WIND LOADING ANALYSIS - Main Wind-Force Resisting System

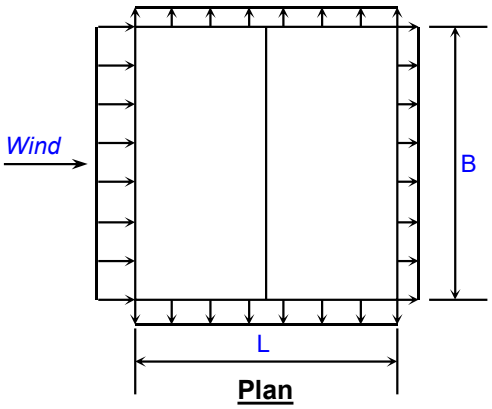
Per ASCE 7-05 Code for Enclosed or Partially Enclosed Buildings

Using Method 2: Analytical Procedure (Section 6.5) for Low-Rise Buildings

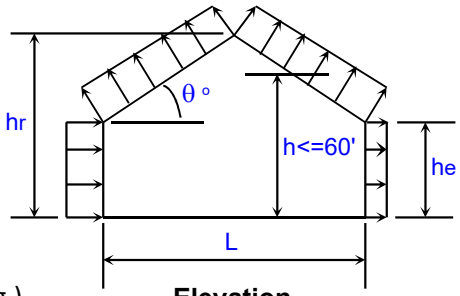
Job Name:		Subject:			
Job Number:		Originator:		Checker:	

Input Data:

Wind Speed, V =	95	mph (Wind Map, Figure 6-1)
Bldg. Classification =	II	(Table 1-1 Occupancy Cat.)
Exposure Category =	C	(Sect. 6.5.6)
Ridge Height, hr =	53.33	ft. (hr >= he)
Eave Height, he =	20.00	ft. (he <= hr)
Building Width =	200.00	ft. (Normal to Building Ridge)
Building Length =	250.00	ft. (Parallel to Building Ridge)
Roof Type =	Gable	(Gable or Monoslope)
Topo. Factor, Kzt =	1.00	(Sect. 6.5.7 & Figure 6-4)
Direct. Factor, Kd =	0.85	(Table 6-4)
Enclosed? (Y/N)	Y	(Sect. 6.2 & Figure 6-5)
Hurricane Region?	Y	



Plan



Elevation

Resulting Parameters and Coefficients:

Roof Angle, θ =	18.43	deg.
Mean Roof Ht., h =	36.67	ft. (h = (hr+he)/2, for angle >10 deg.)

Check Criteria for a Low-Rise Building:

1. Is h <= 60' ? Yes, O.K. 2. Is h <= Lesser of L or B? Yes, O.K.

External Pressure Coeff's., GCpf (Fig. 6-10):

(For values, see following wind load tabulations.)

Positive & Negative Internal Pressure Coefficients, GCpi (Figure 6-5):

+GCpi Coef. =	0.18	(positive internal pressure)
-GCpi Coef. =	-0.18	(negative internal pressure)

If h < 15 then: Kh = 2.01*(15/zg)^(2/α) (Table 6-3, Case 1b)

If h >= 15 then: Kh = 2.01*(z/zg)^(2/α) (Table 6-3, Case 1b)

α =	9.50	(Table 6-2)
zg =	900	(Table 6-2)
Kh =	1.02	(Kh = Kz evaluated at z = h)
I =	1.00	(Table 6-1) (Importance factor)

Velocity Pressure: qz = 0.00256*Kz*Kzt*Kd*V^2*I (Sect. 6.5.10, Eq. 6-15)

qh = 20.12 psf qh = 0.00256*Kh*Kzt*Kd*V^2*I (qz evaluated at z = h)

Design Net External Wind Pressures (Sect. 6.5.12.2.2):

p = qh*[(GCpf) - (+/-GCpi)] (psf, Eq. 6-18)

Wall and Roof End Zone Widths 'a' and '2*a' (Fig. 6-10):

a = 14.67 ft.

2*a = 29.33 ft.

