Wind Load Report - Wind Load Calculation

1. Site & Building Data

Roof Type:	Gable
Wind Speed (ult):	115 mph
Exposure Category:	C
Enclosure Class:	Enclosed
Building Width (W):	40 ft.
Building Length (L):	72 ft.
Eave Height (h_e):	18 ft.
Foundation Height (h_f):	0 ft.
Roof Pitch:	4 /12
Eave Overhang (OH_e):	1 ft.
Gable Overhang (OH_g):	1 ft.

2. Parameters & Coefficients

Topographic Factor (K_{zt}):	1.0
Directionality Factor (K_d):	.85
Roof Angle (θ):	18.43 deg.
Mean Roof Height (h):	21.33 ft.
Ridge Height (h_r):	24.67 ft.
Pos. Internal Pressure (+GCpi):	+0.18
Neg. Internal Pressure (-GCpi):	-0.18
Velocity Pressure Exp. Coeff. (K_h):	0.91 @ z=h
Velocity Pressure (q_h):	26.31 psf
End Zone Width (a):	3.00 ft.
Zone 2/2E Dist.:	20.00 ft.

3. Design Assumptions and Notes

Code Standard:	ASCE 7-10
Geometry:	Regular-Shaped Bldg.
Height Class:	Low-Rise Building
Notes:	

4. Design Loads

Top Chord Dead Load:	5 psf
Bottom Chord Dead Load:	5 psf
Truss/Rafter Spacing:	48 in. o/c

4. Design Wind Pressures: MWFRS Envelope Procedure

Load Case A: Transverse Direction

Surface	GCpf	Design Pressure (psf)	
		(w/ +GCpi)	(w/ -GCpi)
1	0.52	8.85	18.32
2	-0.69	-22.89	-13.42
3	-0.47	-17.06	-7.59
4	-0.42	-15.66	-6.19
1E	0.78	15.79	25.26
2E	-1.07	-32.89	-23.42
3E	-0.67	-22.45	-12.98
4E	-0.62	-21.00	-11.53
2OH	-0.69	-18.15	
2EOH	-1.07	-28.15	
3OH	-0.47	-12.33	
3EOH	-0.67	-17.71	
2OH+W	-0.69/-0.7	-35.92	
2EOH+W	-1.07/-0.7	-45.92	

a) (+) and (-) signs signify wind pressures acting toward & away from surfaces.
b) External Pressure Coefficients linearly interpolated from Fig. 28.4-1 ASCE 7-10.
c) Design building for all wind directions, 4 load patterns per load case.
d) Total horizontal shear shall not be less than that by neglecting roof wind forces.
e) Min. wind load for enclosed or partially enclosed bldg.: 16 psf wall, 8 psf roof.
f) Design pressures are for strength design, multiply by 0.6 for ASD.

Load Case B: Longitudinal Direction

Surface	GCpf	Design Pressure (psf)	
		(w/ +GCpi)	(w/ -GCpi)
1	-0.45	-16.57	-7.10
2	-0.69	-22.89	-13.42
3	-0.37	-14.47	-5.00
4	-0.45	-16.57	-7.10
5	0.40	5.79	15.26
6	-0.29	-12.37	-2.89
1E	-0.48	-17.36	-7.89
2E	-1.07	-32.89	-23.42
3E	-0.53	-18.68	-9.21
4E	-0.48	-17.36	-7.89
5E	0.61	11.31	20.78
6E	-0.43	-16.05	-6.58
2OH	-0.69	-18.15	
2EOH	-1.07	-28.15	
3OH	-0.37	-9.73	
3EOH	-0.53	-13.94	
2EOH+W	-1.07/-0.7	-46.57	
3EOH+W	-0.53/-0.7	-32.36	

a) (+) and (-) signs signify wind pressures acting toward & away from surfaces.
b) External Pressure Coefficients linearly interpolated from Fig. 28.4-1 ASCE 7-10.
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d) Total horizontal shear shall not be less than that by neglecting roof wind forces.
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Torsional Load Cases

