

CONSIGN, LLC

CONSULTING ENGINEERS

CERTIFICATION OF AUTH. # 31618

14021 SW 143RD COURT - BAY 1, MIAMI, FL 33186 - PHONE - FAX # (305) 253-9442

Cover Sheet ***Structural Calculations***

PROJECT:

**ALUMINUM FENCE, SLIDING GATE AND
PEDESTRIAN GATE
1930 N. COMMERCE PARKWAY, SUITE #1
WESTON, FL.**

CUSTOMER: CONENGINEERS BUILDERS, LLC

**DESIGNER: Adolfo Espino P.E.
STATE OF FLORIDA REG. # 98949**

CODES AND SPECIFICATIONS:

**ALUMINUM DESIGN MANUAL 2020
FLORIDA BUILDING CODE 2023
A.S.C.E 7-22**

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DESIGN CRITERIA & APPLICABLE CODES

CODES:

- F.B.C 2023
- ADM 2020

- A.S.C.E 7-22

SOLID FREESTANDING WALL WIND LOAD CALCULATIONS

WIND CODE= ASCE 7-22
WINDSPEED= 115 MPH - FBC 2023
MEAN HEIGHT= Z= 6.00 ft - FBC 2023
EXPOSURE CATEGORY= C - FBC 2023
Aef=Effective area= 5.00 ft X 6.00 ft = 30 ft²
Kzt= 1 - Section 26.8-2 ASCE 7-22
Ke= 1 - Table 26.9-1 ASCE 7-22
Kd= 0.85 - Section 26.6-1 ASCE 7-22
Kz= 0.85 - Table 26.10-1 ASCE 7-22
qh= $0.00256 * Kz * Kzt * Ke * V^2$ - Section 30.3-1
28.78 psf
And:
B= 5.00 ft - Width of Panel
s= 6.00 ft - Height of Panel
h= 6.00 ft - Vertical distance from top of panel to ground surface
B/s= 0.83 - Aspect ratio
s/h= 1.00 - Clearance ratio
G= 0.85 - Gust-effect factor from section 26.11
Cf= 1.45 - Fig. 29.3-1
W design = $qh * G * Cf * Kd$ - Wind design Pressure Section 29.3.1
30.15 Psf
Opening = 50%
15.07 Psf - CRITICAL

WIND SPEED
V=115MPH

WIND PRESSURE
15.07PSF
ASD 0.6W=9.04PSF

CHECKING LOADS COMBINATIONS - ASCE 7-22

1.- D+L 2.- 0.6D+0.6W

CHECKING CRITICAL ALUMINUM FENCE

CHECKING CRITICAL POST ELEMENT

Try Sxx= 0.91 Aluminum SQ. TUBE 2.00" x 1/4"
Critical Span = 6.00 ft in3
Fb = 13.6 ksi Welded
w= 9.04 * 6.00 = 54.27 lb/ft
M= $\frac{54.27 * 6.00}{2}$ = 162.81 lb-ft
M= $\frac{977}{13600}$ lb-ft = 0.072 in3
S r q'd = $\frac{11722}{13600}$ = 0.86 in3
Sxx= 0.91 in3 > 0.86 in3

USE: Aluminum SQ. TUBE 2.00" x 1/4"

CHECKING CRITICAL TOP AND BOTTOM RAIL

Try Sxx= 0.33 Aluminum RT TUBE 2.00"x1.00"x1/8" (h)
Critical Span = 6.00 ft in3
Fb = 13.6 ksi Welded
w= 9.04 * 3.00 = 27.13 lb/ft
M= $\frac{27.13 * 3.00}{2}$ = 40.69 lb-ft
M= $\frac{488}{13600}$ lb-ft = 0.036 in3
S r q'd = $\frac{5861}{13600}$ = 0.43 in3
Sxx= 0.33 in3 > 0.43 in3

USE: Aluminum RT TUBE 2.00"x1.00"x1/8" (h)