MWFRS Wind Load for Transverse Direction				MWFRS Wind Load for Longitudinal Direction			
Surface	GCpf	p = Net Pressures (psf)		Surface	*GCpf	p = Net Pressures (psf)	
		(w/ +GCpi)	(w/ -GCpi)			(w/ +GCpi)	(w/ -GCpi)
Zone 1	0.52	6.77	14.01	Zone 1	0.40	4.43	11.67
Zone 2	-0.69	-17.51	-10.26	Zone 2	-0.69	-17.51	-10.26
Zone 3	-0.47	-13.05	-5.81	Zone 3	-0.37	-11.07	-3.82
Zone 4	-0.42	-11.98	-4.74	Zone 4	-0.29	-9.46	-2.21
Zone 5	-0.45	-12.68	-5.43	Zone 5	-0.45	-12.68	-5.43
Zone 6	-0.45	-12.68	-5.43	Zone 6	-0.45	-12.68	-5.43
Zone 1E	0.78	12.08	19.32	Zone 1E	0.61	8.65	15.90
Zone 2E	-1.07	-25.15	-17.91	Zone 2E	-1.07	-25.15	-17.91
Zone 3E	-0.67	-17.17	-9.93	Zone 3E	-0.53	-14.29	-7.04
Zone 4E	-0.62	-16.06	-8.81	Zone 4E	-0.43	-12.27	-5.03

*Note: Use roof angle θ = 0 degrees for Longitudinal Direction.

For Trans. when GCpf is neg. in Zones 2/2E:

Zones 2/2E dist. = 50.00 ft.

For Long. when GCpf is neg. in Zones 2/2E:

Zones 2/2E dist. = 50.00 ft.

Remainder of roof Zones 2/2E extending to ridge line shall use roof Zones 3/3E pressure coefficients.

MWFRS Wind Load for Transverse, Torsional Case				MWFRS Wind Load for Long., Torsional Case			
Surface	GCpf	p = Net Pressure (psf)		Surface	GCpf	p = Net Pressure (psf)	
		(w/ +GCpi)	(w/ -GCpi)			(w/ +GCpi)	(w/ -GCpi)
Zone 1T	---	1.69	3.50	Zone 1T	---	1.11	2.92
Zone 2T	---	-4.38	-2.57	Zone 2T	---	-4.38	-2.57
Zone 3T	---	-3.26	-1.45	Zone 3T	---	-2.77	-0.96
Zone 4T	---	-3.00	-1.18	Zone 4T	---	-2.36	-0.55

Notes: 1. For Transverse, Longitudinal, and Torsional Cases:

Zone 1 is windward wall for interior zone. Zone 1E is windward wall for end zone.

Zone 2 is windward roof for interior zone. Zone 2E is windward roof for end zone.

Zone 3 is leeward roof for interior zone. Zone 3E is leeward roof for end zone.

Zone 4 is leeward wall for interior zone. Zone 4E is leeward wall for end zone.

Zones 5 and 6 are sidewalls.

Zone 1T is windward wall for torsional case Zone 2T is windward roof for torsional case.

Zone 3T is leeward roof for torsional case Zone 4T is leeward wall for torsional case.

2. (+) and (-) signs signify wind pressures acting toward & away from respective surfaces.

3. Building must be designed for all wind directions using the 8 load cases shown below. The load cases are applied to each building corner in turn as the reference corner.

4. Wind loads for torsional cases are 25% of respective transverse or longitudinal zone load values. Torsional loading shall apply to all 8 basic load cases applied at each reference corner.

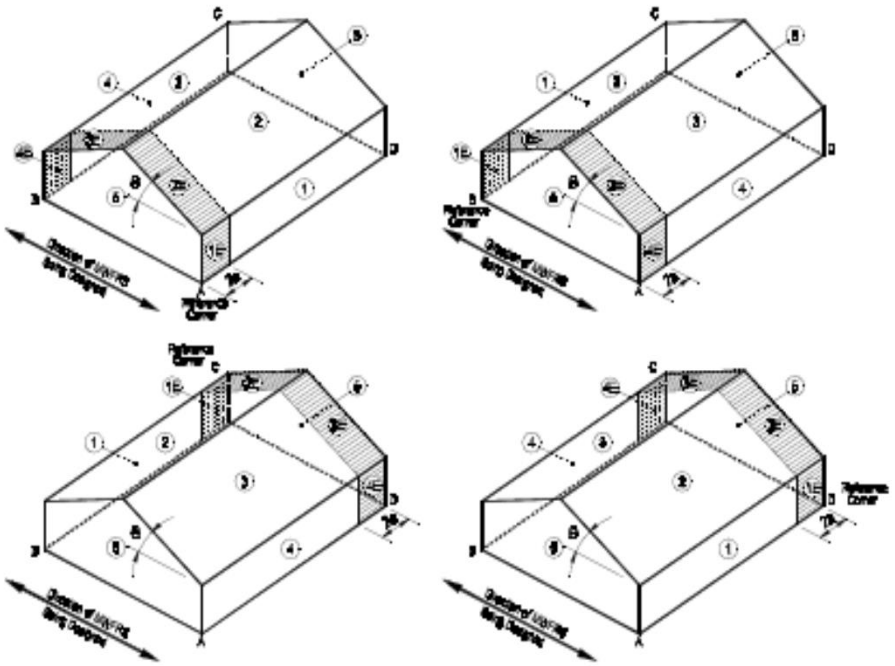
Exception: One-story buildings with "h" <= 30', buildings <= 2 stories framed with light frame