Surface	Load Case	GCpf	Design Pressure (psf)	
			(w/ +GCpi)	(w/ -GCpi)
1T	A	-	2.21	4.58
2T	A	-	-5.72	-3.35
3T	A	-	-4.27	-1.90
4T	A	-	-3.92	-1.55
5T	B	-	1.45	3.81
6T	B	-	-3.09	-0.72

a) (+) and (-) signs signify wind pressures acting toward & away from surfaces.
b) Pressures designated with a "T" are 25% of full design wind pressures.
c) Torsional loading shall apply to all 8 load patterns using the figures shown.
d) Design pressures are for strength design, multiply by 0.6 for ASD.
e) Torsional Design Exceptions: One story bldg. with h ≤ 30 ft,
   Two stories or less framed with light frame construction,
   Two stories or less with flexible diaphragms.
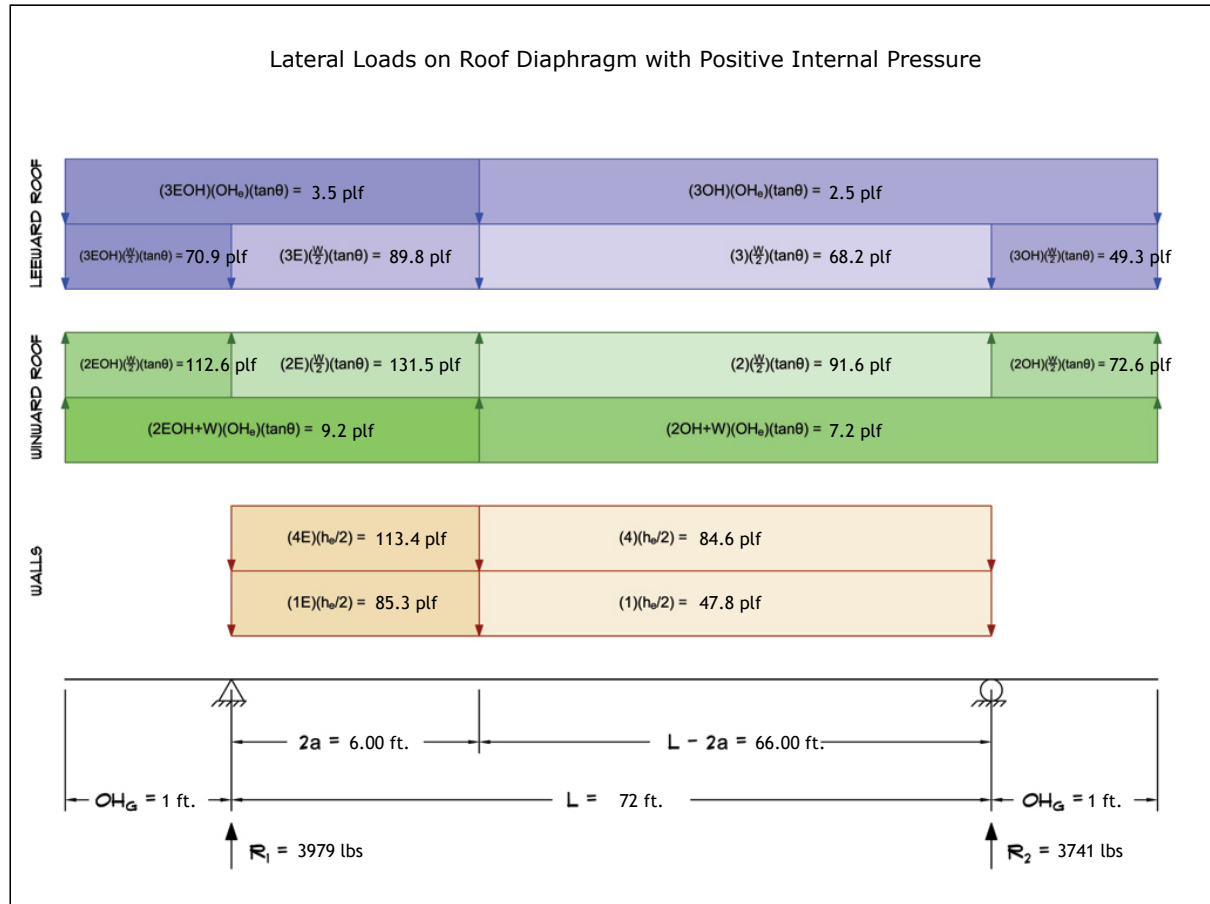

