	E =	29000	ksi			
				End Supports:	Cantilever	

Member Properties

ANSI 4" Schedule 40 steel pipe

Nominal size:	4" diam	-	Sch 40				
Outside Diameter	d =	4.5	in	Moment of Inertia:	Ix =	7.2	in^4
Wall Thickness	t =	0.237	in	Section Modulus:	S =	3.21	in^3
				Deflection Limit:	Defl =	L / 80	

Design wind pressure:	P =	21.0	psf	
Sign area:	A1 =	15.2	sq ft	... tributary area for each post (e.g. sign+post)
Eccentricity of applied force:	e1 =	5.8	ft	... distance to area centroid (weighted avg h1,h2)

(1): Yielding Limit State

Mn = Fy*S — Allowable Moment: Mallow = Mn / 1.67

Mn = 112.5 kip-in — Mallow = 67.4 kip-in

Check Member Bending

Moment in member: Mmax = P*A1*e1

Mmax = 22.2 kip-in — Mmax < Mallow ... **OK**

Check Member Deflection:

Allowable Deflection: Δ_{allow} = 0.87 in — L / 80

Deflection in member: Δ_{max} = P*(A*e^3) / (3*E*I)

Δ_{max} = 0.17 in — Δmax < Δallow ... **OK**

Cast-in-Place Concrete Anchor Bolts

ACI 318-14, Appendix "D"

Required Strength:

Wind pressure:	W =	21.0	psf	Tributary area:	A =	15.2	sqft	
Dead load:	D =	0	lb	Load eccentricity:	e =	5.8	ft	
ASCE 7-10, 2.3.2:	U =	(1.2)D + (1.0)W		**Mu =**	**1.85**	**kip-ft**	… = [(1.2)D+(1.0)W]*A*e	

Anchor & Concrete Specs:

				Concrete:	f'c =	2500	psi	
Anchor bolt size:	1"		da = 1.0 in		nt =	8	threads/in	
Anchor material:	SAE Grade 2 / A307				futa =	74	ksi	
Embedment:	hef =	24	in	Edge distance:	ED =	12.25	in	
Qty anchors in group:	Q =	2	anchors	Anchor group offset:	a =	11.5	in	

Anchor Strength:

Steel: $\phi s = 0.75$

Tension: $U \le 0.75\,\phi\,Nn$ — Conc, no suppl reinf: $\phi c = 0.70$

Steel Strength:

$Ase = \pi/4*(da-0.9743/nt)^2$ $\quad Nsa = Ase*futa$

$Ase = 0.61\ in^2$ $\quad Nsa = 44.8\ kips$ $\quad$ **$\phi s*Nsa = 33.6$ kips**

Concrete Breakout:

$Anc = [ED+s+1.5*hef]*[ED+1.5*hef]$ $\quad Anco = 9*hef^2$

$Anc = 2328\ in^2$ $\quad Anco = 5184\ in^2$

$Nb = kc*\lambda*\sqrt{f'c}*hef^{1.5}$ $\quad$ Cracked Concrete: $\quad \Psi c = 1.0$

$Nb = 141.1$ kips $\quad$ Cast-in anchors: $\quad \Psi cp = 1.0$

Limit = $16*\lambda*\sqrt{f'c}*hef^{(5/3)}$ = 159.8 kips $\quad \Psi ed = 0.7 + 0.3*ED/(1.5*hef)$ $\quad \Psi ed = 0.8$

$kc = 24$ …cast-in anchors $\quad$ No eccentricity between anchors: $\quad \Psi ec = 1.0$

$\lambda = 1.0$ … normal weight concrete

Concrete breakout strength: $\quad Ncb = (Anc/Anco)*\Psi c*\Psi cp*\Psi ed*\Psi ec*Nb$

$Ncb = 50.8$ kips $\quad$ **$\phi c*Ncb = 35.6$ kips**

Concrete Pullout:

Hooked Bar / Stud: $\quad$ Hook length: $eh = 2$ in

$Np = 0.9*f'c*eh*da$

$Np = 4.5$ kips $\quad$ Cracked Concrete: $\quad \Psi c,p = 1.0$

Concrete pullout strength: $\quad Npn = \Psi c.p*Np$

$Npn = 4.5$ kips $\quad$ **$\phi c*Npn = 3.2$ kips**

Concrete Blowout:

Hooked Bar / Stud: $\quad Nsb =$ N/A (No headed stud)

Concrete blowout strength: $\quad Nsb =$ N/A $\quad$ **$\phi c*Nsb =$ N/A**

Critical Anchor Strength:

$\phi Nn = \min(\phi s*Nsa, \phi c*Ncb, \phi c*Npn, \phi c*Nsb)$ $\quad$ **$\phi Nn = 3.2$ kips**

$\phi Mn = Q*\phi Nn*a$

$\phi Mn = 6.0$ kip-ft $\quad Mu \le 0.75\,\phi\,Mn$ $\quad$ **1.85 kip-ft < 4.5 kip-ft** $\quad$ OK

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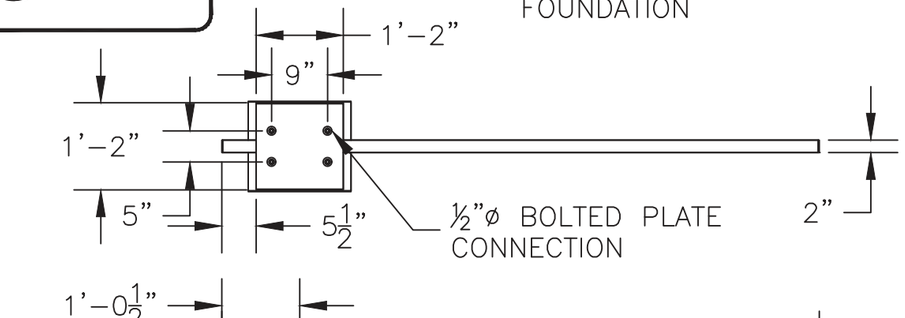
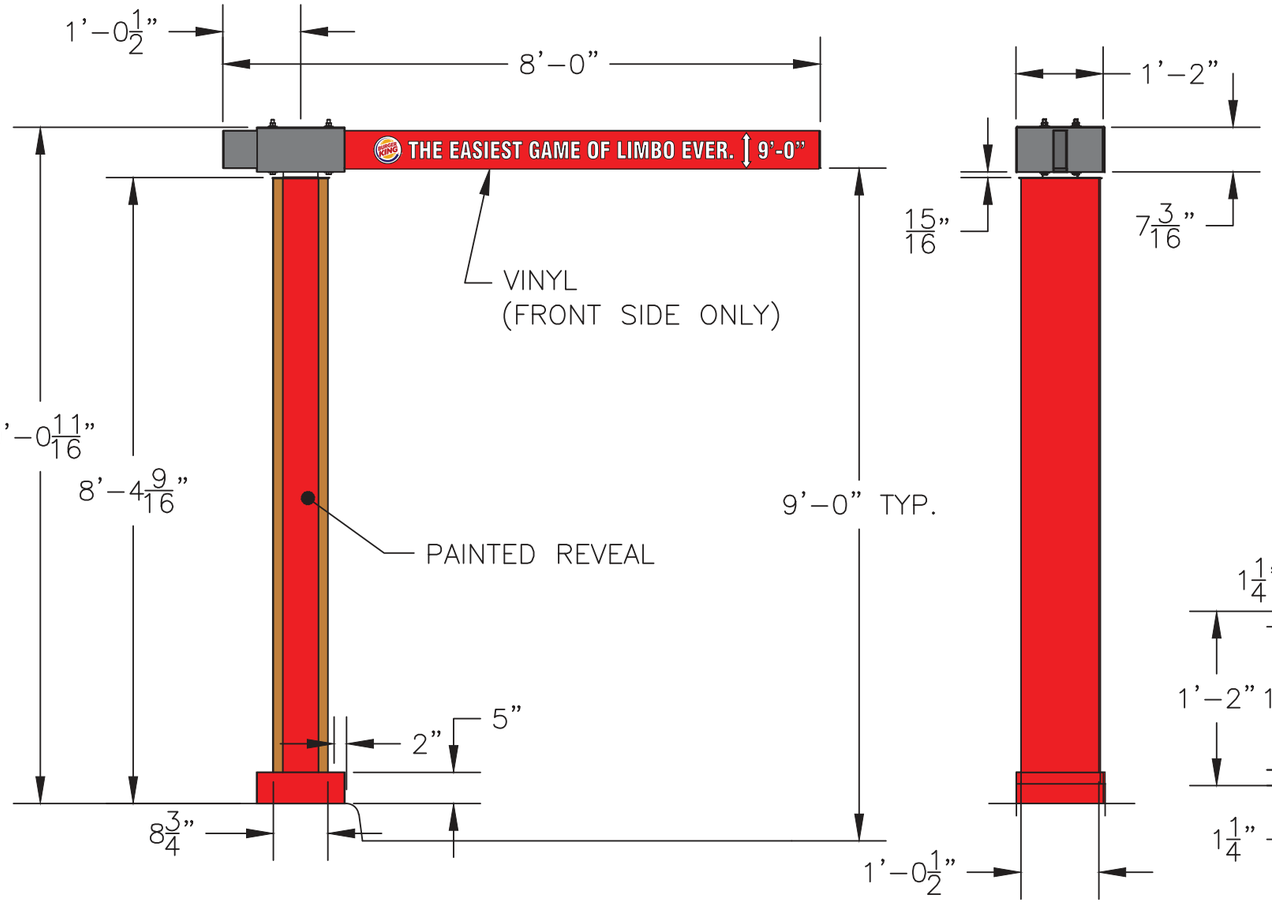
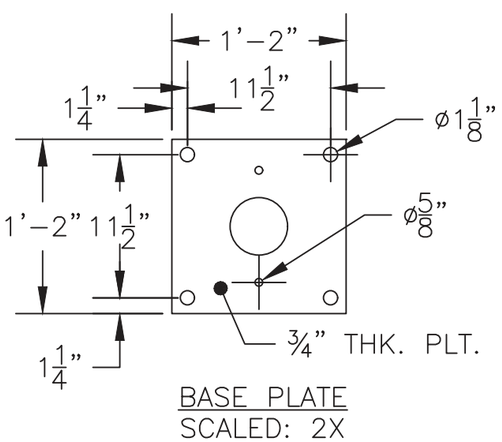
NOTE:
CLADDING/ STEEL SUPPORT: STEEL CONTINGENT ON ENGINEERS SPEC. AND WIND LOAD REQUIREMENTS STEEL BASE PLATE W/STEEL ANCHOR BOLTS AND CONCRETE FOUNDATION



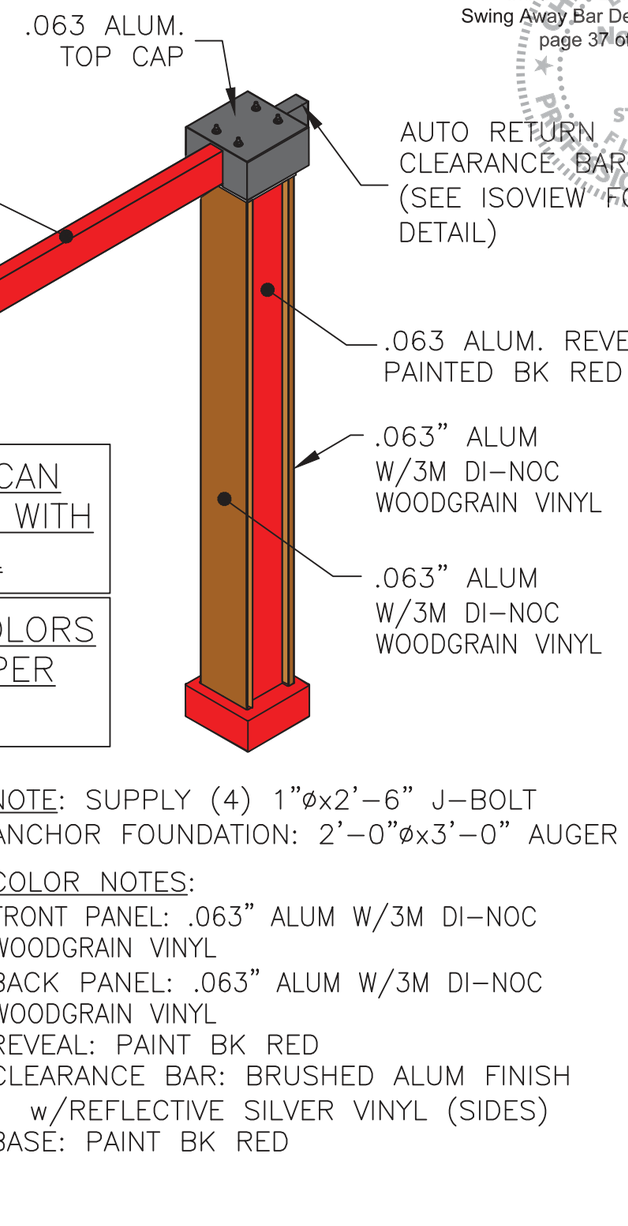


FRONT VIEW

RIGHT VIEW



BASE PLATE
SCALED: 2X



CLEARANCE BAR CAN ONLY BE REMOVED WITH BKC APPROVAL

CLEARANCE BAR COLORS TO MATCH OCU PER LOCATION

NOTE: SUPPLY (4) 1"øx2'–6" J–BOLT
ANCHOR FOUNDATION: 2'–0"øx3'–0" AUGER

COLOR NOTES:
FRONT PANEL: .063" ALUM W/3M DI–NOC WOODGRAIN VINYL
BACK PANEL: .063" ALUM W/3M DI–NOC WOODGRAIN VINYL
REVEAL: PAINT BK RED
CLEARANCE BAR: BRUSHED ALUM FINISH w/REFLECTIVE SILVER VINYL (SIDES)
BASE: PAINT BK RED

Note: BURGER KING® or BURGER KING® Buns and Crescent Logo to use "®" for all locations globally. All other marks will use "TM".

® ® ®

Project Information
BURGER KING COLUMBIA COUNTY, FL
Custom Exterior Signage Systems
File Burger King Design Doc RFP #1 Design – Date. 12/8/2011

Client Review Status
Burger King requires that an "☑ Approved" drawing be obtained from the client prior to any production release or production release revision.