CHECKING CRITICAL PICKET

Try Sxx= 0.11 Aluminum SQ. TUBE 1.00" x 1/8"
Critical Span = 3.50 ft in3
Fb = 31.8 ksi UnWelded
w= 9.04 * 0.33 = 3.01 lb/ft
M= $\frac{3.01 * 0.33}{8}$ = 0.124 lb-ft
M= $\frac{5}{31800}$ lb-ft = 0.00016 in3
S r q'd = $\frac{55}{31800}$ = 0.0017 in3
Sxx= 0.11 in3 > 0.0017 in3

USE: Aluminum SQ. TUBE 1.00" x 1/8"

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CHECKING CRITICAL FOOTING EMBEDMENT AS PER F.B.C 2023 - SECTION 1807.3

For Constrained: $d = \sqrt[4]{4.25 \cdot \left(\frac{P \cdot h}{S_3 \cdot b} \right)}$
For Unconstrained: $d = 0.5A(1 + (4.36h/A))^{\frac{1}{2}}$ $A = 2.34 P / (S_1 b)$
b= diameter of round post or diagonal dimension of square post or footing, ft
d= depth of embedment in earth in feet but not exceed 12 feet for purpose of this calculation
P= applied load, in lbs, at a distance h from the ground
h= distance in feet from ground to point of application of P.
S1= allowable lateral soil bearing pressure in pfs as per table 1806.2 based on a depth of 1/3d.
S3= allowable soil bearing pressure in pfs as per table 1806.2 based on a depth equal to d.
d= 2.2 ft
Enter b = 1.00 ft (12" ϕ)
Enter P = 163 lb
Enter h= 6.00 ft
Lateral Bearing= 400 psf/ft - As 1806.2 - Worst Case
S1= 293 psf
S3= 880 psf
A= 1.299 ft2
Then: $d = 2.2$ ft

CHECKING CRITICAL ALUMINUM SLIDING GATE

CHECKING CRITICAL POST ELEMENT

Try	Aluminum	SQ. TUBE 3.00" x 1/4"
Sxx= 6.00	2.33	in3
Critical Span = Fb =	31.8	ksi
		UnWelded
w= 9.04	*	13.50
M= 122.10	x	36.00
	2	
M= 2198	lb-ft	= 26374
S r q'd = 26374	=	0.83 in3
	31800	
Sxx= 2.33	in3	> 0.83 in3

USE: Aluminum SQ. TUBE 3.00" x 1/4"

CHECKING CRITICAL FRAME

Try	Aluminum	SQ. TUBE 2.00" x 1/4"
Sxx= 6.00	0.91	in3
Critical Span = Fb =	13.6	ksi
		Welded
w= 9.04	*	6.25
M= 56.53	x	36.00
	2	
M= 1017	lb-ft	= 12210
S r q'd = 12210	=	0.90 in3
	13600	
Sxx= 0.91	in3	> 0.90 in3

USE: Aluminum SQ. TUBE 2.00" x 1/4"

CHECKING CRITICAL PICKET

Try	Aluminum	SQ. TUBE 1.00" x 1/8"
Sxx= 5.50	0.11	in3
Critical Span = Fb =	31.8	ksi
		UnWelded
w= 9.04	*	0.33
M= 3.01	x	30.25
	8	
M= 11	lb-ft	= 137
S r q'd = 137	=	0.00 in3
	31800	
Sxx= 0.11	in3	> 0.0043 in3

USE: Aluminum SQ. TUBE 1.00" x 1/8"

