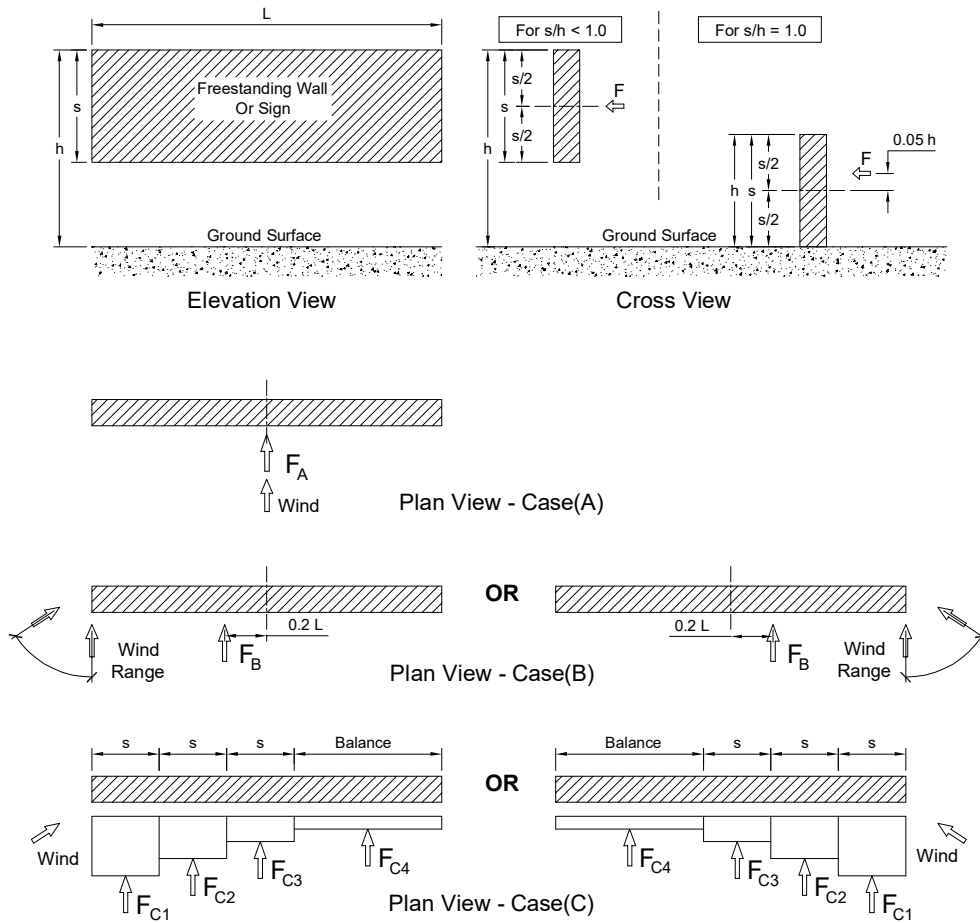




Calculation of Wind load for Solid Freestanding Walls & Signs as per ASCE/SEI 7-10 Chapters 26 & 29



Dimensions of Solid Freestanding Walls or Solid Freestanding Signs

Horizontal Dimension of Wall or Sign, $L=$ 75.0 ft
 Mean top height of Wall or Sign, $h=$ 10.0 ft
 Vertical Dimension of Wall or Sign, $s=$ 10.0 ft

Wind load Parameters

Basic wind speed, $V=$ 105.00 mph
 Wind Directionality Factor (According to Table 26.6-1 of ASCE/SEI 7),
 $K_d=$ 0.85
 The Exposure Category (According to Cl. 26.7.3 of ASCE/SEI 7):
 Category: SEL("ASCE/Exp"; Category;) = B
 Gust-Effect Factor (According to Cl. 26.9.1 of ASCE/SEI 7), $G=$ 0.85
 Topographic Factor (According to Cl. 26.8.2 of ASCE/SEI 7), $K_{zt}=$ 1.00

Velocity Pressure

According to (Table 26.9-1 of ASCE/SEI 7),
 $\alpha=$ TAB("ASCE/Exp"; Alph; Category=Category) = 7.00
 According to (Table 26.9-1 of ASCE/SEI 7),
 $z_g=$ TAB("ASCE/Exp"; z_g; Category=Category) = 1200.00