☐ Approved
☐ Revise & Resubmit

Name
Title Date

Clearance Bar with Swing Away Bar Design
page 37 of 105

CHRISTIAN LANGLEY LICENSE 67382 STATE OF FLORIDA PROFESSIONAL ENGINEER
AUG 30 2021
ENGINEER'S SIGNATURE

Christian Langley
Florida PE #67382
Cert of Auth #31124
1200 N Federal Hwy, #200
Boca Raton, FL 33432
1-888-371-3113

Solid freestanding sign at grade:
• Cf=1.55 (w/h ratio ≥ 1/2) ± 21.0 psf
• Sign Height = 15 ft max
• Kzt=1.0, Kd=0.85, G=0.85
• Risk Category 1 Struct.
• ASD Load Coeff = 0.6
• V=120 mph
• Exposure 'C'

ASCE 7-16
WIND LOADS:

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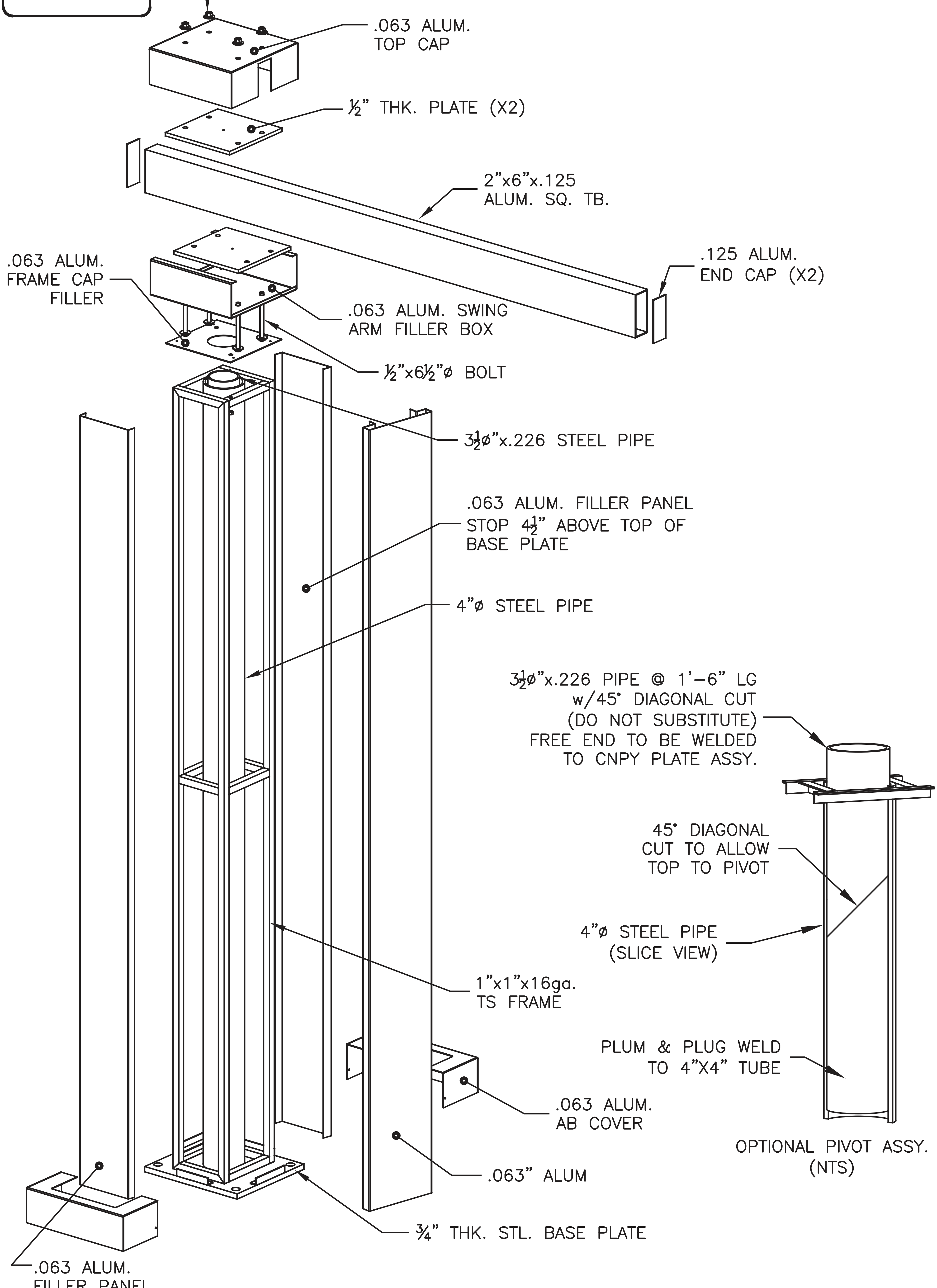
SCALE 1:10



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Title
Date

ASCE 7-16 WIND LOADS: • V=120 mph • Exposure 'C' • Risk Category 1 Struct. • ASD Load Coeff = 0.6 • Sign Height = 15 ft max • Kzt=1.0, Kd=0.85, G=0.85 Solid freestanding sign at grade: • Cf=1.55 (w/h ratio ≥ 1/2) **± 21.0 psf**

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REV	DATE	DESCRIPTION	BY

Clearance Bar with Swing Away Bar Design
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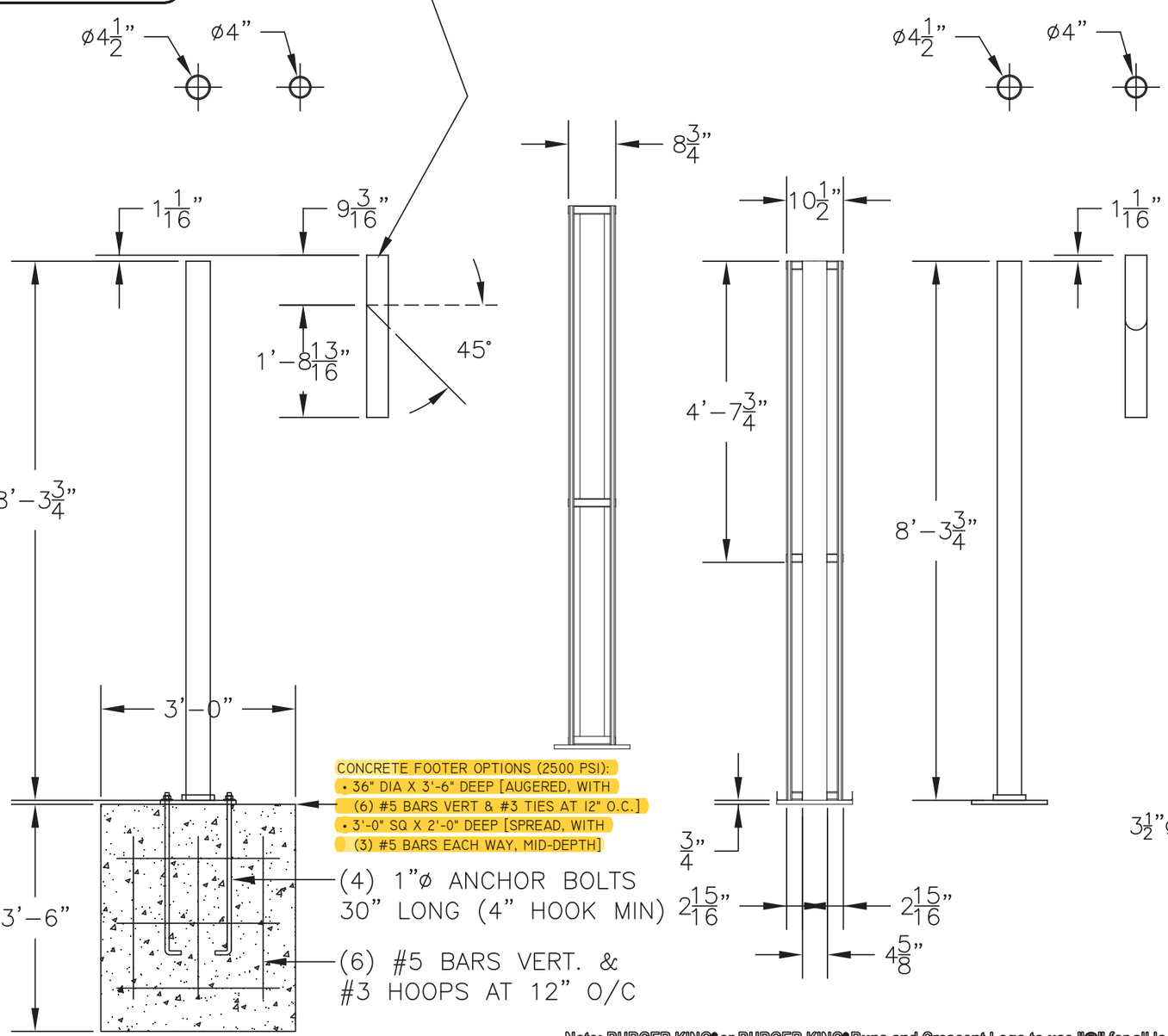
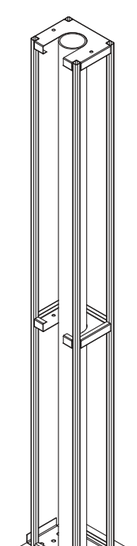
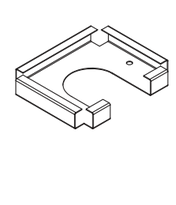
SCALE 1:20

MACHINE CUT DIAGONAL ONLY
FINISH CUT SURFACE SMOOTH

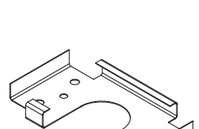




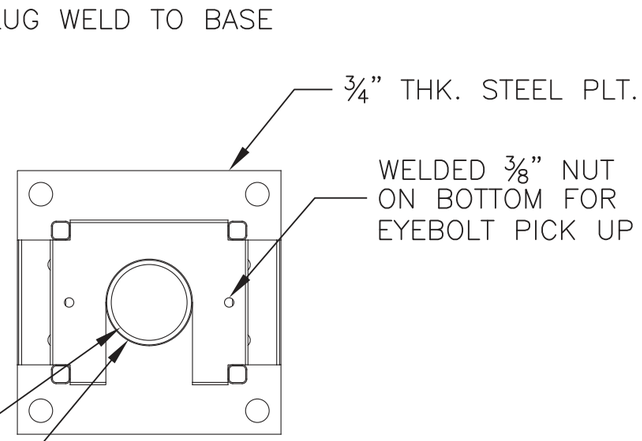
PLUG WELD TO BASE



TOP AND MID PLATE



BOTTOM PLATE



SCALE: 3X

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BURGER KING ® in the U.S. use the ® trademark symbol. The Burger King ® trademark may not be registered in all countries. See "Legal Standards" for more information. For registration updates, please contact the legal department in Miami (305) 378-3080.

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Solid freestanding sign at grade:
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• Sign Height = 15 ft max
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Index:

Engineer's signature and seal valid for pages 1 through 5

CHRISTIAN LANGLEY LICENSE No. 67382 STATE OF FLORIDA PROFESSIONAL ENGINEER

Aug 30 2021

Christian Langley PE # 67382

Easy Seals Cert Auth # 31124

ASCE 7-16 Design Wind Loads

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Risk Category 1 Structure

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120 mph - Exp "C"

Monuments at grade

W/Ht Ratio ≤ 0.5

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50 ft	± 27.1 psf	1.09	20.6
55 ft	± 27.6 psf	1.12	21.0
60 ft	± 28.2 psf	1.14	21.4
70 ft	± 29.1 psf	1.17	22.1
80 ft	± 29.9 psf	1.21	22.7
90 ft	± 30.7 psf	1.24	23.3
100 ft	± 31.3 psf	1.27	23.8
110 ft	± 32.0 psf	1.29	24.3
120 ft	± 32.6 psf	1.32	24.7
130 ft	± 33.1 psf	1.34	25.1
140 ft	± 33.7 psf	1.36	25.5
150 ft	± 34.1 psf	1.38	25.9
175 ft	± 35.3 psf	1.42	26.8
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250 ft	± 38.0 psf	1.53	28.9

Footing Design for Freestanding Signs and Flagpoles

Structure Dimensions & Loading

Design wind pressure:	P =	21.0	psf	
Overturning Safety Factor:	Ω =	1.5		… FBC 1807.2.3
Sign area 1:	A1 =	24.8	sq ft	… tributary area 1 for each footer (e.g. sign)
Height of applied force above grade:	h1 =	3.5	ft	… height of area 1 centroid
Sign area 2:	A2 =	4.9	sq ft	… tributary area 2 for each footer (e.g. post)
Height of applied force above grade:	h2 =	0.8	ft	… height of area 2 centroid

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

Mn = 1.9 kip-ft

Round	Footing Diameter:	B =	3	ft			
	Footing depth:	d =	3.25	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 =	3446	lb	… = 150pcf*π*B^2/4*d
Total weight:	D =	3646	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 = 325 psf

Total applied lateral load: Ptot = 0.62 kips

Equiv ht of applied load: heq = 3.02 ft

As = 2.34*Ptot/(S1*B)

As = 1.5 ft

dreq = As/2 * [1 + √(1+4.36*heq/As)]

dreq = 3.09 ft dreq < d **OK**

Hollow Structural Rectangular Tubing in Bending

Allowable Stress Design per 2016 AISC Spec for Structural Steel Buildings

Material Properties

Yield Stress, A500 Grd B Steel:	Fy =	46	ksi	Safety Factor =	1.67	Per Section B3.4
Modulus of Elasticity:	E =	29000	ksi			

Member Properties

Flange:	b =	4	in	Moment of Inertia:	Ix =	6.5	in^4
Flange Thickness:	tf =	3/16"	= 0.175''	Section Modulus:	S =	3.3	in^3
Web:	d =	4	in	Deflection Limit:	Defl =	L / 80	
Web Thickness:	tw =	3/16"	= 0.175''	End Supports:	Cantilever		

Design wind pressure:	P =	21.0	psf	
Sign area:	A1 =	29.7	sq ft	... tributary area for each post (e.g. sign+post)
Eccentricity of applied force:	e1 =	3.0	ft	... distance to area centroid (weighted avg h1,h2)
Unbraced Length:	Lc =	3.0	ft	

Check for Limiting Width-Thickness Ratios

(Compact/Noncompact, per Table B4.1)

Flanges

b/t =	20.9	= (b-2*t2)/t1
1.12*√(E/Fy) =	28.1	Flange Compact Limit
1.40*√(E/Fy) =	35.2	Flange NonCompact Limit

Flanges are compact

Webs

d/t =	20.9	= (d-2*t1)/t2
2.42*√(E/Fy) =	60.8	Web Compact Limit
5.70*√(E/Fy) =	143.1	Web NonCompact Limit

