

# Wind Loads - Chinatown Park Lanterns

## ASCE 7-10 - CHAPTER 29

### 29.4 DESIGN WIND LOADS—SOLID FREESTANDING WALLS AND SOLID SIGNS

#### 29.4.1 Solid Freestanding Walls and Solid Freestanding Signs

The design wind force for solid freestanding walls and solid freestanding signs shall be determined by the following formula:

$$F = q_h G C_f A_s \text{ (lb) (N)} \quad (29.4-1)$$

where

$q_h$  = the velocity pressure evaluated at height  $h$   
(defined in Fig. 29.4-1) as determined in accordance with Section 29.3.2

$G$  = gust-effect factor from Section 26.9

$C_f$  = net force coefficient from Fig. 29.4-1

$A_s$  = the gross area of the solid freestanding wall or freestanding solid sign, in ft<sup>2</sup> (m<sup>2</sup>)

## \* VELOCITY PRESSURE

### 29.3.2 Velocity Pressure

Velocity pressure,  $q_z$ , evaluated at height  $z$  shall be calculated by the following equation:

$$q_z = 0.00256 K_z K_{zt} K_d V^2 \text{ (lb/ft}^2\text{)} \quad (29.3-1)$$

[In SI:  $q_z = 0.613 K_z K_{zt} K_d V^2 \text{ (N/m}^2\text{)}; V \text{ in m/s}$ ]

where

$K_d$  = wind directionality factor defined in Section 26.6

$K_z$  = velocity pressure exposure coefficient defined in Section 29.3.1

$K_{zt}$  = topographic factor defined in Section 26.8.2

$V$  = basic wind speed from Section 26.5

Height of Interest

$z =$

25

ft

Basic Wind Speed - Mass Code 9th ED

**V =**

128

mph

Wind Directionality Factor:

**K<sub>d</sub>** = 0.85 - Solid Freestanding Signs/Walls

Topographic Factor:

**K<sub>zt</sub>** = 1.0 - Site conditions do not meet conditions specified in 26.8.1Velocity Pressure Exposure Coefficients, **K<sub>h</sub>** and **K<sub>z</sub>**

Table 29.3-1

Height above ground level, z		Exposure		
		B	C	D
ft	(m)			
0-15	(0-4.6)	0.57	0.85	1.03
20	(6.1)	0.62	0.90	1.08
25	(7.6)	0.66	0.94	1.12
30	(9.1)	0.70	0.98	1.16
40	(12.2)	0.76	1.04	1.22
50	(15.2)	0.81	1.09	1.27
60	(18)	0.85	1.13	1.31
70	(21.3)	0.89	1.17	1.34
80	(24.4)	0.93	1.21	1.38
90	(27.4)	0.96	1.24	1.40
100	(30.5)	0.99	1.26	1.43
120	(36.6)	1.04	1.31	1.48
140	(42.7)	1.09	1.36	1.52
160	(48.8)	1.13	1.39	1.55
180	(54.9)	1.17	1.43	1.58
200	(61.0)	1.20	1.46	1.61
250	(76.2)	1.28	1.53	1.68
300	(91.4)	1.35	1.59	1.73
350	(106.7)	1.41	1.64	1.78
400	(121.9)	1.47	1.69	1.82
450	(137.2)	1.52	1.73	1.86
500	(152.4)	1.56	1.77	1.89

