

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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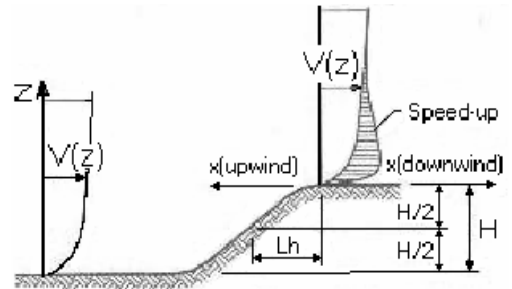
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Wind Loads :

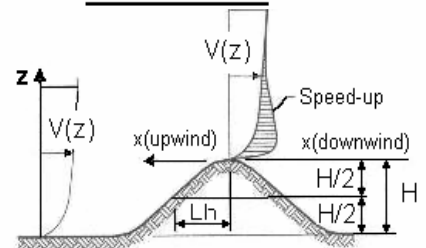
Importance Factor	0.87
Basic Wind speed	90 mph
Directionality (Kd)	0.85
Exposure Category	C
Enclosure Classif.	Partially Enclosed
Internal pressure	+/-0.55
Kh case 1	1.208
Kh case 2	1.208
Type of roof	Monoslope

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	K ₁ = 0.000
x/Lh = 0.31	K ₂ = 0.792
z/Lh = 0.50	K ₃ = 1.000
At Mean Roof Ht:	
Kzt = (1+K ₁ K ₂ K ₃) 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 (n ₁) =	0.7 Hz
Damping ratio (β) =	0.01
/b =	0.65
/α =	0.15
V _z =	96.3
N ₁ =	4.22
R _n =	0.056
R _h =	0.304
R _B =	0.426
R _L =	0.866
g _R =	4.104
R =	0.828
G =	1.094
η =	2.674
η =	1.672
η =	0.224
h =	80.0 ft

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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:

- Ao >= 1.1Aoi
- Ao > smaller of 4' or 0.01 Ag
- Aoi / Agi <= 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
Ri =	1.00

Altitude adjustment to constant 0.00256 :

Altitude =	0 feet	Average Air Density =	0.0765 lbm/ft ³
Constant =	0.00256		

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Wind Loads - Other Structures:

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

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	Kz =	1.208	A _f = 10.0 sf
		qz =	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	Kz =	0.849
Width (zero if round)	2.0 ft	Base pressure (qz) =	13.0 psf
Diameter (zero if rect)	2.0 ft		
Percent of open area to gross area	35.0%	D(qz) ^{.5} =	7.22
Directionality (Kd)	0.85	ε =	0.65
		C _f =	0
		F = q _z G C _f A _f =	0.0 Af
		Solid Area: A _f =	10.0 sf
		F =	0 lbs

C. Chimneys, Tanks & Similar Structures

Height to centroid of Af (z)	15.0 ft	Kz =	0.849
Cross-Section	Square	Base pressure (qz) =	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	Kz =	0.849
ε =	0.27	Base pressure (qz) =	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