Worksheet – Open Fencing – Wind Loading Only FenceDesign.com

Site Location:

Customer:

Site and Geometrical Variables

IBC_____ ASCE 7-_____ Risk Category_____ Frost Depth_____ ft

Basic Wind Speed, V_w = _____ mph

Wind Pressure, q_w = _____ psf

Exposure Category _____ Topographical Factor, K_{zt} = _____

Site Elevation, Z_e = ________ ft Elevation Factor, K_e = _____

Height of fence, h = _____ ft Gap at bottom of fence, g = _____ ft (zero if no gap)

Height of fencing material, s = h - g = _____ ft

Velocity Pressure Exposure Coefficient, K_z = _____

Wind & Axial Loading

Fence Run #____ Length of Fence, B = ____ ft Post spacing, L = ____ ft

Solidity Ratio, ε = ____ Inverted Fence Opening Reduction Factor, $R_{1w} = 1.0$

Force Height Adjustment Factor, $F_{hw} = 1.0$ Wind Force Coefficient, C_{fw} = ____

Expected Post Diameter or Width, $Ø_p$ = ____ in

Top Rail Diameter or Width, $Ø_r$ = ____ in Mid Rail Diameter or Width, $Ø_p$ = ____ in

($Ø_r$ & $Ø_m$ – set to Zero if not applicable for rails)

Wind Area of Post, $A_p = Ø_p / 12 \times h$ = ____ ($Ø_p$) ÷ 12 × ____ (h) = ____ (A_p) ft²

(A_p = 0 for solid / mostly solid fencing)

Wind Area of Rails, $A_r = (Ø_r / 12) \times 2 \times L + (Ø_m /12) \times L$ (A_r = 0 if no rails)

A_r = (____ ($Ø_r$) ÷ 12 × 2 × ____ (L)) + (____ ($Ø_m$) ÷ 12 × ____ (L)) = ____ (A_r) ft²

Wind area tributary to the post, $A_w = \varepsilon\, s\, L + A_p + A_r$ = ____ (ε) × ____ (s) × ____ (L) + ____ (A_p) + ____ (A_r) = ____ (A_w) ft²

Dead Load of fencing materials, D_m ___ psf

Lateral and Axial Forces for Wind Loading

Minimum wind force to the post, $f_{min} = (0.6)\ 16.0\ A_w = 9.6 \times$ _____ (A_w) = _______ (f_{min}) lbs

Calculated Wind Force to the post, $f_w = q_w K_z K_{zt} K_e R_{1w} F_{hw} C_{fw} A_w$

f_w = _____ (q_w) × _____ (K_z) × _____ (K_{zt}) × _____ (K_e) × 1.0 (R_{1w}) × 1.0 (F_{hw}) × _____ (C_{fw}) × _____ (A_w) = ________ (f_w) lbs

Maximum wind force to the post, f_w' = maximum value of either f_{mim} or f_w = ________ (f_w') lbs

Axial force supported by the post, $p_a = D_w\, s\, L$

P_w = _____ (D_w) × _____ (s) × _____ (L) = _______ (p_w) lbs

$5 \times p_w$ = ________ lbs (used for stability check)

Post Selection

Using the diameter of the desired post size, O.D., and the Fence Height, h, look through the post charts for post types that have an F_a value larger than the f_w' value, and a P_a value larger than the p_w value. If the post has an * next to the P_a value, only use it if the P_a value is $\geq 5 \times p_w$ due to stability requirements.

Put in the O.D, post type, weight per foot, D_p and fence height, h and calculate p_w' to include the weight of the post. Add any additional weight if needed.

f_w' / F_a is the bending strength ratio for Wind

p_w' / P_a is the axial strength ratio for Wind

If the sum of the bending strength and axial strength ratios are ≤ 1.0, the post is acceptable.

O.D.	Post Type	D_p (lb/f)	h (ft)	$p_w' = p_w + (D_p \times h)$	
				p_w' =	
Wind					
f_w' = / F_a = ______ =			p_w' = / P_a = ______ =		$\frac{f_w'}{F_a} + \frac{p_w'}{P_a}$ =

O.D.	Post Type	D_p (lb/f)	h (ft)	$p_w' = p_w + (D_p \times h)$	
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Wind					
f_w' = / F_a = ______ =			p_w' = / P_a = ______ =		$\frac{f_w'}{F_a} + \frac{p_w'}{P_a}$ =

O.D.	Post Type	D_p (lb/f)	h (ft)	$p_w' = p_w + (D_p \times h)$	
				p_w' =	
Wind					
f_w' = / F_a = ______ =			p_w' = / P_a = ______ =		$\frac{f_w'}{F_a} + \frac{p_w'}{P_a}$ =

Footing Sizing (non-constrained footings)

Design Footing Depth, D = _____ ft   Footing Diameter, b = _____ ft

Lateral Bearing Pressure per foot of depth, S = _____ psf / ft   per geotechnical analysis or table 1806.2

Maximum Wind Force, $P = f_w'$ = _____ lbs   Post Height, h = _____ ft

Modifier for Isolated Posts, $M = 2.0$ per IBC §1086.3.4

Allowable Lateral Soil Bearing Pressure for non-constrained footings, $S_1 = ⅓\, D\, S\, M$

S_1 = ⅓ × _____ (D) × _____ (S) × 2.0 (M) = ______ (S_1) psf   per IBC §1807.3.2.1

Soil Bearing Factor, $A = 2.34\, P / (S_1\, b)$ per IBC §1807.3.2.1

A = 2.34 × _____ (P) ÷ (_____ (S_1) × _____ (b)) = _____ (A)

Minimum Depth, $d = \frac{1}{2} A \left(1 + \sqrt{1 + \frac{4.36\ \frac{1}{2}h}{A}}\right)$ per Eq. 18-1, modified for fencing

d = ½ × ____ (A) × (1 + $\sqrt{1 + (4.36 \times \frac{1}{2} \times \_\_\_\_ (h) \div \_\_\_\_ (A))}$)) = ____ (d) ft

Area of the bottom of the footing, $A_f = \pi (\frac{1}{2} b)^2$ = 3.14 × (½ × _____ (b))^2 = _____ (A_f) ft^2

Footing Volume, $V = A_f\, D$ = _____ (A_f) × _____ (D) = _____ (V) ft^3

Weight of footing, $D_f = 150\, V$ = 150 × _____ (V) = _____ (D_f) lbs   (Typical Concrete weight is 150 lbs / ft^3)

Axial Dead Load, $D_{max} = D_f + p_w'$

D_{max} = _____ (D_f) + ______ (p_w') = ______ (D_{max}) lbs

Maximum Vertical Foundation Pressure, S_y = ______ psf   per geotechnical analysis or table 1806.2

Maximum Axial Pressure on the soil, $s_y = D_{max} / A_f$ = _____ (D_{max}) ÷ _____ (A_f) = _____ (s_y) psf

Actual to Allowable Soil Strength Ratio, s_y / S_y = _____ (s_y) ÷ _____ (S_y) = ____ ≤ 1.0 is OK

s_y / S_y must be less than 1.0. If not, start over with a larger footing diameter, b