Exposure Category - Page 298

**EC =**

B - Urban/Suburban Areas, Wood Areas

▼

Velocity Pressure Exposure Coefficient

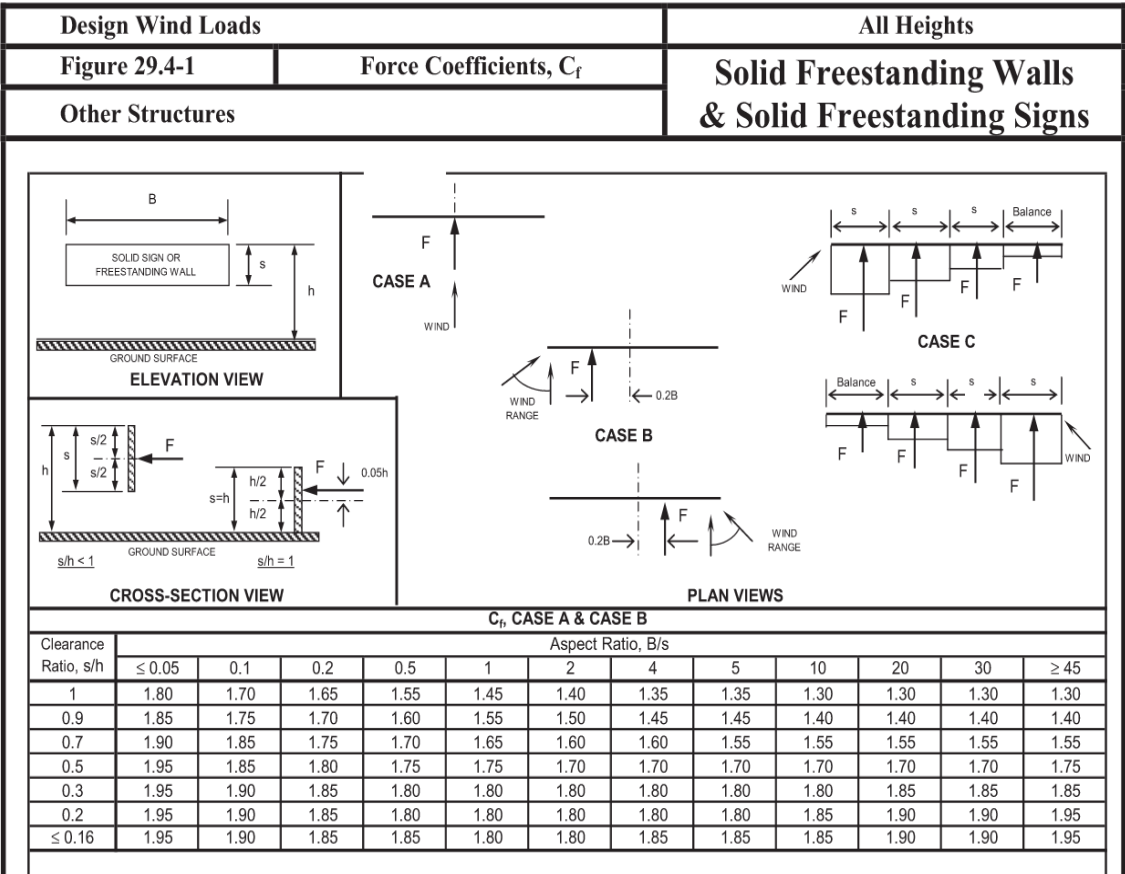
$K_z =$

0.66

\* Gust-effect Factor

$G = 0.85$  - Section 26.9.1


\* Net Force Coefficient





Net Force Coefficient


C<sub>f</sub> =


1.8







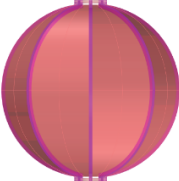





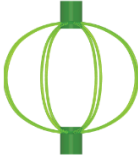












2.38 ft<sup>2</sup>

1.47 ft<sup>2</sup>

3.22 ft<sup>2</sup>

1.83 ft<sup>2</sup>

0.08 ft<sup>2</sup>

H

C

A

D

K

Gross Area of Each Lantern

A<sub>s\_H</sub> =

2.38

ft<sup>2</sup>

A<sub>s\_C</sub> =

1.47

ft<sup>2</sup>

A<sub>s\_A</sub> =

3.22

ft<sup>2</sup>

A<sub>s\_D</sub> =

1.83

ft<sup>2</sup>

A<sub>s\_K</sub> =

0.08

ft<sup>2</sup>

Calculate

Reset

**Results:**

Velocity Pressure at Height z:

$$q_z = 23.53 \text{ psf}$$

Design Wind Force for Each Type of Lantern:

$$F_H = 85.68 \text{ lb}$$

$$F_C = 52.92 \text{ lb}$$

$$F_A = 115.92 \text{ lb}$$

$$F_D = 65.88 \text{ lb}$$

$$F_K = 2.88 \text{ lb}$$