CHECKING CRITICAL FOOTING EMBEDMENT AS PER F.B.C 2023 - SECTION 1807.3

For Constrained: $d = \sqrt[4]{4.25 \cdot \left(\frac{P \cdot h}{S_3 \cdot b} \right)}$
For Unconstrained: $d = 0.5A(1 + (4.36h/A))^{\frac{1}{2}}$ $A = 2.34 P / (S_1 b)$
b= diameter of round post or diagonal dimension of square post or footing, ft
d= depth of embedment in earth in feet but not exceed 12 feet for purpose of this calculation
P= applied load, in lbs, at a distance h from the ground
h= distance in feet from ground to point of application of P.
S1= allowable lateral soil bearing pressure in pfs as per table 1806.2 based on a depth of 1/3d.
S3= allowable soil bearing pressure in pfs as per table 1806.2 based on a depth equal to d.
d= 2.9 ft
Enter b = 1.00 ft (12" ϕ)
Enter P = 366 lb
Enter h= 6.00 ft
Lateral Bearing= 400 psf/ft - As 1806.2 - Worst Case
S1= 380 psf
S3= 1140 psf
A= 2.256 ft2
Then: $d = 2.9$ ft

ROLLING GATE
CALCULATIONS
BASED ON WIND
PRESSURE
V=115MPH

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CHECKING CRITICAL ALUMINUM PEDESTRIAN GATE

CHECKING CRITICAL POST ELEMENT

Try	Aluminum	SQ. TUBE 2.00" x 1/4"			
Sxx=	0.91	in3			
Critical Span =	4.00	ft			
Fb	=	31.8	ksi	UnWelded	
w=	9.04	*	4.00	=	36.18
M=	36.18	x	16.00	=	289.42
		2			lb/ft
M=	289	lb-ft	=	3473	lb-in
S r q'd =	3473	=	0.11	in3	
	31800				
Sxx=	0.91	in3	>	0.11	in3

USE: Aluminum SQ. TUBE 2.00" x 1/4"

CHECKING CRITICAL FRAME

Try	Aluminum	SQ. TUBE 2.00" x 1/8"			
Sxx=	0.53	in3			
Critical Span =	8.00	ft			
Fb	=	13.6	ksi	Welded	
w=	9.04	*	2.00	=	18.09
M=	18.09	x	64.00	=	578.84
		2			lb/ft
M=	579	lb-ft	=	6946	lb-in
S r q'd =	6946	=	0.51	in3	
	13600				
Sxx=	0.53	in3	>	0.51	in3

USE: Aluminum SQ. TUBE 2.00" x 1/8"

CHECKING CRITICAL PICKET

Try	Aluminum	SQ. TUBE 1.00" x 1/8"			
Sxx=	0.11	in3			
Critical Span =	3.50	ft			
Fb	=	31.8	ksi	UnWelded	
w=	9.04	*	0.33	=	3.01
M=	3.01	x	12.25	=	4.62
		8			lb/ft
M=	5	lb-ft	=	55	lb-in
S r q'd =	55	=	0.00	in3	
	31800				
Sxx=	0.11	in3	>	0.0017	in3

USE: Aluminum SQ. TUBE 1.00" x 1/8"

CHECKING CRITICAL FOOTING EMBEDMENT AS PER F.B.C 2023 - SECTION 1807.3

For Constrained:	d=	SQRT(4.25 * ((P*h)/(S3 * b)))			
For Unconstrained:	d=	0.5A(1+(1+(4.36h/A))^(1/2))	A = 2.34 P / (S1b)		
	b=	diameter of round post or diagonal dimension of square post or footing, ft			
	d=	depth of embedment in earth in feet but not exceed 12 feet for purpose of this calculation			
	P=	applied load, in lbs, at a distance h from the ground			
	h=	distance in feet from ground to point of application of P.			
	S1=	allowable lateral soil bearing pressure in pfs as per table 1806.2 based on a depth of 1/3d.			
	S3=	allowable soil bearing pressure in pfs as per table 1806.2 based on a depth equal to d.			
	d=	1.5	ft		
	Enter b =	1.00	ft (12" ϕ)		
	Enter P =	72	lb		
	Enter h=	4.00	ft		
Lateral Bearing=		400	psf/ft - As 1806.2	- Worst Case	
	S1=	193	psf		
	S3=	580	psf		
	A=	0.876	ft2		
Then :	d =	1.5	ft		