Webs are compact

(1): Yielding Limit State

This criteria applies to all members, compact and noncompact

Mn = Fy*S

Mn = 150.4 kip-in

Mallow = Mn / 1.67

Mallow = 90.0 kip-in

Check Member Bending

Allowable Moment: **Mn = 90.0 kip-in** Minimum of Mallow values above

Moment in member: Mmax = P*A1*e1

Mmax = 22.6 kip-in Mmax < Mn ... **OK**

Check Member Deflection:

Allowable Deflection: Δ_{allow} = 0.45 in L / 80

Deflection in member: Δ_{max} = P*(A*e^3) / (3*E*I)

Δ_{max} = 0.05 in Δmax < Δallow ... **OK**

Cast-in-Place Concrete Anchor Bolts

ACI 318-14, Appendix "D"

Required Strength:

Wind pressure:	W =	21.0	psf	Tributary area:	A =	29.7	sqft	
Dead load:	D =	0	lb	Load eccentricity:	e =	3.0	ft	
ASCE 7-10, 2.3.2:	U =	(1.2)D + (1.0)W		**Mu =**	**3.14**	**kip-ft**	… = [(1.2)D+(1.0)W]*A*e	

Anchor & Concrete Specs:

				Concrete:	f'c =	2500	psi	
Anchor bolt size:	5/8"		da = 0.625 in		nt =	11	threads/in	
Anchor material:	SAE Grade 2 / A307				futa =	74	ksi	
Embedment:	hef =	24	in	Edge distance:	ED =	14	in	
Qty anchors in group:	Q =	2	anchors	Anchor group offset:	a =	8	in	

Anchor Strength:

Steel: $\phi s = 0.75$

Tension: $U \le 0.75\,\phi\,Nn$ — Conc, no suppl reinf: $\phi c = 0.70$

Steel Strength:

$Ase = \pi/4*(da-0.9743/nt)^2$ — $Nsa = Ase*futa$

$Ase = 0.23$ in² — $Nsa = 16.7$ kips — **$\phi s*Nsa = 12.5$ kips**

Concrete Breakout:

$Anc = [ED+s+1.5*hef]*[ED+1.5*hef]$ — $Anco = 9*hef^2$

$Anc = 2500$ in² — $Anco = 5184$ in²

$Nb = kc*\lambda*\sqrt{f'c}*hef^{1.5}$ — Cracked Concrete: $\Psi c = 1.0$

$Nb = 141.1$ kips — Cast-in anchors: $\Psi cp = 1.0$

Limit = $16*\lambda*\sqrt{f'c}*hef^{(5/3)}$ = 159.8 kips — $\Psi ed = 0.7 + 0.3*ED/(1.5*hef)$: $\Psi ed = 0.82$

$kc = 24$ …cast-in anchors — No eccentricity between anchors: $\Psi ec = 1.0$

$\lambda = 1.0$ … normal weight concrete

Concrete breakout strength: $Ncb = (Anc/Anco)*\Psi c*\Psi cp*\Psi ed*\Psi ec*Nb$

$Ncb = 55.6$ kips — **$\phi c*Ncb = 38.9$ kips**

Concrete Pullout:

Hooked Bar / Stud: — Hook length: eh = 6 in

$Np = 0.9*f'c*eh*da$

$Np = 8.4$ kips — Cracked Concrete: $\Psi c,p = 1.0$

Concrete pullout strength: $Npn = \Psi c.p*Np$

$Npn = 8.4$ kips — **$\phi c*Npn = 5.9$ kips**

Concrete Blowout:

Hooked Bar / Stud: Nsb = N/A (No headed stud)

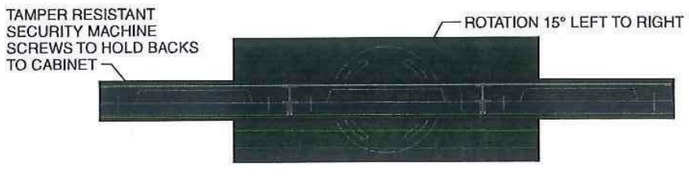
Concrete blowout strength: Nsb = N/A — **$\phi c*Nsb$ = N/A**

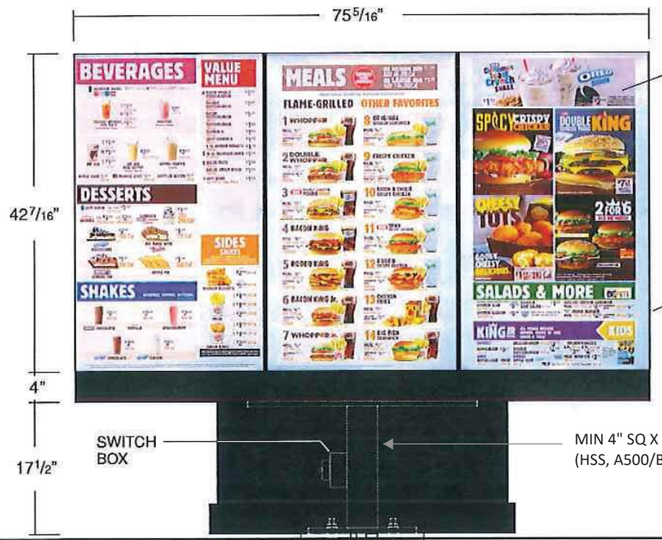
Critical Anchor Strength:

$\phi Nn = \min(\phi s*Nsa, \phi c*Ncb, \phi c*Npn, \phi c*Nsb)$ — **$\phi Nn = 5.9$ kips**

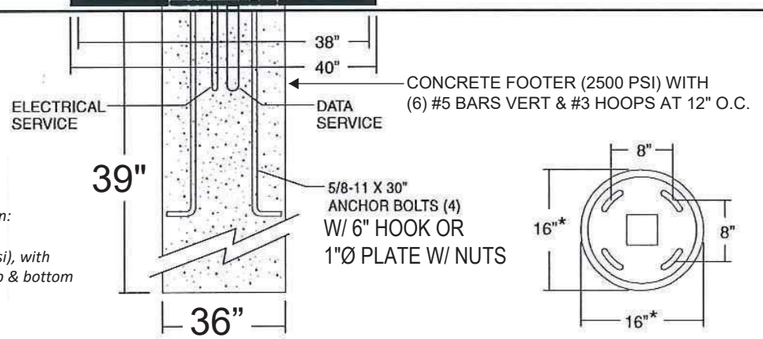
$\phi Mn = Q*\phi Nn*a$

$\phi Mn = 7.9$ kip-ft — $Mu \le 0.75\,\phi\,Mn$ — **3.14 kip-ft < 5.9 kip-ft** — **OK**

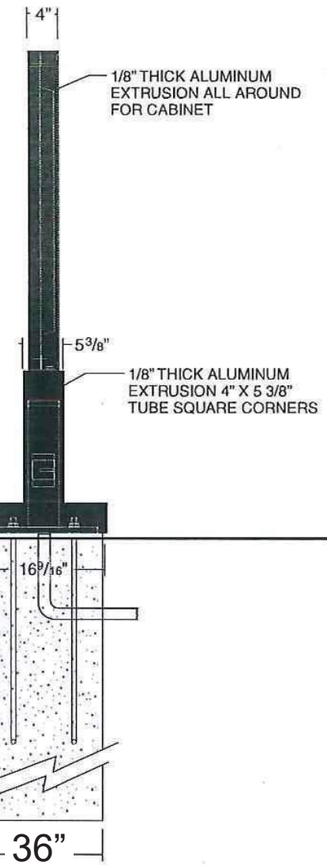




*** Unit can be installed on existing foundation and anchor bolts, and if preferred can utilize the existing mounting steel base.**
(This would require the data cables to be routed outside of the existing mounting steel.)



Alt Shallow Footer Option:
3'-3" Sq x 2'-0" deep
Concrete Footer (2500 psi), with
(3) #5 bars each way, top & bottom



Drawing Type Art Creative
Customer Burger King COLUMBIA COUNTY, FL
Project Description 1 X 3 Digital Drive-Thru

Drawn By: DL
Proj. Man.:
Date: 04/20/18
Proj. No.:

Note:

Christian Langley
Florida PE #67382
Cert of Auth #31124
1200 N Federal Hwy, #200
Boca Raton, FL 33432
1-888-371-3113

ASCE 7-16 • V=120 mph • Risk Category 1 Struct. • Sign Height = 15 ft max Solid freestanding sign at grade: **± 21.0 psf**
WIND LOADS: • Exposure 'C' • ASD Load Coeff = 0.6 • Kzt=1.0, Kd=0.85, G=0.85 • Cf=1.55 (w/h ratio ≥ 1/2)

General Notes: • Design is in accordance with the requirements of the **Fla Bldg Code 7th Ed (2020)** for use within & outside the High Velocity Hurricane Zone (HVHZ). • This engineering certifies only the structural integrity of those systems, components, and/or other construction explicitly specified herein. • Electrical notes, details, & specifications are provided by and are the sole responsibility of the electrical contractor. No electrical review has been performed and no certification of such is intended. • Structural design meets requirements of ACI 318-14, AISC 360-16, ADM1-15, & NDS-18, as applicable. • Steel components shall be coated, painted, or otherwise protected against corrosion per FBC Sec 2203.2/2222.6. • Alum components in contact with steel or embedded in concrete shall be painted or protected as prescribed in ADM1-15(1a), or plastic/neoprene spacers provided. • All exposed fasteners shall be S.S. or have a protective coating for corrosion protection. • All welding shall comply with AWS requirements. • Steel welds: E70xx electrodes. • Aluminum welds: 4043 filler alloy. • Alum extrusions: 6063-T6 or stronger, U.N.O.

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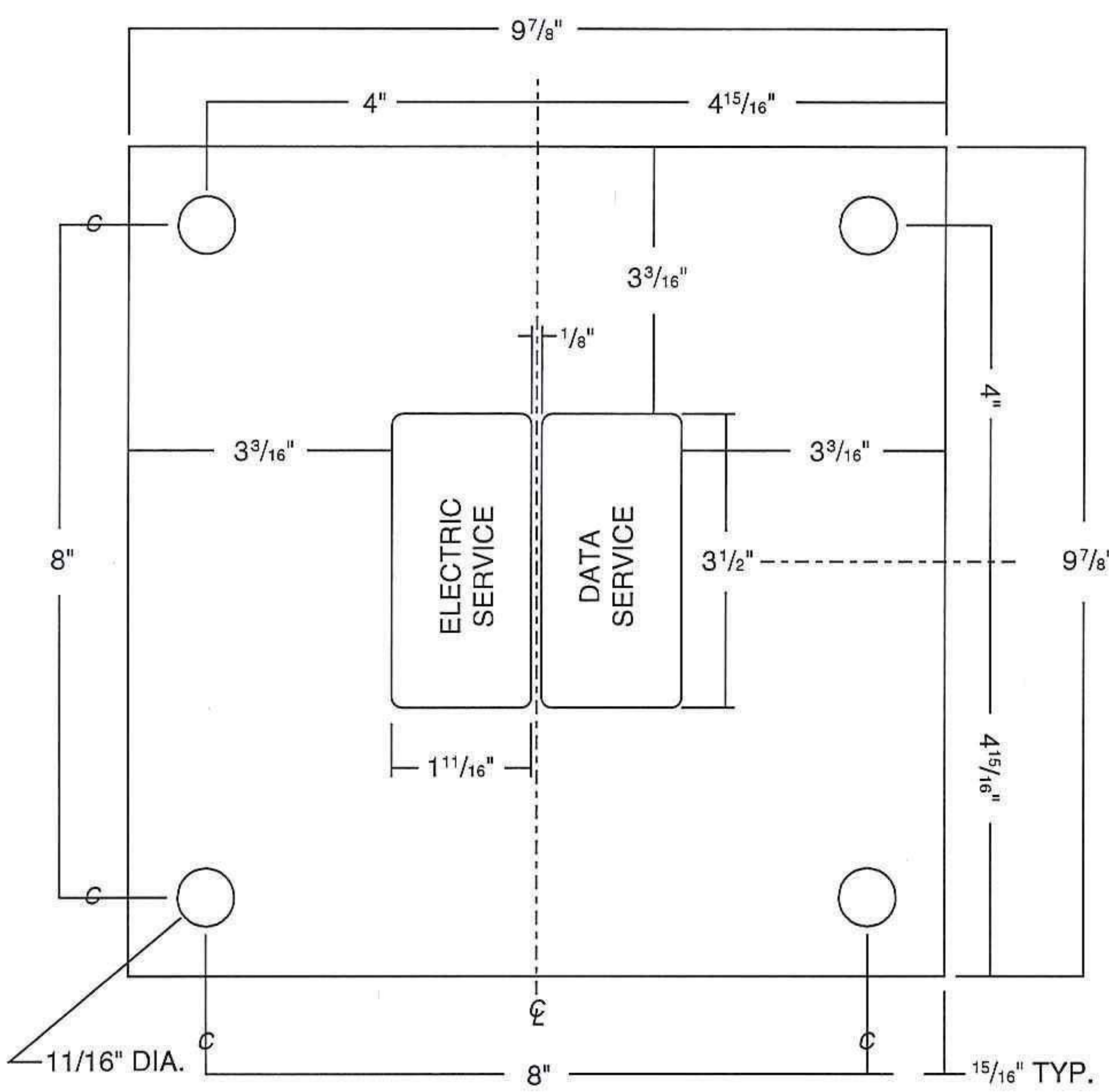
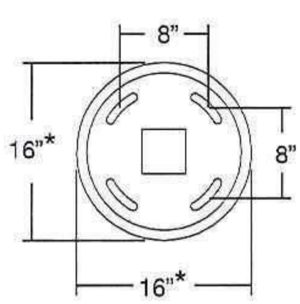
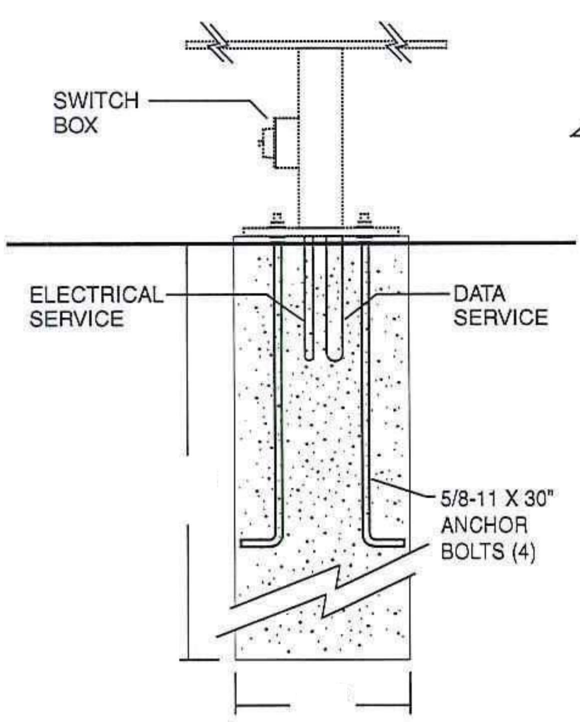
Digital
Drive Thru & Pre Sell
Anchor Bolt Template







(Anchor Bolt Size: 5/8"-11 x 30")

This is a suggested plan. Local requirements may exceed this design. The contractor is responsible to verify this plan.