Case A Torsion — Transverse Direction

Case B Torsion — Longitudinal Direction

Subject	Customer	Location	Job No.
Wind Loads	Paul Hurlbut	676 East Columbine Drive	Vap Construction

Engr.			Rev.
Engineer Name	ENGINEERING COMPANY INC.		-

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5. Wind Load Calculations

1.) Lateral Loads - Transverse Direction:

Lateral Loads on Roof Diaphragm with Positive Internal Pressure

LEEWARD ROOF
- $(3EOH)(OH_e)(tan\theta) = 3.5$ plf
- $(3OH)(OH_e)(tan\theta) = 2.5$ plf
- $(3EOH)(\frac{W}{2})(tan\theta) = 70.9$ plf
- $(3E)(\frac{W}{2})(tan\theta) = 89.8$ plf
- $(3)(\frac{W}{2})(tan\theta) = 68.2$ plf
- $(3OH)(\frac{W}{2})(tan\theta) = 49.3$ plf

WINWARD ROOF
- $(2EOH)(\frac{W}{2})(tan\theta) = 112.6$ plf
- $(2E)(\frac{W}{2})(tan\theta) = 131.5$ plf
- $(2)(\frac{W}{2})(tan\theta) = 91.6$ plf
- $(2OH)(\frac{W}{2})(tan\theta) = 72.6$ plf
- $(2EOH+W)(OH_e)(tan\theta) = 9.2$ plf
- $(2OH+W)(OH_e)(tan\theta) = 7.2$ plf

WALLS
- $(4E)(h_e/2) = 113.4$ plf
- $(4)(h_e/2) = 84.6$ plf
- $(1E)(h_e/2) = 85.3$ plf
- $(1)(h_e/2) = 47.8$ plf

$2a = 6.00$ ft. $L - 2a = 66.00$ ft.
$OH_G = 1$ ft. $L = 72$ ft. $OH_G = 1$ ft.
$R_1 = 3979$ lbs $R_2 = 3741$ lbs

a) (-) signs signify wind lateral forces acting opposite to the direction of the arrows shown.
b) Strength design values multiplied by 0.6 to obtain ASD values.

Wind Base Shear (ASD)						
Load Case A: Transverse Direction						
Load Case	Walls (lbs)	Roof (lbs)	Roof Overhangs (lbs)	Total Lateral Load (lbs)	R_1 (lbs)	R_2 (lbs)
Positive Internal Pressure	9929	-1789	-421	7720	3979	3741
Negative Internal Pressure	9929	-1789	-421	7720	3979	3741
Roof Pressure = 0	9929	0	0	9929	5147	4782
Min. Pressures (8 psf, 16 psf)	6221	2304	182	8707	4354	4354