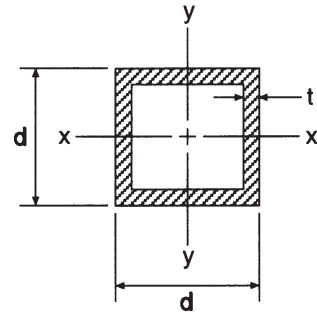


Table 23
SQUARE TUBES

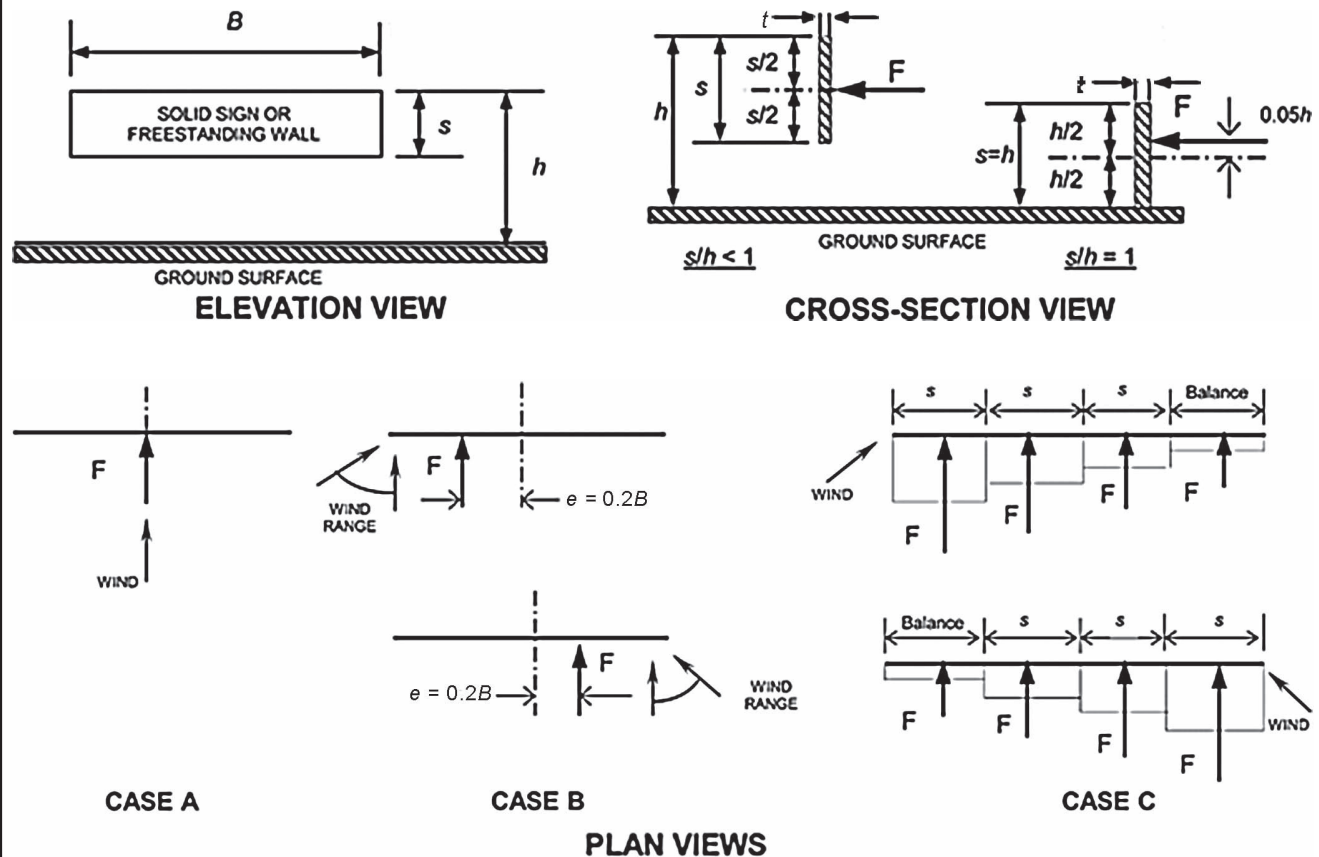
Designation	Depth width <i>d</i> in.	Thickness <i>t</i> in.	Weight lb/ft	Area <i>A</i> in ²	Axis x-x, y-y			<i>J</i> in ⁴
					<i>I_x, I_y</i> in ⁴	<i>S_x, S_y</i> in ³	<i>r_x, r_y</i> in.	
RT 1 × 1 × .065	1.000	0.065	0.286	0.243	0.0356	0.0712	0.383	0.0531
RT 1 × 1 × .095	1.000	0.095	0.404	0.344	0.0475	0.0949	0.371	0.0704
RT 1 × 1 × .125	1.000	0.125	0.515	0.438	0.0570	0.114	0.361	0.0837
RT 1.25 × 1.25 × .065	1.250	0.065	0.362	0.308	0.0723	0.116	0.485	0.108
RT 1.25 × 1.25 × .095	1.250	0.095	0.516	0.439	0.0982	0.157	0.473	0.146
RT 1.25 × 1.25 × .125	1.250	0.125	0.662	0.563	0.120	0.192	0.462	0.178
RT 1.375 × 1.375 × .125	1.375	0.125	0.735	0.625	0.164	0.239	0.513	0.244
RT 1.5 × 1.5 × .065	1.500	0.065	0.439	0.373	0.128	0.171	0.586	0.192
RT 1.5 × 1.5 × .078	1.500	0.078	0.522	0.444	0.150	0.200	0.581	0.224
RT 1.5 × 1.5 × .095	1.500	0.095	0.628	0.534	0.176	0.235	0.575	0.263
RT 1.5 × 1.5 × .125	1.500	0.125	0.809	0.688	0.218	0.291	0.564	0.325
RT 1.5 × 1.5 × .250	1.500	0.250	1.47	1.25	0.339	0.451	0.520	0.488
RT 1.75 × 1.75 × .125	1.750	0.125	0.956	0.813	0.360	0.411	0.665	0.536
RT 2 × 2 × .095	2.000	0.095	0.851	0.724	0.439	0.439	0.779	0.657
RT 2 × 2 × .125	2.000	0.125	1.10	0.938	0.552	0.552	0.767	0.824
