FenceDesign.com Wind Formula Methodology

The FenceDesign.com Design Guide uses a simplified set of formulas to determine wind forces, but delivers the same end result as the more complicated ASCE 7 methods. The first two tables below show the ASCE formulas. The third table shows the rearranged and simplified method used for fencing in this design guide.

ASCE 7-10 & 7-16 Formulas (K_e is not used in 7-10, so K_e is set to 1.0 in that case)		
$q_h = 0.00256\, K_h\, K_{zt}\, K_d\, K_e\, V^2$	Wind pressure w/ site modifiers at z = h	Eq. 26.10-1 evaluated at top of structure
$q_z = 0.00256\, K_z\, K_{zt}\, K_d\, K_e\, V^2$	Wind pressure w/ site modifiers at z ≈ ½h	Eq. 26.10-1 evaluated at centroid of structure
$F = (0.6)\, q_h\, G\, C_f\, A_s$	Force to post in Wind loading for ε > 0.7	Eq. 29.3-1 modified for ASD Load Cases
$F = (0.7)\, q_h\, G\, C_f\, A_s$	Force to post in Wind on Ice loading for ε > 0.7	
$F = (0.6)\, q_z\, G\, C_f\, A_f$	Force to post in Wind loading for ε ≤ 0.7	Eq. 29.4-1 modified for ASD Load Cases
$F = (0.7)\, q_z\, G\, C_f\, A_f$	Force to post in Wind on Ice loading for ε ≤ 0.7	

ASCE 7-22 Formulas (K_d moves from q to F - no net effect)		
$q_h = 0.00256\, K_h\, K_{zt}\, K_e\, V^2$	Wind pressure w/ site modifiers	Eq. 26.10-1 evaluated at top of structure
$q_z = 0.00256\, K_z\, K_{zt}\, K_e\, V^2$	Wind pressure w/ site modifiers	Eq. 26.10-1 evaluated at centroid of structure
$F = 0.6\, q_h\, K_d\, G\, C_f\, A_s$	Force to post in Wind loading for ε > 0.7	Eq. 29.3-1 modified for ASD Load Cases
$F = 0.7\, q_h\, K_d\, G\, C_f\, A_s$	Force to post in Wind on Ice loading for ε > 0.7	
$F = 0.6\, q_z\, K_d\, G\, C_f\, A_f$	Force to post in Wind loading for ε ≤ 0.7	Eq. 29.4-1 modified for ASD Load Cases
$F = 0.7\, q_z\, K_d\, G\, C_f\, A_f$	Force to post in Wind on Ice loading for ε ≤ 0.7	

FenceDesign.com Design Procedure - Formulas rearranged to separate wind pressure from site specific modifiers		
$q_w = (0.6)\, 0.00256\, K_d\, G\, V_w^2$	ASD Wind pressure w/o site modifiers	Rearranging formulas allows for tabular wind pressure values and simplification of formulas
$q_i = (0.7)\, 0.00256\, K_d\, G\, V_i^2$	ASD Wind on Ice pressure w/o site modifiers	
$F_w = q_w\, K_z\, K_{zt}\, K_e\, R_{1w}\, F_{hw}\, C_{fw}\, A_w$	Forces to mid-height of post based on site specific modifiers and fence design variables	
$F_i = q_i\, K_z\, K_{zt}\, K_e\, R_{1i}\, F_{hi}\, C_{fi}\, A_i$		

Wind Directionality Factor, K_d = 0.85 per Table 26.6-1 for solid freestanding walls and single plane open frames

Gust Effect Factor, G = 0.85 per §26.9 (7-10) or §26.11 (7-16 & 7-22) for rigid structures (n_a > 1.0 Hz)

Velocity Pressure Exposure Coefficients, K_z evaluated at ½ h, and K_h evaluated at h

The FenceDesign.com Design Guide uses only K_z, but determines the value at ½ h for open fencing and h for solid fencing

Open Frame Area, $A_f = \varepsilon\, s\, L$

Solid / Mostly Solid Wall Area, $A_s = s\, L$ The fence opening reduction factor is used in ASCE to reduce the C_f value

Wind Force Coefficient, C_f C_{fw} for Wind loading C_{fi} for Wind on Ice loading

Inverted Fence Opening Reduction Factor, R_1 R_{1w} for Wind loading R_{1i} for Wind on Ice loading

Force Height Adjustment Factor, F_h F_{hw} for Wind loading F_{hi} for Wind on Ice loading.

A_w = Net Area for Wind Loading

A_i = Net Area for Wind on Ice Loading