a) Bottom half of wall neglected in tributary area calculations.
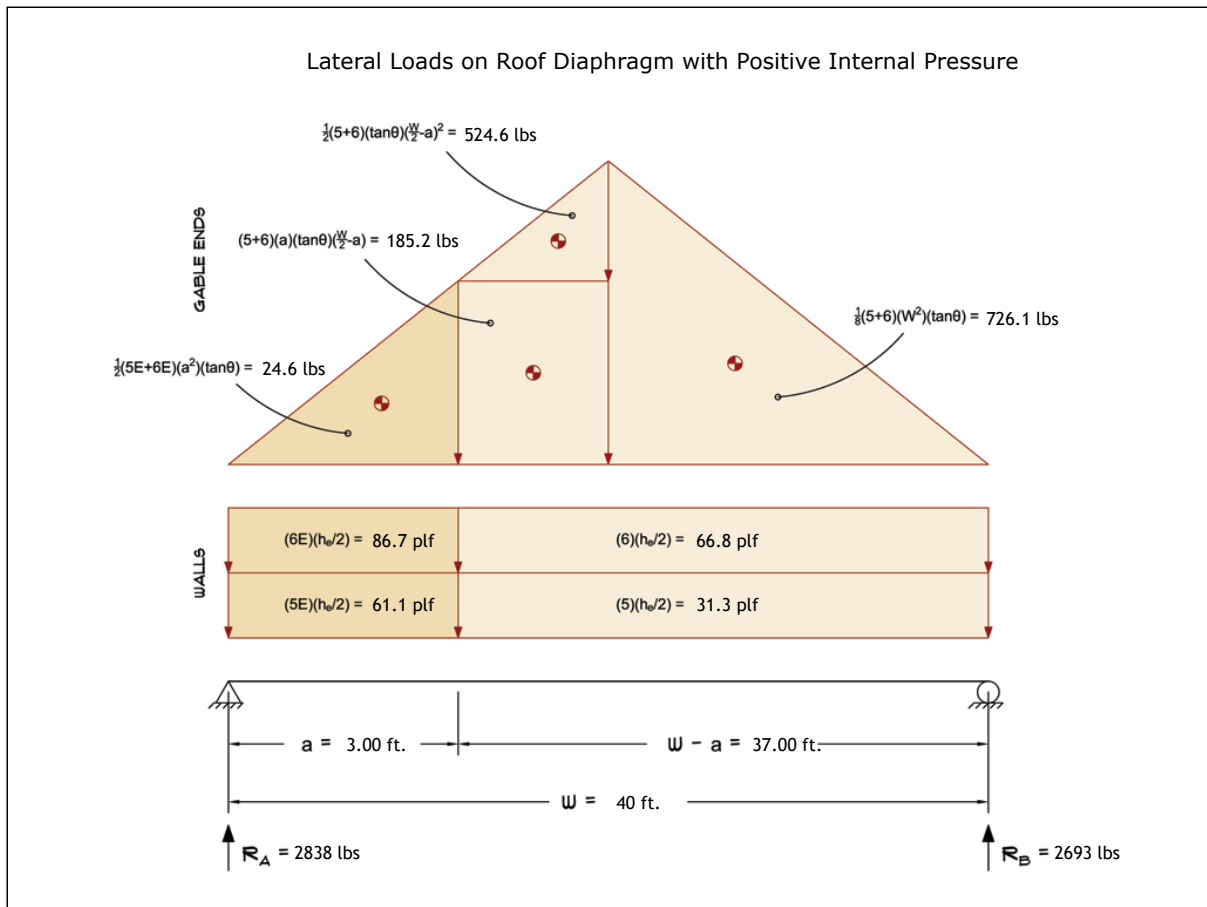b) Strength design values multiplied by 0.6 to obtain ASD values.

Subject	Customer	Location	Job No.
Wind Loads	Paul Hurlbut	676 East Columbine Drive	Vap Construction

Engr.			Rev.
Engineer Name	**ENGINEERING COMPANY INC.**		-
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2.) <u>Lateral Loads - Longitudinal Direction:</u>

Lateral Loads on Roof Diaphragm with Positive Internal Pressure

$\frac{1}{2}(5+6)(\tan\theta)(\frac{W}{2}-a)^2$ = 524.6 lbs

$(5+6)(a)(\tan\theta)(\frac{W}{2}-a)$ = 185.2 lbs

$\frac{1}{8}(5+6)(W^2)(\tan\theta)$ = 726.1 lbs

$\frac{1}{2}(5E+6E)(a^2)(\tan\theta)$ = 24.6 lbs

GABLE ENDS

WALLS

$(6E)(h_e/2)$ = 86.7 plf

$(6)(h_e/2)$ = 66.8 plf

$(5E)(h_e/2)$ = 61.1 plf

$(5)(h_e/2)$ = 31.3 plf

a = 3.00 ft. W − a = 37.00 ft.

W = 40 ft.

R_A = 2838 lbs R_B = 2693 lbs

a) (-) signs signify wind lateral forces acting opposite to the direction of the arrows shown.
b) Strength design values multiplied by 0.6 to obtain ASD values.
c) Where the length of building (L) exceeds 4X the mean roof height (h), wind drag forces should additionally be considered.

Wind Base Shear (ASD)						
Load Case B: Longitudinal Direction						
Load Case	Walls (lbs)	Gable Ends (lbs)	Roof (lbs)	Total Lateral Load (lbs)	R_A (lbs)	R_B (lbs)
Positive Internal Pressure	4070	1461	0	5531	2838	2693
Negative Internal Pressure	4070	1461	0	5531	2838	2693
Roof Pressure = 0	4070	1461	0	5531	2838	2693
Min. Pressures (8 psf, 16 psf)	3456	1280	0	4736	2368	2368