RT 2 × 2 × .156	2.000	0.156	1.35	1.15	0.657	0.657	0.755	0.978
RT 2 × 2 × .188	2.000	0.188	1.60	1.36	0.754	0.754	0.744	1.12
RT 2 × 2 × .250	2.000	0.250	2.06	1.75	0.911	0.911	0.722	1.34
RT 2.25 × 2.25 × .125	2.250	0.125	1.25	1.06	0.802	0.713	0.869	1.20
RT 2.5 × 2.5 × .125	2.500	0.125	1.40	1.19	1.12	0.896	0.971	1.67
RT 2.5 × 2.5 × .188	2.500	0.188	2.04	1.74	1.56	1.25	0.947	2.32
RT 2.5 × 2.5 × .250	2.500	0.250	2.65	2.25	1.92	1.54	0.924	2.85
RT 2.75 × 2.75 × .125	2.750	0.125	1.54	1.31	1.51	1.10	1.07	2.26
RT 2.75 × 2.75 × .188	2.750	0.188	2.27	1.93	2.12	1.54	1.05	3.16
RT 3 × 3 × .095	3.000	0.095	1.30	1.10	1.55	1.04	1.19	2.33
RT 3 × 3 × .125	3.000	0.125	1.69	1.44	1.98	1.32	1.17	2.97
RT 3 × 3 × .188	3.000	0.188	2.49	2.11	2.80	1.87	1.15	4.18
RT 3 × 3 × .250	3.000	0.250	3.23	2.75	3.49	2.33	1.13	5.20
RT 3 × 3 × .375	3.000	0.375	4.63	3.94	4.61	3.08	1.08	6.78
RT 3.5 × 3.5 × .125	3.500	0.125	1.98	1.69	3.21	1.83	1.38	4.81
RT 3.5 × 3.5 × .250	3.500	0.250	3.82	3.25	5.76	3.29	1.33	8.58
RT 3.5 × 3.5 × .375	3.500	0.375	5.51	4.69	7.74	4.42	1.28	11.4
RT 4 × 4 × .125	4.000	0.125	2.28	1.94	4.85	2.43	1.58	7.27
RT 4 × 4 × .188	4.000	0.188	3.37	2.87	6.96	3.48	1.56	10.4
RT 4 × 4 × .250	4.000	0.250	4.41	3.75	8.83	4.41	1.53	13.2
RT 4 × 4 × .375	4.000	0.375	6.39	5.44	12.0	6.02	1.49	17.9
RT 4 × 4 × .500	4.000	0.500	8.23	7.00	14.6	7.29	1.44	21.4

