**Worksheet – Open Fencing – Wind Loading**

**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, $\varepsilon$ = ____ 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, $A_w = \varepsilon\, s\, L + A_p + A_r$ = ____ ($\varepsilon$) × ____ ($s$) × ____ ($L$) + ____ ($A_p$) + ____ ($A_r$) = ____ ($A_w$) ft²

Dead Load of fencing materials, $D_m$ ___ psf

### Lateral and Axial Forces for Wind Loading

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

The 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 | | | | | |
| $\frac{f_w =}{F_a =}$ = | | | $\frac{p_w' =}{P_a =}$ = | | $\frac{f_w}{F_a} + \frac{p_w'}{P_a} =$ |

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

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

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

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

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

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

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

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

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

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

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

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

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

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