a) Bottom half of wall neglected in tributary area calculations.
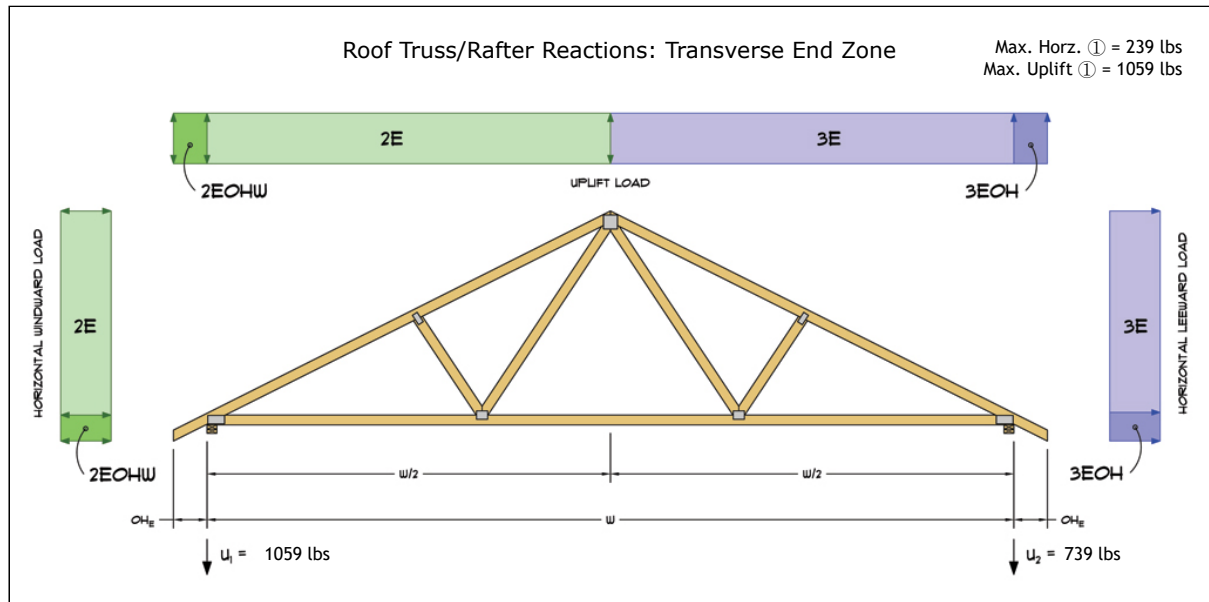b) Strength design values multiplied by 0.6 to obtain ASD values.

3.) Roof Truss Reactions:

Roof Truss/Rafter Reactions: Transverse End Zone

Max. Horz. ① = 239 lbs
Max. Uplift ① = 1059 lbs

a) Strength design values multiplied by 0.6 to obtain ASD values.
b) Windward loads may be positive or negative depending on pitch of roof.

Roof Truss/Rafter Reactions (ASD)					
w/ Positive Internal Pressure					
Load Case	Horizontal Load (lbs)	Gross Uplift (lbs)	Net Uplift (lbs)	U_1 (lbs)	U_2 (lbs)
Transverse Int. Zone	112	2033	1022	610	412
Transverse End Zone	190	2809	1798	1059	739
Longitudinal Int. Zone	141	1860	849	536	313
Longitudinal End Zone	239	2576	1565	970	595

a) Gross Uplift calculations do not include any counteracting roof dead loads.
b) Net Uplift calculations include counteracting roof dead loads multiplied by 0.6 per load case (7) ASCE 7-10.
c) Strength design values multiplied by 0.6 to obtain ASD values for wind loads.
d) Loads based on truss spacing calculated at 48" o/c.
e) Negative values for horizontal load indicate load acting in windward direction (tranverse load cases).
f) Negative values for uplift indicate net downward force (zero uplift).

*Disclaimer: The calculations produced herein are for initial design and estimating purposes only. The calculations and drawings presented do not constitute a fully engineered design. All of the potential load cases required to fully design an actual structure may not be provided by this calculator. For the design of an actual structure, a registered and licensed professional should be consulted as per IRC 2012 Sec. R802.10.2 and designed according to the minimum requirements of ASCE 7-10. The wind load calculations provided by this online tool are for educational and illustrative purposes only. Medeek Design assumes no liability or loss for any designs presented and does not guarantee fitness for use.