The Velocity Pressure Exposure Coefficient (According to Table 29.3-1 of ASCE/SEI 7):

Kh = IF(h<15; 2.01 * (15/zg)^(2/alpha); 2.01 * (h/zg)^(2/alpha)) = 0.57

Velocity Pressure (According to Cl. 29.3.2 of ASCE/SEI 7),

qh = 0.00256 * Kh * Kzt * Kd * V^2 = 13.67 psf

The gross area of the solid freestanding wall or sign, As = L * s = 750 ft^2

Ratio of solid area to gross area, epsilon = 1.00

Reduction Factor for Openings, RF = 1 - (1 - epsilon)^1.5 = 1.00

Wind Forces - Case A

Force Coefficient (According to Fig. 29.4-1 of ASCE/SEI 7), Cfa = 1.33

Design wind force (According to Cl. 29.4.1 of ASCE/SEI 7),

Fa = qh * G * Cfa * As * RF / 1000 = 11.6 kips

Wind Forces - Case B

Force Coefficient (According to Fig. 29.4-1 of ASCE/SEI 7), Cfb = 1.33

Design wind force (According to Cl. 29.4.1 of ASCE/SEI 7),

Fb = qh * G * Cfb * As * RF / 1000 = 11.6 kips

Wind Forces - Case C

Region-1 from (0 to s or less)

Force Coefficient for Region-1 (According to Fig. 29.4-1 of ASCE/SEI 7),

Cfc1 = 3.48

Effective Area for Region-1, Asc1 = IF(L/s>1;s*s;L*s;) = 100 ft^2

Design Wind Force for Region-1 (According to Cl. 29.4.1 of ASCE/SEI 7).

Fc1 = RF/1000*MAX(16;qh*G*Cfc1*IF(s/h>0.8;(1.8-s/h);1))*Asc1 = 3.2 kips

Region-2 from (s to 2s) Validation: IF(L/s>1;"Valid";"Invalid";) = Valid

Force Coefficient for Region-2 (According to Fig. 29.4-1 of ASCE/SEI 7),

Cfc2 = 2.28

Effective Area for Region-2, Asc2 = IF(L/s>2;s*s;IF(L/s<1;0;(L-s)*s);) = 100 ft^2

Design Wind Force for Region-2 (According to Cl. 29.4.1 of ASCE/SEI 7).

Fc2 = RF/1000*MAX(16;qh*G*Cfc2*IF(s/h>0.8;(1.8-s/h);1))*Asc2 = 2.1 kips

Region-3 from (2s to 3s) Validation: IF(L/s>2;"Valid";"Invalid";) = Valid

Force Coefficient for Region-3 (According to Fig. 29.4-1 of ASCE/SEI 7),

Cfc3 = 1.68

Effective Area for Region-3, Asc3 = IF(L/s>3;s*s;IF(L/s<2;0;(L-2*s)*s);) = 100 ft^2

Design Wind Force for Region-3 (According to Cl. 29.4.1 of ASCE/SEI 7).

Fc3 = RF/1000*MAX(16;qh*G*Cfc3*IF(s/h>0.8;(1.8-s/h);1))*Asc3 = 1.6 kips

Region-4 from (3s to L) Validation: IF(L/s>3;"Valid";"Invalid";) = Valid

Force Coefficient for Region-4 (According to Fig. 29.4-1 of ASCE/SEI 7),



$$C_{fc4} = 1.05$$

$$\text{Effective Area for Region-4, } A_{sC4} = IF(L/s > 3; (L - 3*s)*s; 0;) = 450 \text{ ft}^2$$

Design Wind Force for Region-4 (According to Cl. 29.4.1 of ASCE/SEI 7).

$$F_{C4} = RF/1000 * \text{MAX}(16; q_h * G * C_{fc4} * IF(s/h > 0.8; (1.8 - s/h); 1)) * A_{sC4} = 7.2 \text{ kips}$$

Calculation Summary

$$F_A = F_A = 11.6 \text{ kips}$$

$$F_B = F_B = 11.6 \text{ kips}$$

$$F_{C1} = F_{C1} = 3.2 \text{ kips}$$

$$F_{C2} = F_{C2} = 2.1 \text{ kips}$$

$$F_{C3} = F_{C3} = 1.6 \text{ kips}$$

$$F_{C4} = F_{C4} = 7.2 \text{ kips}$$