**NOTE: These are approximate foundation measurements. The soil bearing capacity at the erection site must be considered when designing the foundation. The sign manufacturer is not able to predetermine the specific needs of each location. Consult a local engineer for design specifications.*

Drawing Type Installation	Drawn By:	Note:
Customer Burger King COLUMBIA COUNTY, FL	Proj. Man.:	
Project Description DT PS Anchor Bolt Template	Date: 07/09/18	
	Page: 1	

ASCE 7-16 WIND LOADS: • V=120 mph • Exposure 'C' • Risk Category 1 Struct. • ASD Load Coeff = 0.6 • Sign Height = 15 ft max • Kzt=1.0, Kd=0.85, G=0.85 Solid freestanding sign at grade: • Cf=1.55 (w/h ratio ≥ 1/2) **± 21.0 psf**

1200 N Federal Hwy, #200
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1-888-371-3113

Christian Langley
Florida PE #67382
Cert of Auth #31124

General Notes: • Design is in accordance with the requirements of the **Fla Bldg Code 7th Ed (2020)** for use within & outside the High Velocity Hurricane Zone (HVHZ). • This engineering certifies only the structural integrity of those systems, components, and/or other construction explicitly specified herein. • Electrical notes, details, & specifications are provided by and are the sole responsibility of the electrical contractor. No electrical review has been performed and no certification of such is intended. • Structural design meets requirements of ACI 318-14, AISC 360-16, ADM1-15, & NDS-18, as applicable. • Steel components shall be coated, painted, or otherwise protected against corrosion per FBC Sec 2203.2/2222.6. • Alum components in contact with steel or embedded in concrete shall be painted or protected as prescribed in ADM1-15(1a), or plastic/neoprene spacers provided. • All exposed fasteners shall be S.S. or have a protective coating for corrosion protection. • All welding shall comply with AWS requirements. • Steel welds: E70xx electrodes. • Aluminum welds: 4043 filler alloy. • Alum extrusions: 6063-T6 or stronger, U.N.O.

DESIGN CALCULATIONS

FOR

BURGER KING
Order Canopy
Columbia County, FL

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.

Index:

Engineer's signature and seal valid for pages 1 through 5

CHRISTIAN LANGLEY LICENSE No. 67382 STATE OF FLORIDA PROFESSIONAL ENGINEER

Aug 30 2021

Christian Langley PE # 67382

Easy Seals Cert Auth # 31124

ASCE 7-16 Design Wind Loads

FREESTANDING SOLID SIGNS AND WALLS (AT GRADE)

Building Specs

V =	120 mph	*Basic wind speed*
Exposure	C	

Risk Category 1 Structure

ASD Load Combo Coeff: 0.6

Calculations

α =	9.5	*3-sec gust speed power law exponent*
z_g =	900'	*Nominal ht. of atmos. boundary layer*
G =	0.85	

Kd =	0.85	*Directionality factor*
Kzt =	1.0	*Topographic factor*
Ke =	1.0	*Ground elevation factor*
Cf =	1.55	*Force Coefficient*

...Width / Height ratio ≥ 0.5

120 mph - Exp "C"

Monuments at grade

W/Ht Ratio ≤ 0.5

SIGN HEIGHT	DESIGN WIND PRESSURES	Kh = Kz	q_z
15 ft	± 21.0 psf	0.85	16.0
18 ft	± 21.8 psf	0.88	16.6
20 ft	± 22.3 psf	0.90	17.0
30 ft	± 24.3 psf	0.98	18.5
35 ft	± 25.1 psf	1.01	19.1
40 ft	± 25.8 psf	1.04	19.6
45 ft	± 26.5 psf	1.07	20.1
50 ft	± 27.1 psf	1.09	20.6
55 ft	± 27.6 psf	1.12	21.0
60 ft	± 28.2 psf	1.14	21.4
70 ft	± 29.1 psf	1.17	22.1
80 ft	± 29.9 psf	1.21	22.7
90 ft	± 30.7 psf	1.24	23.3
100 ft	± 31.3 psf	1.27	23.8
110 ft	± 32.0 psf	1.29	24.3
120 ft	± 32.6 psf	1.32	24.7
130 ft	± 33.1 psf	1.34	25.1
140 ft	± 33.7 psf	1.36	25.5
150 ft	± 34.1 psf	1.38	25.9
175 ft	± 35.3 psf	1.42	26.8
200 ft	± 36.3 psf	1.46	27.5
250 ft	± 38.0 psf	1.53	28.9

Footing Design for Freestanding Signs and Flagpoles

Structure Dimensions & Loading

Design wind pressure:	P =	21.0	psf	
Overturning Safety Factor:	Ω =	1.5		… FBC 1807.2.3
Sign area 1:	A1 =	42.0	sq ft	… tributary area 1 for each footer (e.g. sign)
Height of applied force above grade:	h1 =	2.5	ft	… height of area 1 centroid
Sign area 2:	A2 =	24.8	sq ft	… tributary area 2 for each footer (e.g. post)
Height of applied force above grade:	h2 =	4.4	ft	… height of area 2 centroid

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

Mn = 4.5 kip-ft

Round	Footing Diameter:	B =	3	ft			
	Footing depth:	d =	4.5	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 =	4771	lb	… = 150pcf*π*B^2/4*d
Total weight:	D =	4971	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 = 450 psf

Total applied lateral load: Ptot = 1.40 kips

Equiv ht of applied load: heq = 3.20 ft

As = 2.34*Ptot/(S1*B)

As = 2.4 ft

dreq = As/2 * [1 + √(1+4.36*heq/As)]

dreq = 4.37 ft dreq < d **OK**

Hollow Structural Pipe in Bending

Allowable Stress Design per 2016 AISC Spec for Structural Steel Buildings

Material Properties

Yield Stress, A53 Grd B Steel:	Fy =	35	ksi	Safety Factor =	1.67	Per Section B3.4
Modulus of Elasticity:	E =	29000	ksi			
				End Supports:	Cantilever	

Member Properties

ANSI 4" Schedule 40 steel pipe

Nominal size:	4" diam	-	Sch 40				
Outside Diameter	d =	4.5	in	Moment of Inertia:	Ix =	7.2	in^4
Wall Thickness	t =	0.237	in	Section Modulus:	S =	3.21	in^3
				Deflection Limit:	Defl =	L / 80	

Design wind pressure:	P =	21.0	psf	
Sign area:	A1 =	66.8	sq ft	... tributary area for each post (e.g. sign+post)
Eccentricity of applied force:	e1 =	3.2	ft	... distance to area centroid (weighted avg h1,h2)

(1): Yielding Limit State

Mn = Fy*S — Allowable Moment: Mallow = Mn / 1.67

Mn = 112.5 kip-in — Mallow = 67.4 kip-in

Check Member Bending

Moment in member: Mmax = P*A1*e1

Mmax = 53.8 kip-in — Mmax < Mallow ... **OK**

Check Member Deflection:

Allowable Deflection: Δ_{allow} = 0.48 in — L / 80

Deflection in member: Δ_{max} = P*(A*e^3) / (3*E*I)

Δ_{max} = 0.13 in — Δmax < Δallow ... **OK**

Cast-in-Place Concrete Anchor Bolts

ACI 318-14, Appendix "D"

Required Strength:

Wind pressure:	W =	21.0	psf	Tributary area:	A =	66.8	sqft	
Dead load:	D =	0	lb	Load eccentricity:	e =	3.2	ft	
ASCE 7-10, 2.3.2:	U =	(1.2)D + (1.0)W		**Mu =**	**7.48**	**kip-ft**	… = [(1.2)D+(1.0)W]*A*e	

Anchor & Concrete Specs:

				Concrete:	f'c =	2500	psi	
Anchor bolt size:	3/4"		da = 0.75 in		nt =	10	threads/in	
Anchor material:	SAE Grade 2 / A307				futa =	74	ksi	
Embedment:	hef =	40	in	Edge distance:	ED =	14.125	in	
Qty anchors in group:	Q =	2	anchors	Anchor group offset:	a =	7.75	in	

Anchor Strength:

Steel: $\phi s = 0.75$

Tension: $U \le 0.75\,\phi\,Nn$ — Conc, no suppl reinf: $\phi c = 0.70$

Steel Strength:

$Ase = \pi/4*(da-0.9743/nt)^2$ — $Nsa = Ase*futa$

$Ase = 0.33\ in^2$ — $Nsa = 24.8$ kips — **$\phi s*Nsa = 18.6$ kips**

Concrete Breakout:

$Anc = [ED+s+1.5*hef]*[ED+1.5*hef]$ — $Anco = 9*hef^2$

$Anc = 5495\ in^2$ — $Anco = 14400\ in^2$

$Nb = kc*\lambda*\sqrt{f'c}*hef^{1.5}$ — Cracked Concrete: $\Psi c = 1.0$

$Nb = 303.6$ kips — Cast-in anchors: $\Psi cp = 1.0$

$\Psi ed = 0.7 + 0.3*ED/(1.5*hef)$ — $\Psi ed = 0.77$

$kc = 24$ …cast-in anchors — No eccentricity between anchors: $\Psi ec = 1.0$

$\lambda = 1.0$ … normal weight concrete

Concrete breakout strength: $Ncb = (Anc/Anco)*\Psi c*\Psi cp*\Psi ed*\Psi ec*Nb$

$Ncb = 89.3$ kips — **$\phi c*Ncb = 62.5$ kips**

Concrete Pullout:

Headed Stud / Bolt: — Head diameter: $dh = 1.5$ in

$Np = 8*Abrg*f'c$ — $Abrg = 1.8\ in^2$

$Np = 35.3$ kips — Cracked Concrete: $\Psi c,p = 1.0$

Concrete pullout strength: $Npn = \Psi c.p*Np$

$Npn = 35.3$ kips — **$\phi c*Npn = 24.7$ kips**

Concrete Blowout:

Headed Stud / Bolt: $Nsb = 160*ED*\sqrt{Abrg}*\lambda*\sqrt{f'c}$

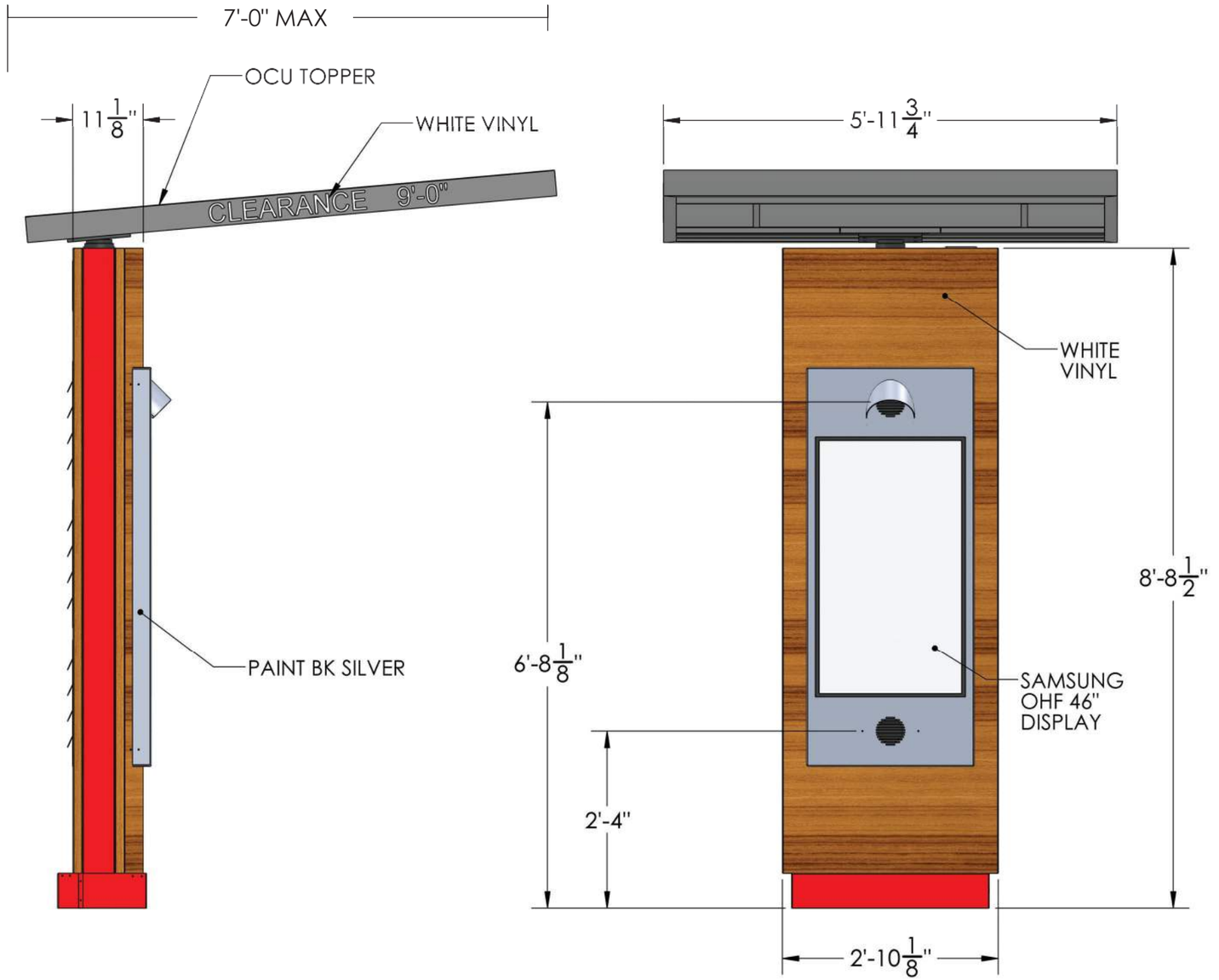
Concrete blowout strength: $Nsb = 150.2$ **kips** — **$\phi c*Nsb = 105.2$ kips**