Table 26.10-1. Velocity Pressure Exposure Coefficients, K_h and K_z .

Height above Ground Level, z or h		Exposure		
ft	m	B	C	D
0–15	0–4.6	0.57 (0.70)*	0.85	1.03
20	6.1	0.62 (0.70)*	0.90	1.08
25	7.6	0.66 (0.70)*	0.94	1.12
30	9.1	0.70	0.98	1.16
40	12.2	0.74	1.04	1.22
50	15.2	0.79	1.09	1.27
60	18.3	0.83	1.13	1.31
70	21.3	0.86	1.17	1.34
80	24.4	0.90	1.21	1.38
90	27.4	0.92	1.24	1.40
100	30.5	0.95	1.26	1.43
120	36.6	1.00	1.31	1.48
140	42.7	1.04	1.34	1.52
160	48.8	1.08	1.39	1.55
180	54.9	1.11	1.41	1.58
200	61.0	1.14	1.44	1.61
250	76.2	1.21	1.51	1.68
300	91.4	1.27	1.57	1.73
350	106.7	1.33	1.62	1.78
400	121.9	1.38	1.66	1.82
450	137.2	1.42	1.70	1.86
500	152.4	1.46	1.74	1.89

* Use 0.70 in Chapter 28, Exposure B, when $z < 30$ ft (9.1 m).

Diagrams



Notation

B = Horizontal dimension of wall or sign, ft (m)
 e = Eccentricity of force, ft (m)
 F = Design wind force for other structures, lb (N)
 h = Height of the wall or sign, ft (m)
 L_r = Horizontal dimension of return corner, ft (m)
 $R_{\min} = t/\min(B \text{ and } s)$
 $R_{\max} = t/\max(B \text{ and } s)$
 s = Vertical dimension of the wall or sign, ft (m)
 t = Thickness of the wall or sign, ft (m)
 e = Ratio of solid area to gross area

Force Coefficients, C_f , for Case A and Case B

Clearance Ratio, s/h	Aspect Ratio, B/s											
	≤ 0.05	0.1	0.2	0.5	1	2	4	5	10	20	30	≥ 45
1	1.80	1.70	1.65	1.55	1.45	1.40	1.35	1.35	1.30	1.30	1.30	1.30
0.9	1.85	1.75	1.70	1.60	1.55	1.50	1.45	1.45	1.40	1.40	1.40	1.40
0.7	1.90	1.85	1.75	1.70	1.65	1.60	1.60	1.55	1.55	1.55	1.55	1.55
0.5	1.95	1.85	1.80	1.75	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.75
0.3	1.95	1.90	1.85	1.80	1.80	1.80	1.80	1.80	1.80	1.85	1.85	1.85
0.2	1.95	1.90	1.85	1.80	1.80	1.80	1.80	1.80	1.85	1.90	1.90	1.95
≤ 0.16	1.95	1.90	1.85	1.85	1.80	1.80	1.85	1.85	1.85	1.90	1.90	1.95

Figure 29.3-1. Design wind loads (all heights): force coefficients, C_f , for other structures—solid freestanding walls and solid freestanding signs.