

Company

Address
City, State
Phone
other

JOB TITLE Example 10 - Sign

JOB NO. _____ SHEET NO. _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____

STRUCTURAL CALCULATIONS

FOR

Example 10 - Sign

Guide to Wind Load Procedures of ASCE 7-02

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www.struware.com

Code Search

Code: ASCE 7 - 02

Occupancy:

Occupancy Group = B Business

Occupancy Category & Importance Factors:

Occupancy Category =	I
Wind factor =	0.87
Snow factor =	0.80
Seismic factor =	1.00

Type of Construction:

Fire Rating:	
Roof =	0.0 hr
Floor =	0.0 hr

Building Geometry:

Roof angle (θ)	0.00 / 12	0.0 deg
Building length (L)	2.0 ft	
Least width (B)	50.0 ft	
Mean Roof Ht (h)	80.0 ft	
Parapet ht above grd	0.0 ft	
Minimum parapet ht	0.0 ft	

Live Loads:

Roof 0 to 200 sf: 20 psf
 200 to 600 sf: 24 - 0.02Area, but not less than 12 psf
 over 600 sf: 12 psf

Floor

Typical Floor	50 psf
Lobbies & first floor corridors	100 psf
Corridors above first floor	80 psf
Mechanical	100 psf
Stairs & Exitways	100 psf
Balcony / Deck	50 psf
Partitions	20 psf

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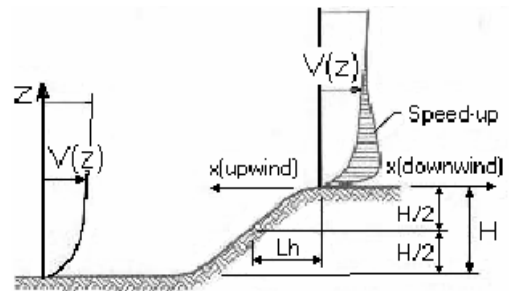
Wind Loads :

Importance Factor 0.87
Basic Wind speed 90 mph
Directionality (Kd) 0.85
Exposure Category C
Enclosure Classif. Partially Enclosed
Internal pressure +/-0.55
Kh case 1 1.208
Kh case 2 1.208
Type of roof Monoslope

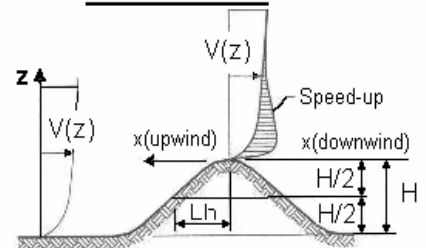
Topographic Factor (Kzt)

Topography Flat
Hill Height (H) 80.0 ft
Half Hill Length (Lh) 100.0 ft
Actual H/Lh = 0.80
Use H/Lh = 0.50
Modified Lh = 160.0 ft
From top of crest: x= 50.0 ft
Bldg up/down wind? downwind

H/Lh= 0.50 K₁ = 0.000
x/Lh = 0.31 K₂ = 0.792
z/Lh = 0.50 K₃ = 1.000
At Mean Roof Ht:
Kzt = (1+K₁K₂K₃)² = 1.00



ESCARPMENT



2D RIDGE or 3D AXISYMMETRICAL HILL

Gust Effect Factor

h = 80.0 ft use 20.0
B = 50.0 ft
/z (0.6h) = 48.0 ft use 70.0

Flexible structure if natural frequency < 1 Hz (T > 1 second).
However, if building h/B < 4 then probably rigid structure (rule of thumb).
h/B = 0.40 Therefore, probably rigid structure

G = 1.09 Using flexible structure formula

Rigid Structure

/ε = 0.20
l = 500 ft
z_{min} = 15 ft
c = 0.20
g_Q, g_v = 3.4
L_z = 581.1 ft
Q = 0.93
I_z = 0.18
G = 0.89 use G = 0.85

Flexible or Dynamically Sensitive Structure

Natural Frequency (n₁) = 0.7 Hz
Damping ratio (β) = 0.01
/b = 0.65
/α = 0.15
V_z = 96.3
N₁ = 4.22
R_n = 0.056
R_h = 0.304 η = 2.674 h = 80.0 ft
R_B = 0.426 η = 1.672
R_L = 0.866 η = 0.224
g_R = 4.104
R = 0.828
G = 1.094

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Enclosure Classification

Test for Enclosed Building: A building that does not qualify as open or partially enclosed.