construction, and buildings <=2 stories designed with flexible diaphragms need not be designed for torsional load cases.

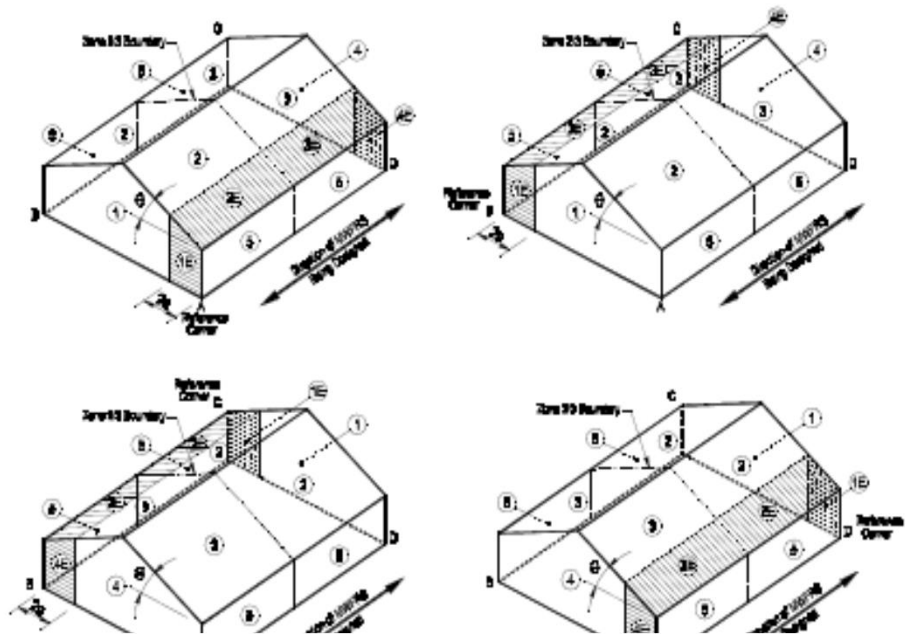
5. Per Code Section 6.1.4.1, the minimum wind load for MWFRS shall not be less than 10 psf.

6. References : a. ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures".
b. "Guide to the Use of the Wind Load Provisions of ASCE 7-05"
by: Kishor C. Mehta and William L. Coulbourne (2010).

Low-Rise Buildings h <= 60'

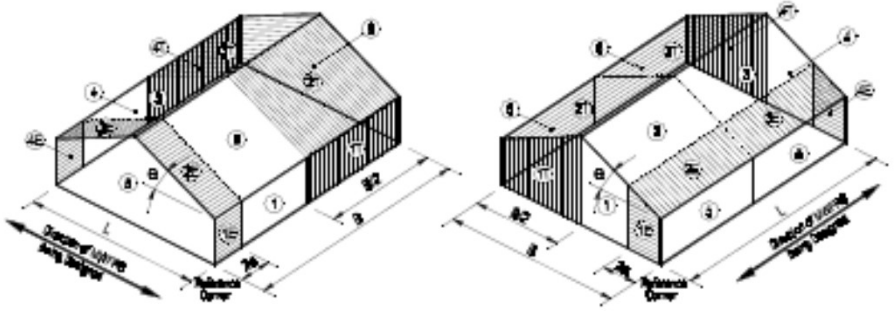


Transverse Direction



Longitudinal Direction

Basic Load Cases



Transverse Direction

Longitudinal Direction

Torsional Load Cases

Version 1.4