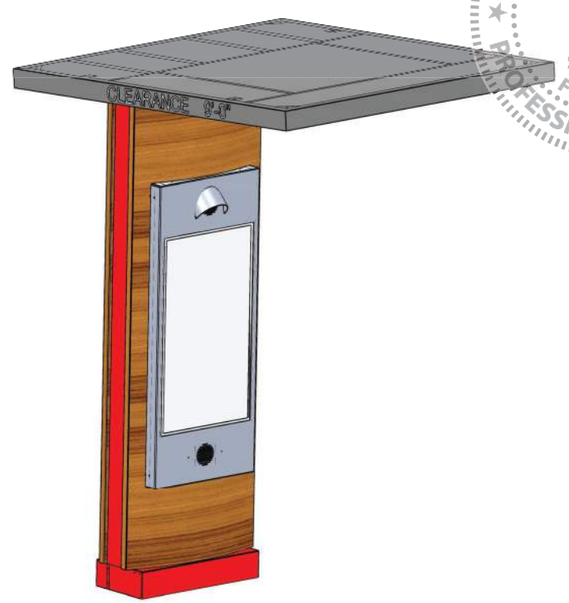
Critical Anchor Strength:

$\phi Nn = \min(\phi s*Nsa, \phi c*Ncb, \phi c*Npn, \phi c*Nsb)$ — **$\phi Nn = 18.6$ kips**

$\phi Mn = Q*\phi Nn*a$

$\phi Mn = 24.0$ kip-ft — $Mu \le 0.75\,\phi\,Mn$ — **7.48 kip-ft < 18.0 kip-ft** — OK





ELECTRICAL NOTE-ACTUAL # OF CIRCUITS TO BE DETERMINED BY A LICENSED ELECTRICAL CONTRACTOR.
TOTAL AMPS: 0.3
OF CKTS: 1 @ 20 AMP (RECOMMENDED)
VOLTS: 120
ELECTRICAL CONNECTION AS FOLLOWS:
GREEN TO GREEN (GROUND), WHITE TO WHITE (NEUTRAL), BLACK TO BLACK (POWER)
THIS SIGN IS INTENDED TO BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF ARTICAL 600 OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER APPLICABLE LOCAL CODES. THIS INCLUDES PROPER GROUNDING AND BONDING OF THE SIGN.
THE LOCATION OF THE DISCONNECT SWITCH AFTER INSTALLATION SHALL COMPLY WITH ARTICAL 600.6(A) (1) OF THE NATIONAL ELECTRICAL CODE.
ALL SIGNAGE WILL BE (U.L.) LISTED, (U.L.) 2161 COMPLIANT AND CARRY (U.L) LABELS

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CHRISTIAN LANGLEY LICENSE No. 67382 STATE OF FLORIDA PROFESSIONAL ENGINEER
AUG 30 2021
ENGINEER'S SIGNATURE

Christian Langley
Florida PE #67382
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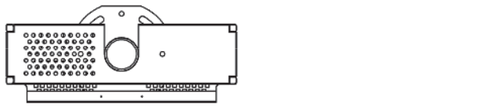
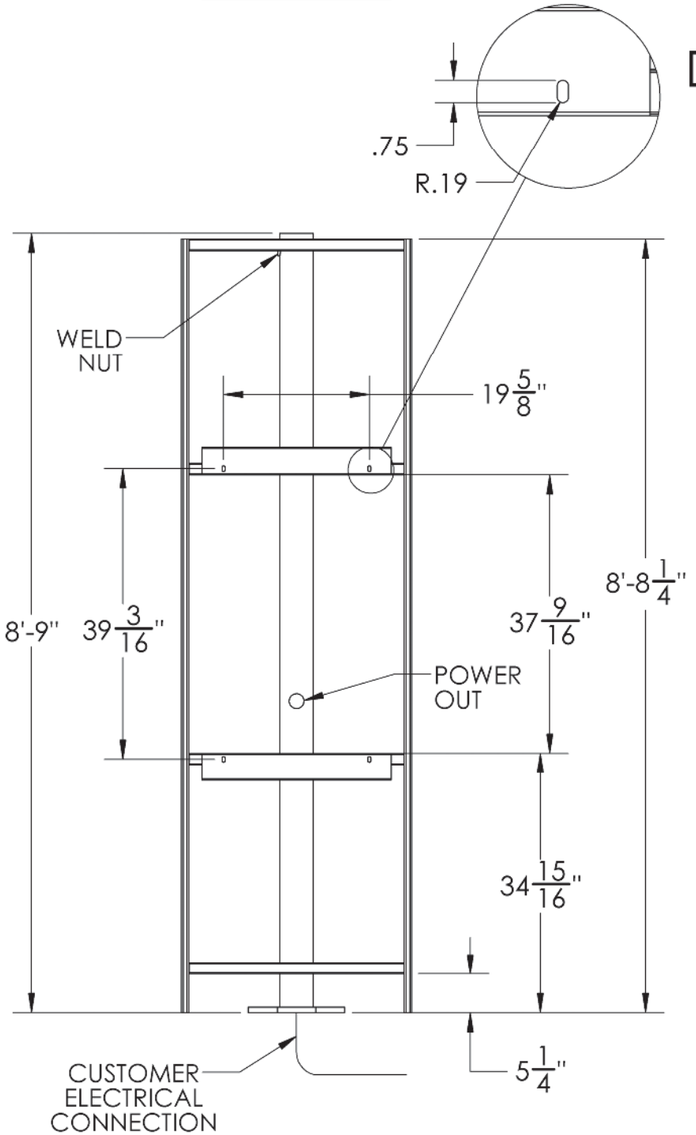
Boca Raton, FL 33432
1-888-371-3113

WIND LOADS: **ASCE 7-16** • V=120 mph • Exposure 'C' • Risk Category 1 Struct. • ASD Load Coeff = 0.6 • Sign Height = 15 ft max • Kzt=1.0, Kd=0.85, G=0.85 Solid freestanding sign at grade: • Cf= 1.55 (w/h ratio ≥ 1/2) **± 21.0 psf**

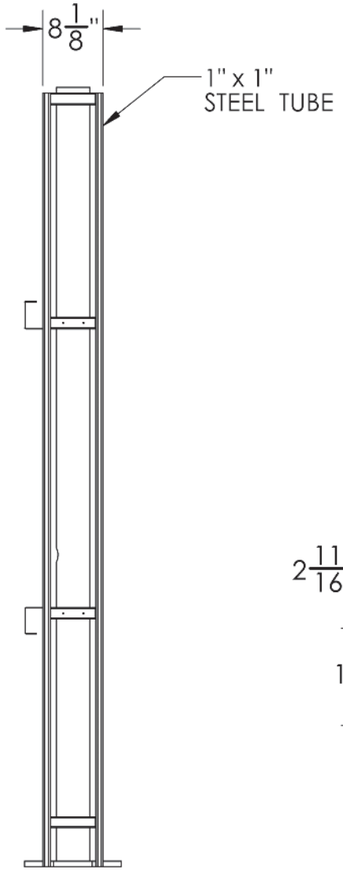
General Notes: • Design is in accordance with the requirements of the **Fla Bldg Code 7th Ed (2020)** for use within & outside the High Velocity Hurricane Zone (HVHZ). • This engineering certifies only the structural integrity of those systems, components, and/or other construction explicitly specified herein. • Electrical notes, details, & specifications are provided by and are the sole responsibility of the electrical contractor. No electrical review has been performed and no certification of such is intended. • Structural design meets requirements of ACI 318-14, AISC 360-16, ADM1-15, & NDS-18, as applicable. • Steel components shall be coated, painted, or otherwise protected against corrosion per FBC Sec 2203.2/2222.6. • Alum components in contact with steel or embedded in concrete shall be painted or protected as prescribed in ADM1-15(1a), or plastic/neoprene spacers provided. • All exposed fasteners shall be S.S. or have a protective coating for corrosion protection. • All welding shall comply with AWS requirements. • Steel welds: E70xx electrodes. • Aluminum welds: 4043 filler alloy. • Alum extrusions: 6063-T6 or stronger, U.N.O.

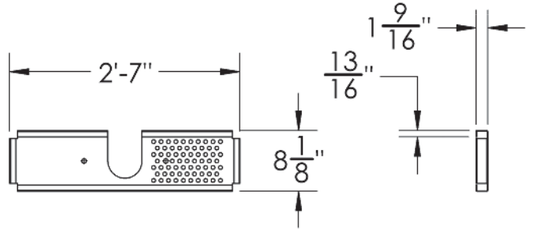


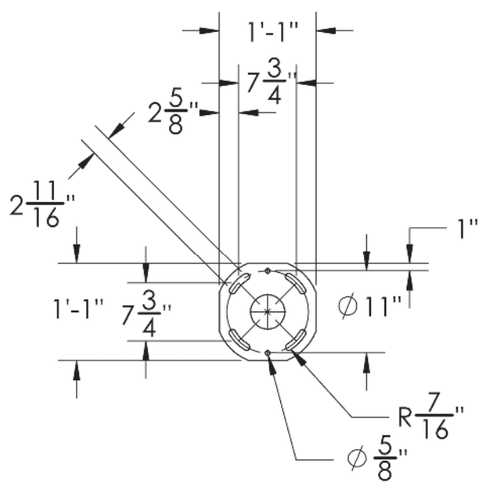


DETAIL C

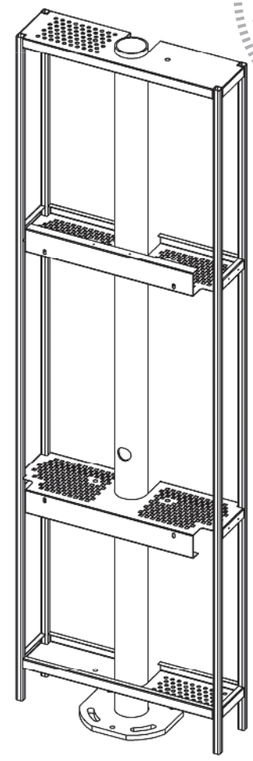
SCALE 1 : 5







BASE PLATE
3/4" STEEL



MATERIALS:(TOTAL)			
11	SQFT	SS0008	5' X 10' X 16GA STEEL SHEET
2	SQFT	SPL0013	.75 STEEL SHEET
9	LFT	SP0001	4" X .237 STEEL PIPE
35	LFT	ST0009	1 X 1 X 16GA STEEL TUBE

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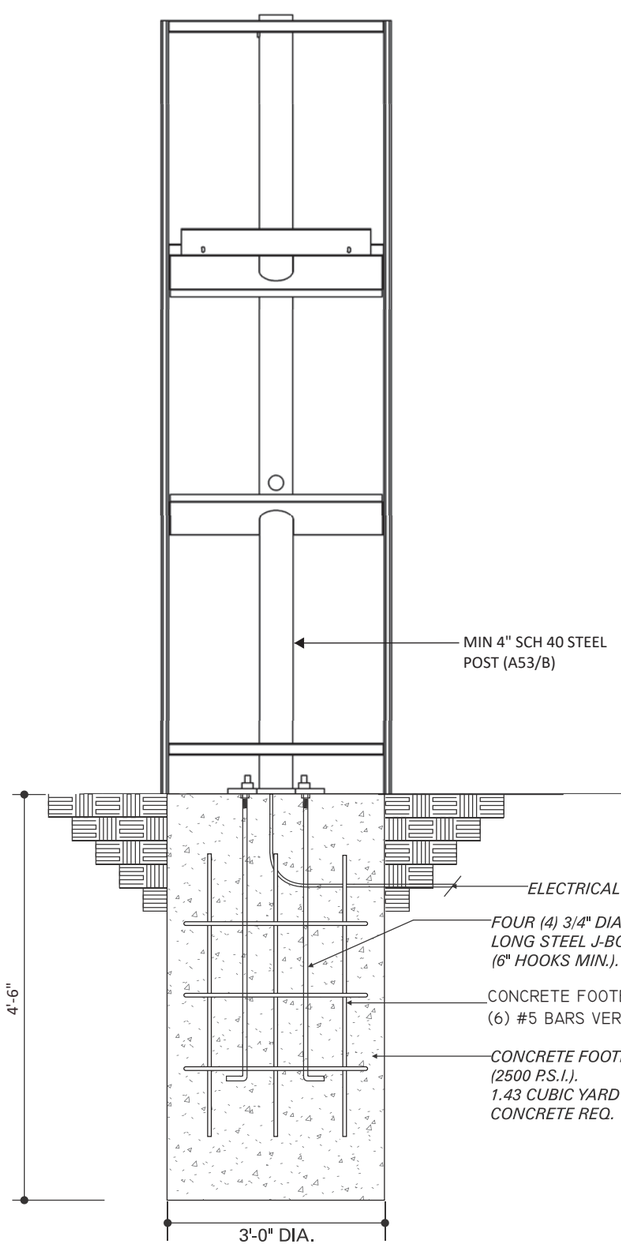
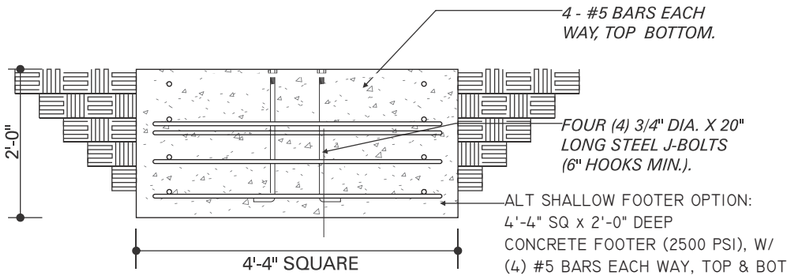
DRAWN BY: STEVE BERTRAND	DRAWING NUMBER: BK444	PAGE NUMBER: 2 OF 7

Christian Langley
Florida PE #67382
Cert of Auth #31124
1200 N Federal Hwy, #200
Boca Raton, FL 33432
1-888-371-3113

ASCE 7-16 • V=120 mph • Risk Category 1 Struct. • Sign Height = 15 ft max Solid freestanding sign at grade: **± 21.0 psf**
• Exposure 'C' • ASD Load Coeff = 0.6 • Kzt=1.0, Kd=0.85, G=0.85 • Cf= 1.55 (w/h ratio ≥ 1/2)
WIND LOADS:

General Notes: • Design is in accordance with the requirements of the **Fla Bldg Code 7th Ed (2020)** for use within & outside the High Velocity Hurricane Zone (HVHZ). • This engineering certifies only the structural integrity of those systems, components, and/or other construction explicitly specified herein. • Electrical notes, details, & specifications are provided by and are the sole responsibility of the electrical contractor. No electrical review has been performed and no certification of such is intended. • Structural design meets requirements of ACI 318-14, AISC 360-16, ADM1-15, & NDS-18, as applicable. • Steel components shall be coated, painted, or otherwise protected against corrosion per FBC Sec 2203.2/2222.6. • Alum components in contact with steel or embedded in concrete shall be painted or protected as prescribed in ADM1-15(1a), or plastic/neoprene spacers provided. • All exposed fasteners shall be S.S. or have a protective coating for corrosion protection. • All welding shall comply with AWS requirements. • Steel welds: E70xx electrodes. • Aluminum welds: 4043 filler alloy. • Alum extrusions: 6063-T6 or stronger, U.N.O.