Test for Open Building: All walls are at least 80% open.
 $A_o \geq 0.8A_g$

Test for Partially Enclosed Building:

Input		Test	
Ao	0.0 sf	$A_o \geq 1.1A_{oi}$	YES
Ag	0.0 sf	$A_o > 4' / 0.01A_g$	NO
Aoi	0.0 sf	$A_{oi} / A_{gi} \leq 0.20$	NO
Agi	0.0 sf		

Building is NOT Partially Enclosed.

Conditions to qualify as Partially Enclosed Building. Must satisfy all of the following:

- $A_o \geq 1.1A_{oi}$
- $A_o >$ smaller of 4' or 0.01 Ag
- $A_{oi} / A_{gi} \leq 0.20$

Where:

- Ao = the total area of openings in a wall that receives positive external pressure.
- Ag = the gross area of that wall in which Ao is identified.
- Aoi = the sum of the areas of openings in the building envelope (walls and roof) not including Ao.
- Agi = the sum of the gross surface areas of the building envelope (walls and roof) not including Ag.

Reduction Factor for large volume partially enclosed buildings (Ri) :

If the partially enclosed building contains a single room that is unpartitioned , the internal pressure coefficient may be multiplied by the reduction factor Ri.

Total area of all wall & roof openings (Aog): 0 sf
 Unpartitioned internal volume (Vi) : 0 cf
 $R_i = 1.00$

Altitude adjustment to constant 0.00256 :

Altitude = 0 feet Average Air Density = 0.0765 lbm/ft³
 Constant = 0.00256

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Wind Loads - Other Structures:

Importance Factor = 0.87
Gust Effect Factor (G) = 1.09 Wind Speed 90 mph
Kzt = 1.00 Exposure C

A. Solid Freestanding Walls & Solid Signs (& open signs with less than 30% open)

Height to centroid of Af (z) =	80.0 ft	M =	50.00	Case A & B
Dist to sign top (h)	80.0 ft	N =	20.00 ft	C _f = 1.20
Height (s)	20.0 ft	M/N =	2.50 ft	F = q _z G C _f A _f = 24.3 Af
Width (B)	50.0 ft	K _z =	1.208	A _f = 10.0 sf
		q _z =	18.5 psf	F = 243 lbs
Directionality (Kd)	0.85			
Percent of open area to gross area	0.0%			

B. Open Signs & Lattice Frameworks (openings 30% or more of gross area)

Height to centroid of Af (z)	15.0 ft		K _z = 0.849
			Base pressure (q _z) = 13.0 psf
Width (zero if round)	2.0 ft	Either width or diameter must be zero	
Diameter (zero if rect)	2.0 ft	D(qz) ^{.5} = 7.22	F = q _z G C _f A _f = 0.0 Af
Percent of open area to gross area	35.0%	ε = 0.65	Solid Area: A _f = 10.0 sf
Directionality (Kd)	0.85	C _f = 0	F = 0 lbs

C. Chimneys, Tanks & Similar Structures

Height to centroid of Af (z)	15.0 ft		K _z = 0.849
Cross-Section	Square		Base pressure (q _z) = 13.8 psf
Directionality (Kd)	0.90		h/D = 15.00
Height (h)	15.0 ft		
Width (D)	1.0 ft		
Type of Surface	N/A		

Square (wind along diagonal)

C_f = 1.28
F = q_z G C_f A_f = **19.3 Af**
A_f = sf
F = 0 lbs

Square (wind normal to face)

C_f = 1.67
F = q_z G C_f A_f = **25.1 Af**
A_f = 10.0 sf
F = 251 lbs

D. Trussed Towers

Height to centroid of Af (z)	15.0 ft		K _z = 0.849
ε =	0.27		Base pressure (q _z) = 15.3 psf
Tower Cross Section	square		
Member Shape	flat		Diagonal wind factor = 1.2
Directionality (Kd)	1.00		Round member factor = 1.000

Square (wind along tower diagonal)

C_f = 3.24
F = q_z G C_f A_f = **54.3 Af**
Solid Area: A_f = 10.0 sf
F = 543 lbs

Square (wind normal to face)

C_f = 2.70
F = q_z G C_f A_f = **45.2 Af**
Solid Area: A_f = 10.0 sf
F = 452 lbs