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Boca Raton, FL 33432
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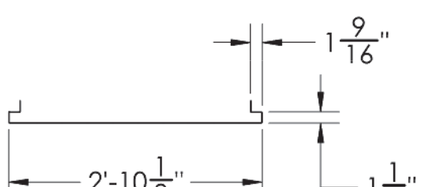
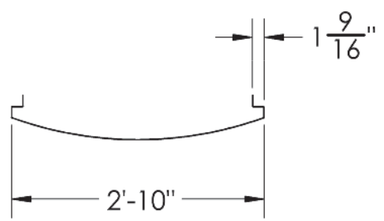
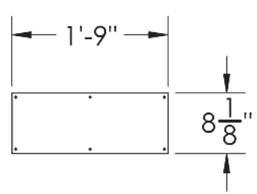
Solid freestanding sign at grade: **± 21.0 psf**
• Cf=1.55 (w/h ratio ≥ 1/2)
• Sign Height = 15 ft max • Kzt=1.0, Kd=0.85, G=0.85
• Risk Category 1 Struct. • ASD Load Coeff = 0.6
• Exposure 'C'

ASCE 7-16 WIND LOADS: • V=120 mph

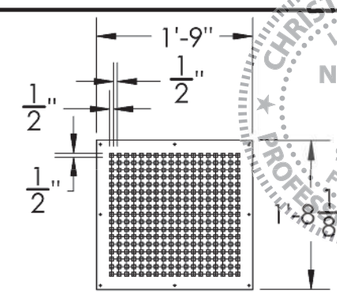


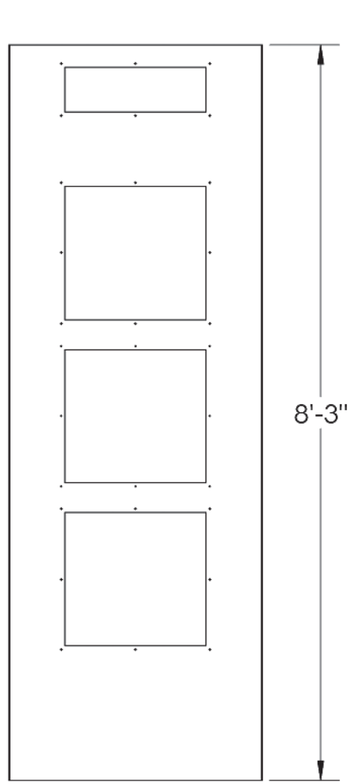


EYEBROW
.063 ALUM
PAINT BK SILVER

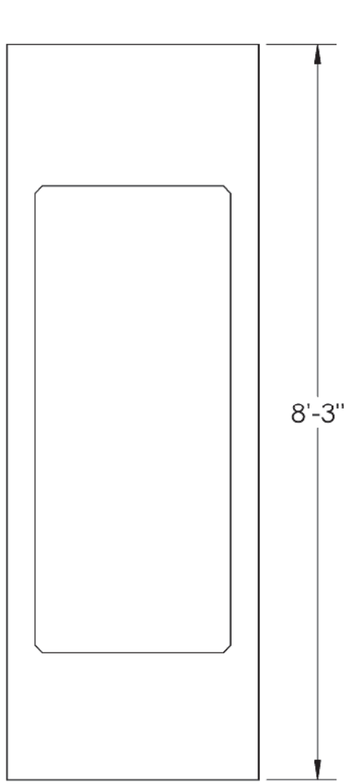


TOP ACCESS PANEL
.063 ALUM
WOODGRAIN

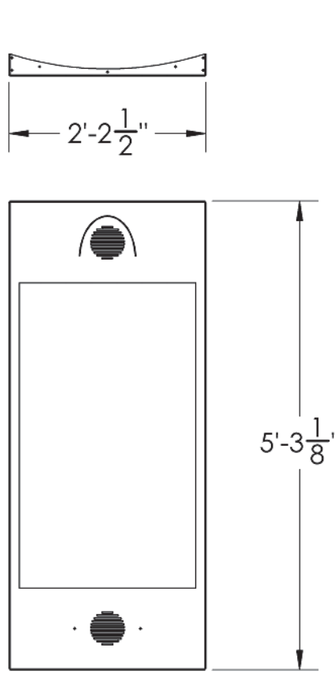




BACK PANEL
.063 ALUM
WOODGRAIN

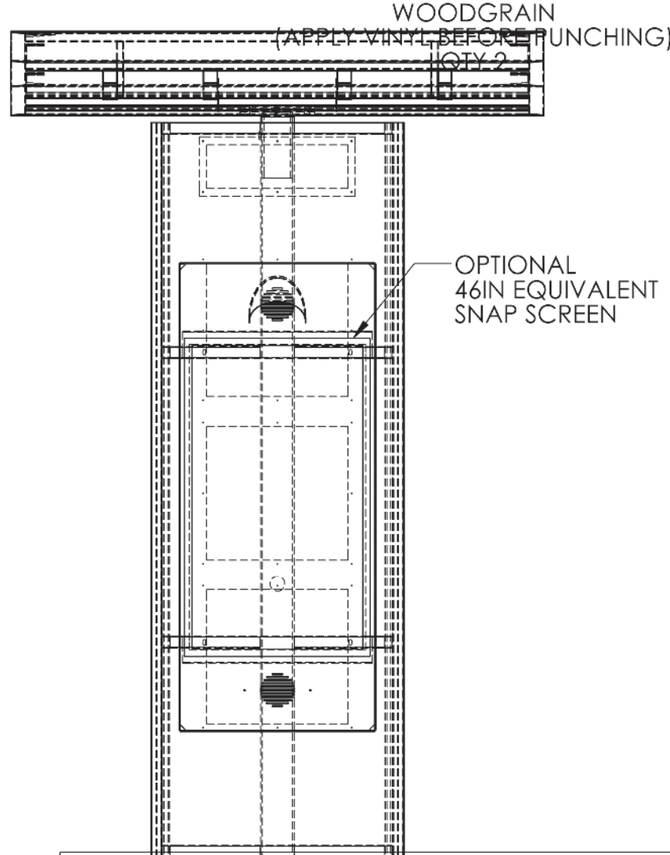


FRONT PANEL
.063 ALUM
WOODGRAIN



DISPLAY FRAME
.090 ALUM
PAINT BK SILVER

BACK ACCESS PANEL
.063 ALUM
WOODGRAIN
(APPLY VINYL BEFORE PUNCHING)
QTY 2



MATERIALS:(TOTAL)

51	SQFT	AS0021	5' X 10' X .063 ALUM SHEET
8	SQFT	AS0027	5' X 12' X .090 ALUM SHEET

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Christian Langley
Florida PE #67382
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1200 N Federal Hwy, #200
Boca Raton, FL 33432
1-888-371-3113

ASCE 7-16 • V=120 mph • Risk Category 1 Struct. • Sign Height = 15 ft max Solid freestanding sign at grade:
WIND LOADS: • Exposure 'C' • ASD Load Coeff = 0.6 • Kzt=1.0, Kd=0.85, G=0.85 • Cf=1.55 (w/h ratio ≥ 1/2) **± 21.0 psf**

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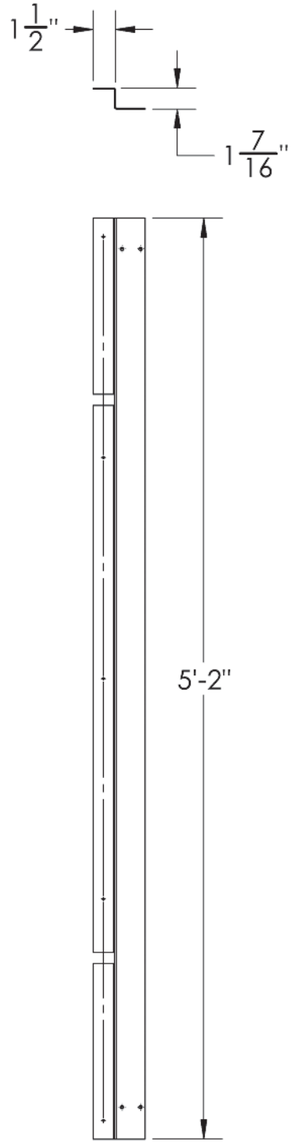
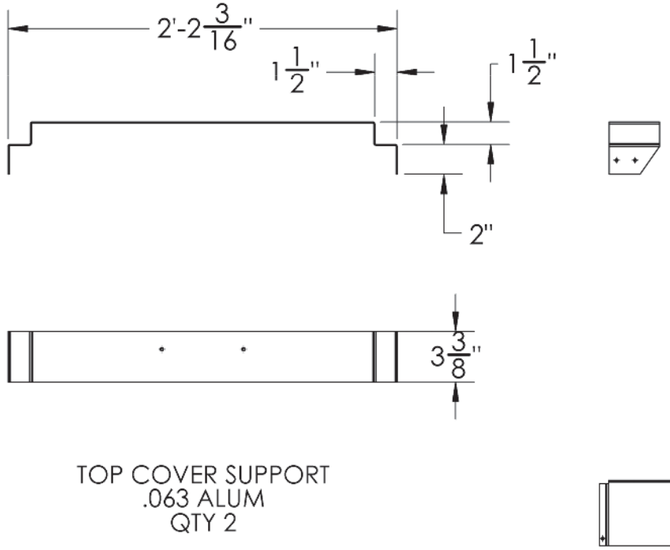
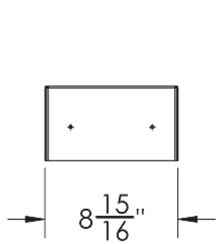
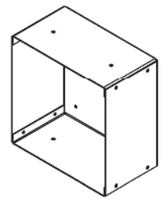


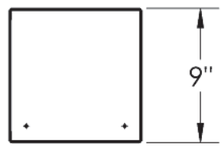
SIDE COVER SUPPORT
.063 ALUM
QTY 2
BEND ONE OPPOSITE

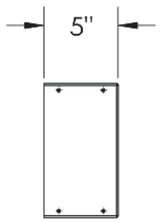


TOP COVER SUPPORT
.063 ALUM
QTY 2

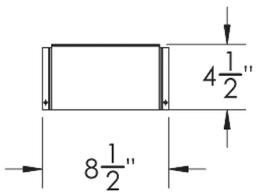


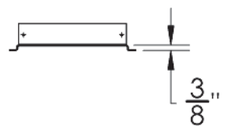




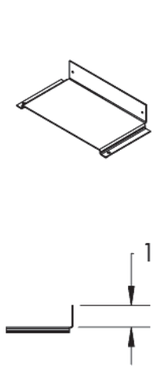


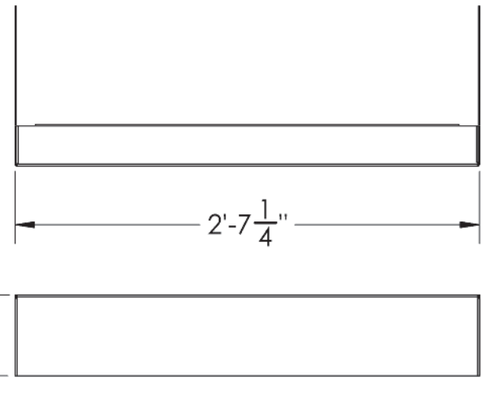
SPEAKER BOX
.063 ALUM
QTY 2



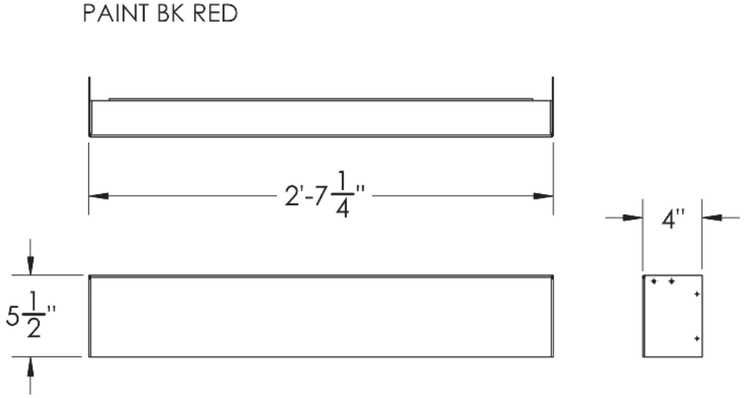


SPEAKER MOUNT
.063 ALUM
QTY 2





BOLT COVER FRONT
.063 ALUM
PAINT BK RED



BOLT COVER BACK
.063 ALUM
PAINT BK RED

MATERIALS:(TOTAL)

16 SQFT AS0021 5' X 10' X .063 ALUM SHEET

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Christian Langley
Florida PE #67382
Cert of Auth #31124
1200 N Federal Hwy, #200
Boca Raton, FL 33432
1-888-371-3113

ASCE 7-16 • V=120 mph • Risk Category 1 Struct. • Sign Height = 15 ft max Solid freestanding sign at grade:
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WIND LOADS:

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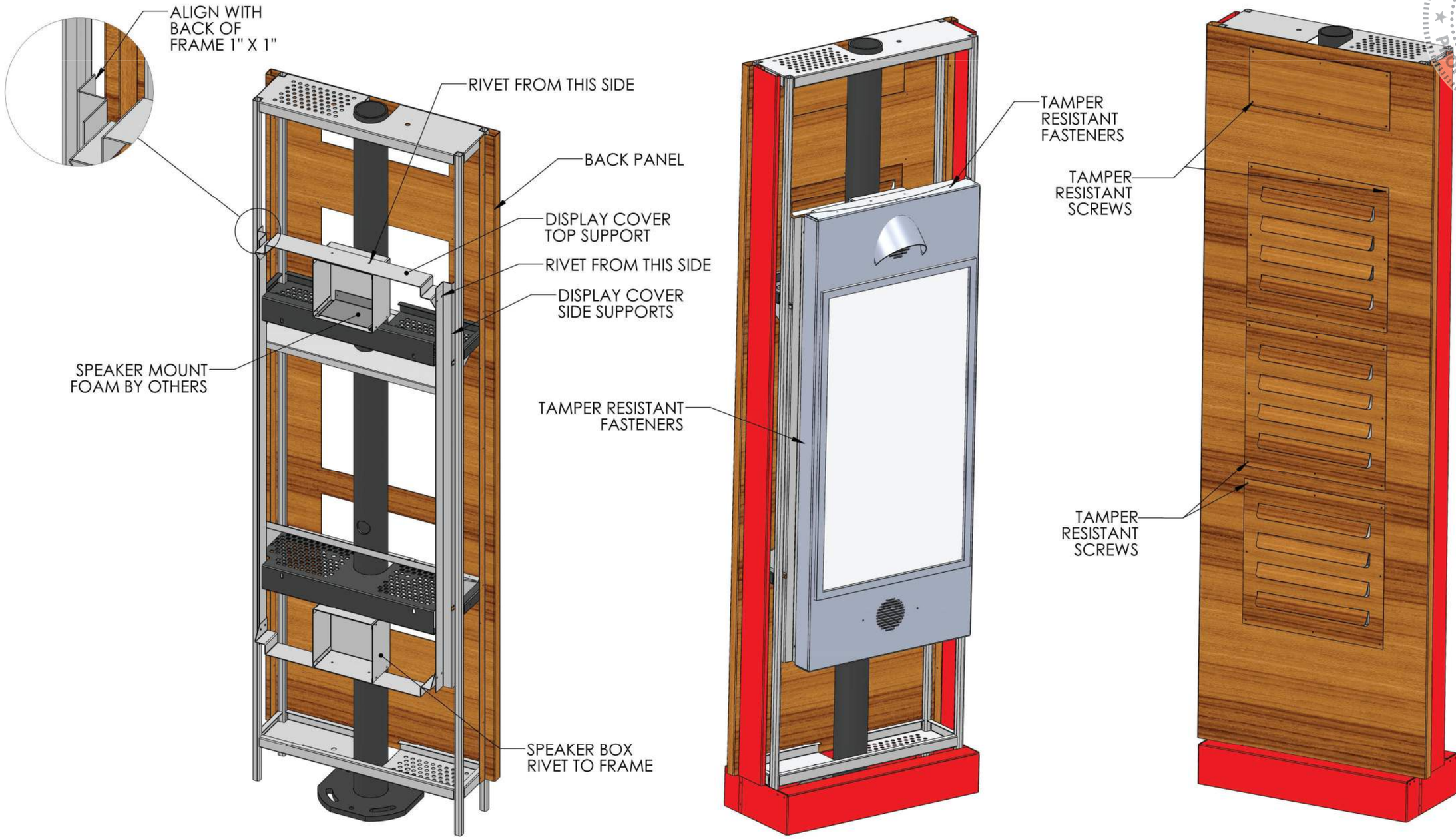

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ASCE 7-16 • V=120 mph • Risk Category 1 Struct. • Sign Height = 15 ft max Solid freestanding sign at grade: **± 21.0 psf**
WIND LOADS: • Exposure 'C' • ASD Load Coeff = 0.6 • Kzt=1.0, Kd=0.85, G=0.85 • Cf= 1.55 (w/h ratio ≥ 1/2)

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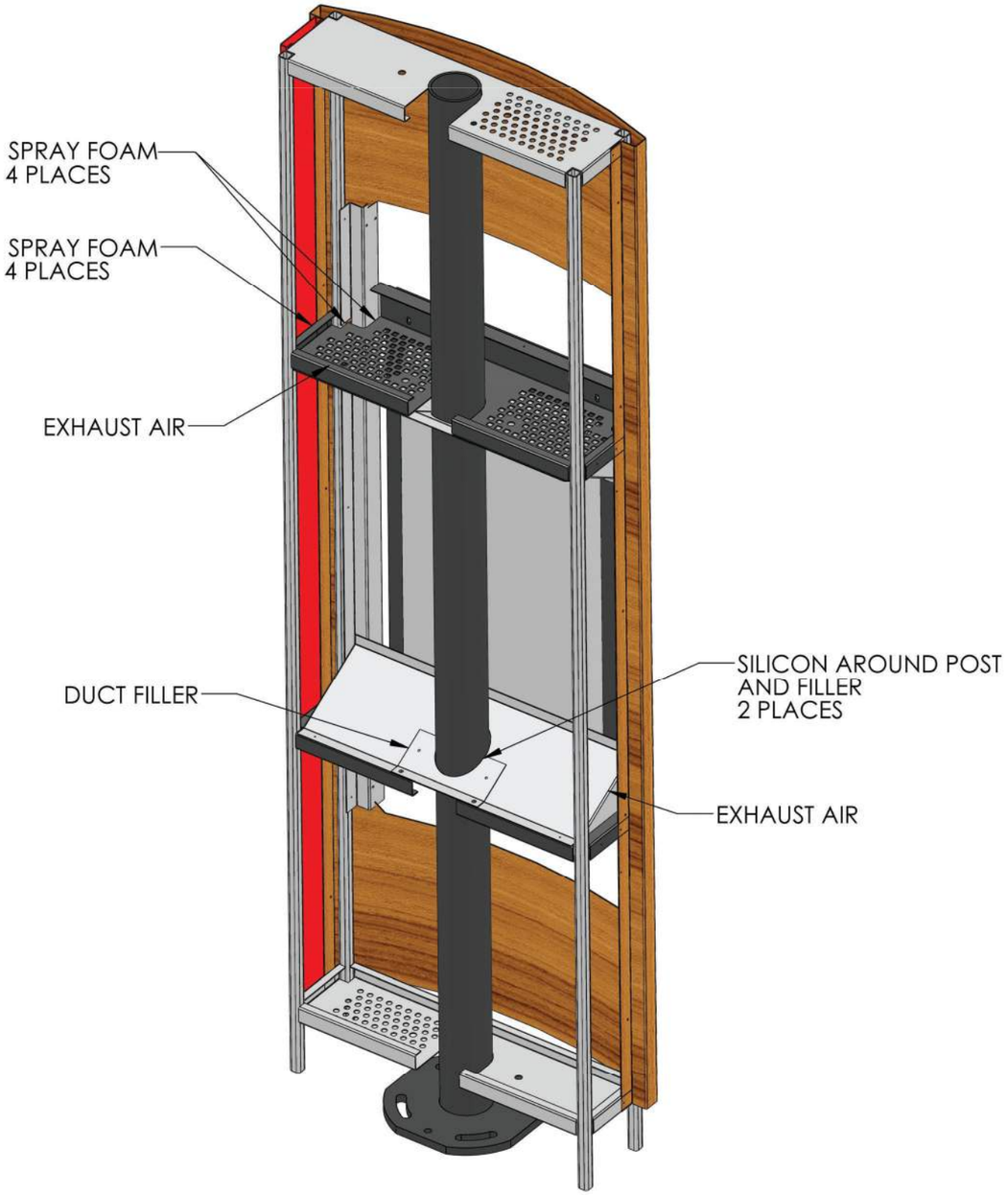
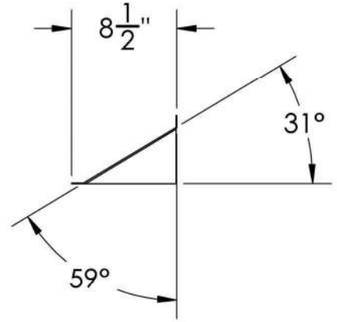
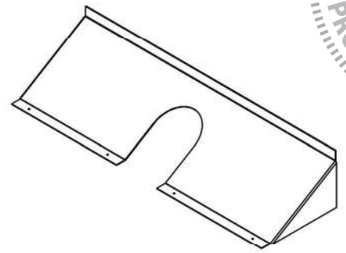
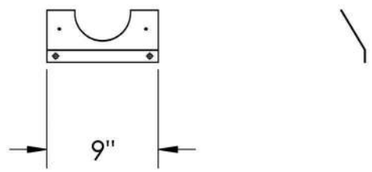
AUG 30 2021
ENGINEER'S SIGNATURE
Christian Langley
Florida PE #67382
Cert of Auth #31124
1200 N Federal Hwy, #200
Boca Raton, FL 33432
1-888-371-3113









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FILE LOCATION: G:\ENGINEERING\CUSTOMER\BK		PAGE TYPE: FRAMING
DRAWN BY: STEVE BERTRAND	DRAWING NUMBER: BK444	PAGE NUMBER: 7 OF 7

General Notes: • Design is in accordance with the requirements of the **Fla Bldg Code 7th Ed (2020)** for use within & outside the High Velocity Hurricane Zone (HVHZ). • This engineering certifies only the structural integrity of those systems, components, and/or other construction explicitly specified herein. • Electrical notes, details, & specifications are provided by and are the sole responsibility of the electrical contractor. No electrical review has been performed and no certification of such is intended. • Structural design meets requirements of ACI 318-14, AISC 360-16, ADM1-15, & NDS-18, as applicable. • Steel components shall be coated, painted, or otherwise protected against corrosion per FBC Sec 2203.2/2222.6. • Alum components in contact with steel or embedded in concrete shall be painted or protected as prescribed in ADM1-15(1a), or plastic/neoprene spacers provided. • All exposed fasteners shall be S.S. or have a protective coating for corrosion protection. • All welding shall comply with AWS requirements. • Steel welds: E70xx electrodes. • Aluminum welds: 4043 filler alloy. • Alum extrusions: 6063-T6 or stronger, U.N.O.

ASCE 7-16 **WIND LOADS:** • V=120 mph • Exposure 'C' • Risk Category 1 Struct. • ASD Load Coeff = 0.6 • Sign Height = 15 ft max • Kzt=1.0, Kd=0.85, G=0.85 Solid freestanding sign at grade: • Cf= 1.55 (w/h ratio ≥ 1/2) **± 21.0 psf**

Christian Langley
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1-888-371-3113

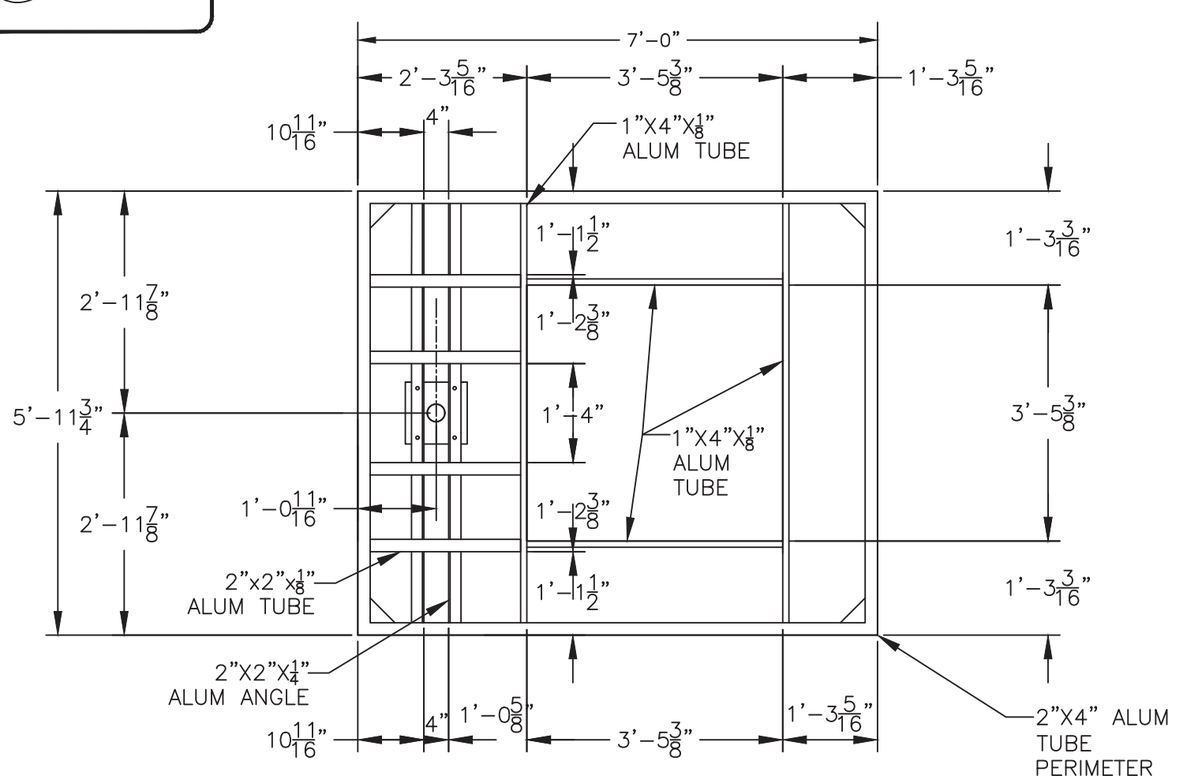
REV	DATE	DESCRIPTION	BY

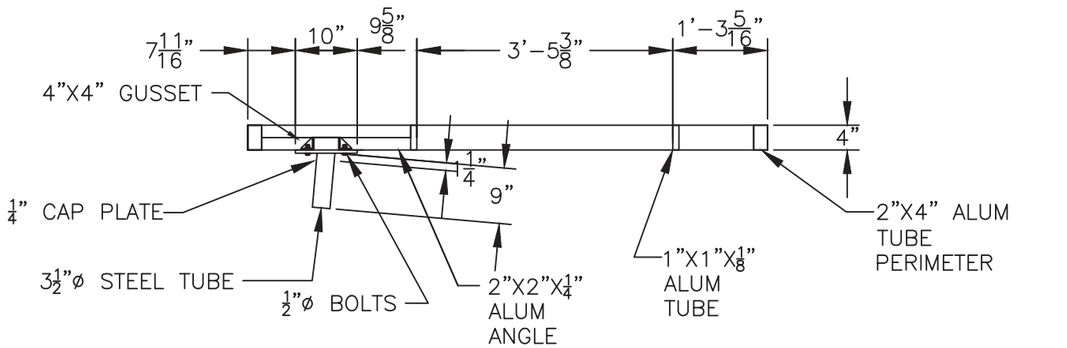
S-10.2 Drive Thru OCU

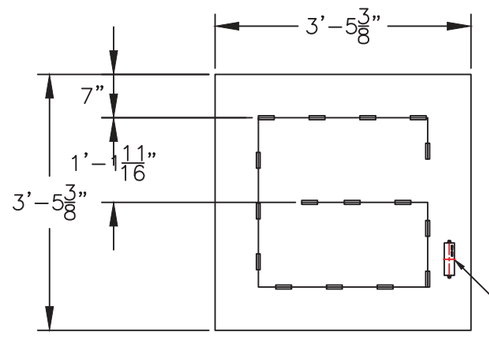
Swing Away/Manual Return

Canopy Arm

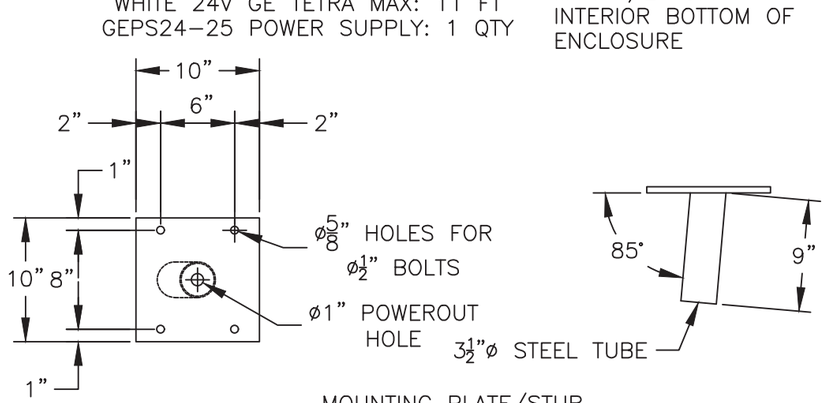
Revised 05/16/2018







LIGHT BOX LED LAYOUT
WHITE 24V GE TETRA MAX: 11 FT
GEPS24-25 POWER SUPPLY: 1 QTY



MOUNTING PLATE/STUB
1/2" STEEL PLATE
SCALE: 2X

FRAME MATERIAL LIST:

26	LFT	ARECT0009	2"X4"X1/8" ALUM TUBE
3	LFT	SA0004	1"X1"X1/8" STEEL ANGLE
10	LFT	AA0017	2"X2"X1/4" ALUM ANGLE
84	SQFT	AS0017	.063 ALUM SHEET
1	SQFT	SPL0012	1/2" STEEL PLATE
2	SQFT	SPL0011	1/4" STEEL PLATE
2	LFT	SP0007	3 1/2"ø STEEL PIPE
20	LFT	ARECT0004	1"X4"X1/8" ALUM TUBE

Note: BURGER KING® or BURGER KING® Buns and Crescent Logo to use "®" for all locations globally. All other marks will use "TM".
BURGER KING ® in the U.S. use the ® trademark symbol. The Burger King ® trademark may not be registered in all countries. See "Legal Standards" for more information. For registration updates, please contact the legal department in Miami (305) 378-3080.

Project Information

BURGER KING COLUMBIA COUNTY, FL

Custom Exterior Signage Systems

File Burger King Design Doc RFP #1 Design ... Date. 12/8/2011

Client Review Status

Burger King requires that an "☑ Approved" drawing be obtained from the client prior to any production release or production release revision.

☐ Approved

☐ Revise & Resubmit

Name

Title Date

Christian Langley
Florida PE #67382
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Boca Raton, FL 33432
1-888-371-3113

CHRISTIAN LANGLEY LICENSE No. 67382 PROFESSIONAL ENGINEER STATE OF FLORIDA
AUG 30 2021
ENGINEER'S SIGNATURE

Solid freestanding sign at grade: • Cf= 1.55 (w/h ratio ≥ 1/2) **± 21.0 psf**
• Sign Height = 15 ft max • Kzt=1.0, Kd=0.85, G=0.85
• Risk Category 1 Struct. • ASD Load Coeff = 0.6
• V= 120 mph • Exposure 'C'
ASCE 7-16
WIND LOADS:

General Notes: • Design is in accordance with the requirements of the **Fla Bldg Code 7th Ed (2020)** for use within & outside the High Velocity Hurricane Zone (HVHZ). • This engineering certifies only the structural integrity of those systems, components, and/or other construction explicitly specified herein. • Electrical notes, details, & specifications are provided by and are the sole responsibility of the electrical contractor. No electrical review has been performed and no certification of such is intended. • Structural design meets requirements of ACI 318-14, AISC 360-16, ADM1-15, & NDS-18, as applicable. • Steel components shall be coated, painted, or otherwise protected against corrosion per FBC Sec 2203.2/2222.6. • Alum components in contact with steel or embedded in concrete shall be painted or protected as prescribed in ADM1-15(1a), or plastic/neoprene spacers provided. • All exposed fasteners shall be S.S. or have a protective coating for corrosion protection. • All welding shall comply with AWS requirements. • Steel welds: E70xx electrodes. • Aluminum welds: 4043 filler alloy. • Alum extrusions: 6063-T6 or stronger, U.N.O.

DESIGN CALCULATIONS

FOR

BURGER KING
FREESTANDING MONUMENT

13721 US Hwy 441 – 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.

Index:

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

CHRISTIAN LANGLEY LICENSE No. 67382 STATE OF FLORIDA PROFESSIONAL ENGINEER

Sep 02 2021

Christian Langley PE # 67382

Easy Seals Cert Auth # 31124

ASCE 7-16 Design Wind Loads

FREESTANDING SOLID SIGNS (ELEVATED)

Building Specs

V =	120 mph	*Basic wind speed (Vult)*	Risk Category 1 Structure		
Exposure	C		ASD Load Combo Coeff:	0.6	

Calculations

α =	9.5	*3-sec gust speed power law exponent*	Kd =	0.85	*Directionality factor*
z_g =	900'	*Nominal ht. of atmos. boundary layer*	Kzt =	1.0	*Topographic factor*
G =	0.85		Ke =	1.0	*Ground elevation factor*
			Cf =	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	Kh = Kz	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

Footing Design for Freestanding Signs

Structure Dimensions & Loading

Design wind pressure:	P =	29.0	psf	
Overturning Safety Factor:	Ω =	1.5		… FBC 1807.2.3
Sign area 1:	A1 =	200.0	sq ft	… tributary area 1 for each footer (e.g. sign)
Height of applied force above grade:	h1 =	10.0	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 = 58.1 kip-ft

Round — Footing Diameter: B = 3 ft

Footing depth: d = 9.83 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 =	10423	lb	… = 150pcf*π*B^2/4*d
Total weight:	D =	10623	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 = 983 psf

Total applied lateral load: Ptot = 5.81 kips

Equiv ht of applied load: heq = 10.00 ft

As = 2.34*Ptot/(S1*B)

As = 4.6 ft

dreq = As/2 * [1 + √(1+4.36*heq/As)]

dreq = 9.76 ft — dreq < d **OK**

Hollow Structural Pipe in Bending

Allowable Stress Design per 2016 AISC Spec for Structural Steel Buildings

Material Properties

Yield Stress, A53 Grd B Steel:	Fy =	35	ksi	Safety Factor =	1.67	Per Section B3.4
Modulus of Elasticity:	E =	29000	ksi			
				End Supports:	Cantilever	

Member Properties

ANSI 12" Schedule td steel pipe

Nominal size:	12" diam	-	Std				
Outside Diameter	d =	12.75	in	Moment of Inertia:	Ix =	279.3	in^4
Wall Thickness	t =	0.375	in	Section Modulus:	S =	43.82	in^3
				Deflection Limit:	Defl =	L / 60	

Design wind pressure:	P =	29.0	psf	
Sign area:	A1 =	200.0	sq ft	... tributary area for each post (e.g. sign+post)
Eccentricity of applied force:	e1 =	10.0	ft	... distance to area centroid (weighted avg h1,h2)

(1): Yielding Limit State

Mn = Fy*S — Allowable Moment: Mallow = Mn / 1.67

Mn = 1533.6 kip-in — Mallow = 918.3 kip-in

Check Member Bending

Moment in member: Mmax = P*A1*e1

Mmax = 696.9 kip-in — Mmax < Mallow ... **OK**

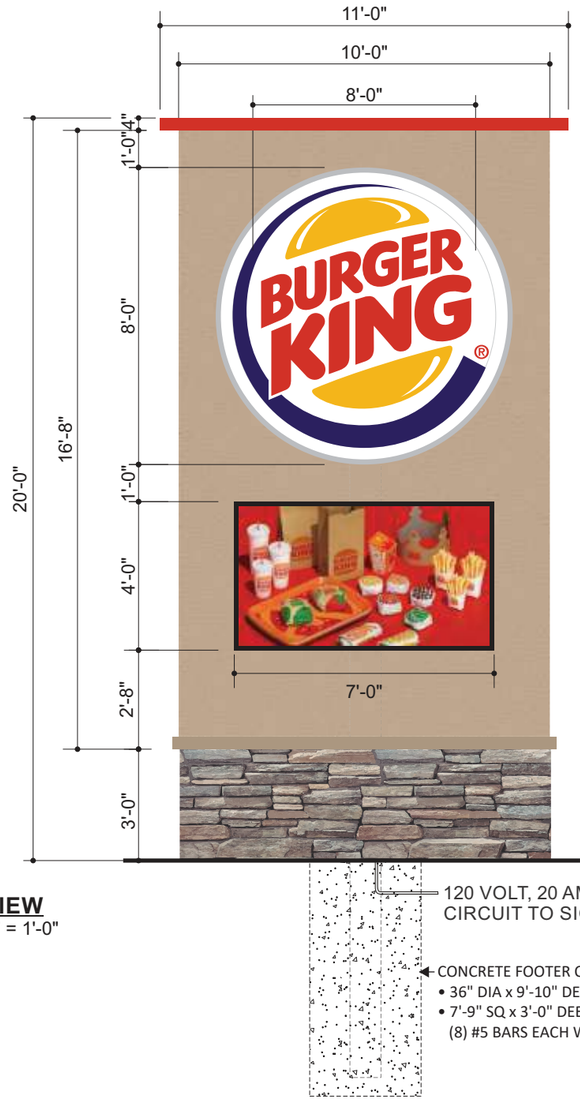
Check Member Deflection:

Allowable Deflection: Δ_{allow} = 2.00 in — L / 60

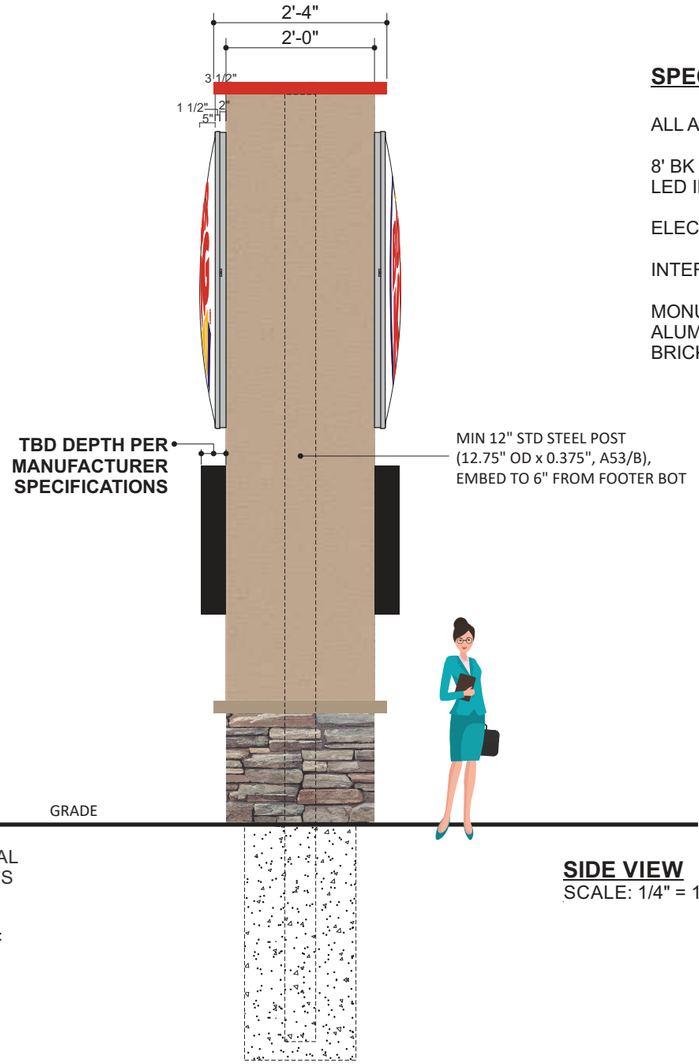
Deflection in member: Δ_{max} = P*(A*e^3) / (3*E*I)

Δ_{max} = 0.41 in — Δmax < Δallow ... **OK**

Monument Sign



FRONT VIEW
SCALE: 1/4" = 1'-0"



SIDE VIEW
SCALE: 1/4" = 1'-0"

SPECIFICATIONS:

ALL ALUMINUM CONSTRICTION WITH INTERNAL BRACING AS NECESSARY.

8' BK LOGO SIGNS ARE STANDARD CAP OVER FACE DESIGN.
LED ILLUMINATED.

ELECTRONIC MESSAGE CENTER: SPECIFICATIONS TBD.

INTERNAL STEEL AND FOUNDATION SPECIFICATIONS PER ENGINEER.

MONUMENT WILL BE SENT UNPAINTED.
ALUMINUM TO BE SANDED AND PREPPED TO BE PAINTED IN FIELD.
BRICK AND PAINTING BY OTHERS.

CHRISTIAN LANGLEY LICENSE No. 67382 STATE OF FLORIDA PROFESSIONAL ENGINEER

SEP 02 2021
ENGINEER'S SIGNATURE

Christian Langley
Florida PE #67382
Cert of Auth #31124
1200 N Federal Hwy, #200
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Allen Industries
FILE NUMBER:E212503
Listed MET E212503 — Electric Sign Complies with UL48 CSA C22.2 No.207
THIS SIGN IS INTENDED TO BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF **ARTICLE 600 OF THE NATIONAL ELECTRICAL CODE** AND/OR OTHER APPLICABLE LOCAL CODES. THIS INCLUDES PROPER GROUNDING AND BONDING OF THE SIGN.
GROUNDED ELECTRICAL CONNECTIONS

Allen Industries
YOUR BRAND AT ITS BEST™
1-800-967-2553
www.allenindustries.com

Client: **Burger King**	Date: **8/12/21**	Page #: **2 of 2**	
Address: **13721 S. US HWY 441 Lake City, FL 32025**	File Name: **BK-F.2774_Lake City, FL_100**		
	Sales: **House**	Design: **LB**	PM: **KR**

#	Date	Description	Initial
1	—	—	—
2	-	-	-
3	-	-	-
4	-	-	-
5	-	-	-
6	-	-	-

Client Review Status
Allen Industries, Inc. requires that an approved drawing be obtained from the client prior to any production release or production release revision.

Client Signature: | Approval Date:

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