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:	24 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.
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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

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.

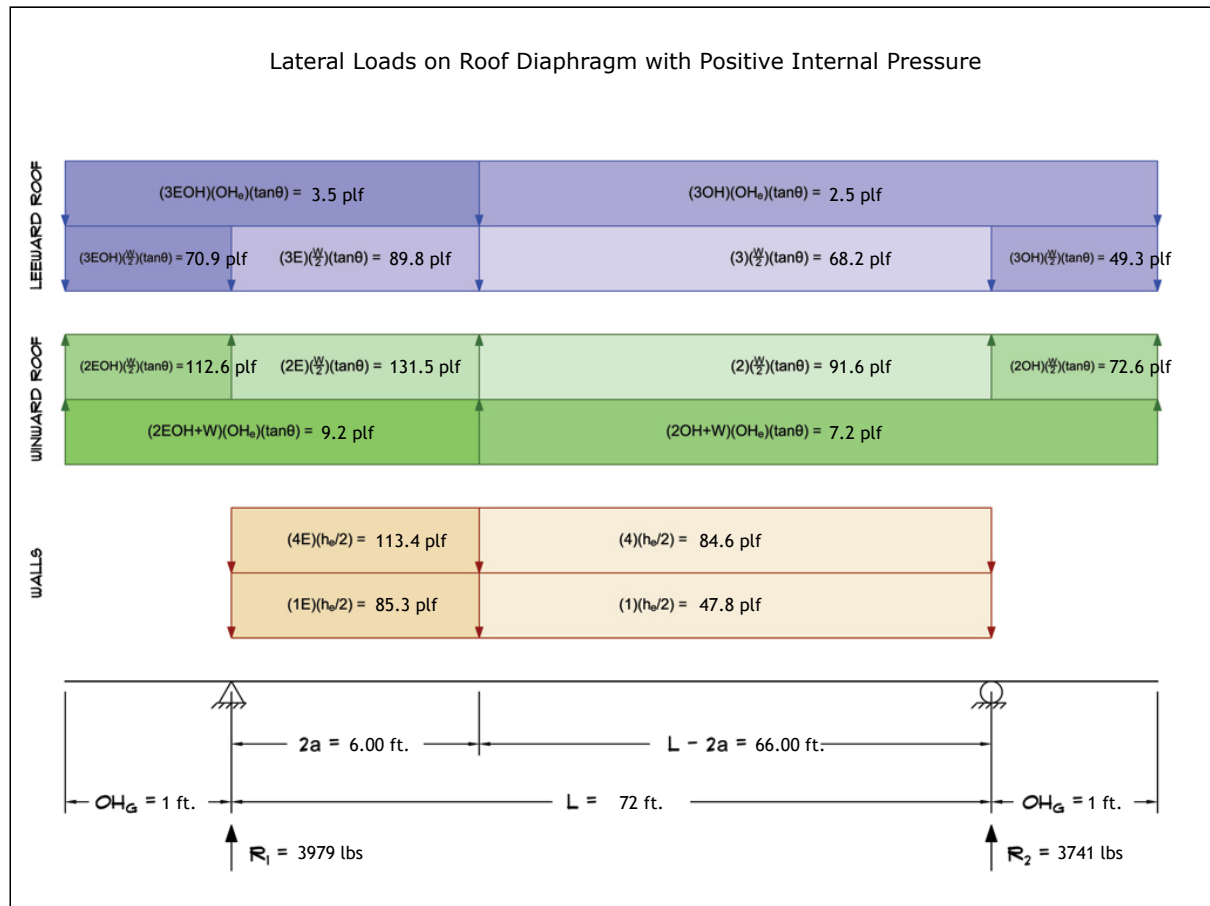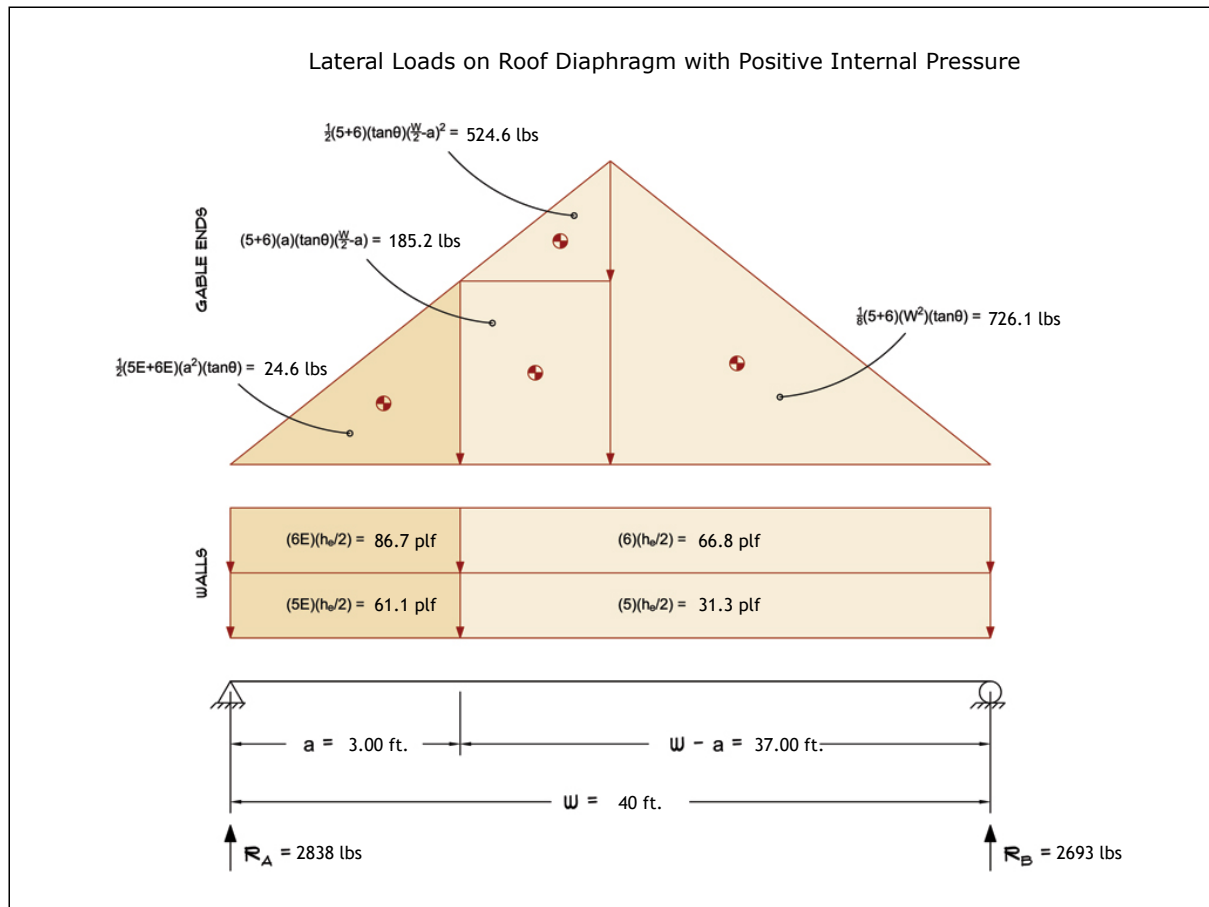| Subject	Customer	Location	Job No.
Wind Loads	Paul Hurlbut	676 East Columbine Drive	Vap Construction
Engr. Engineer Name	**ENGINEERING COMPANY INC.** Street Address City, CA 99999 ph. (800) 000-0000 www.website.com	STRUCTURAL ENGINEERS COMPANY LOGO	This report may not be copied, reproduced or distributed without the written consent of Engineering Company Inc. Copyright © 2025
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2.) Lateral Loads - Longitudinal Direction:

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.
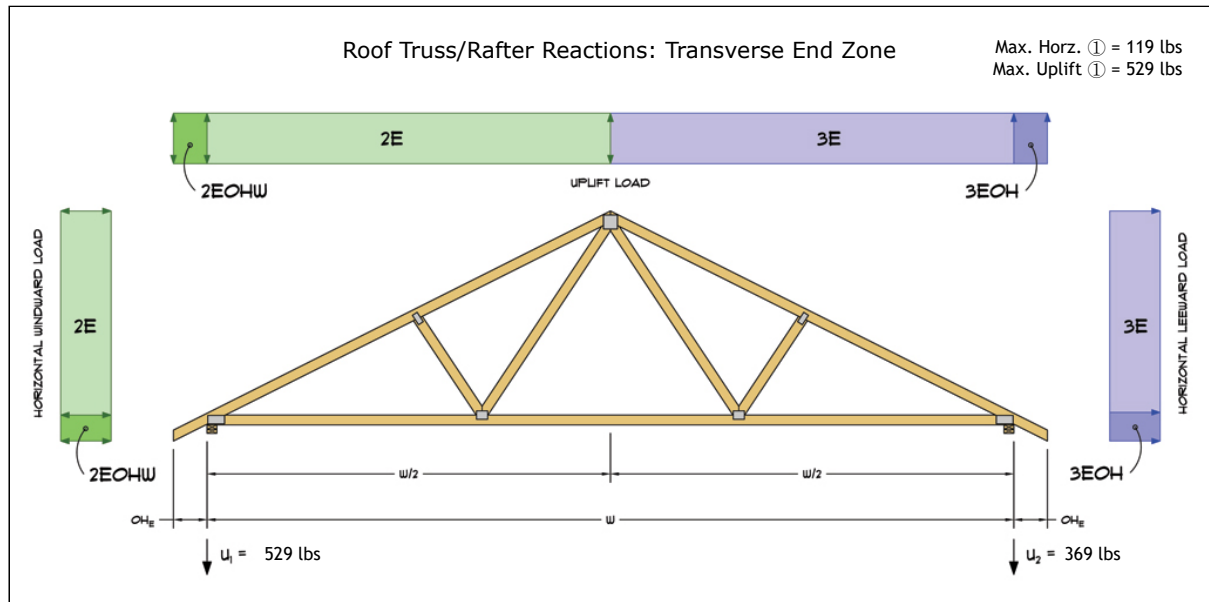b) Strength design values multiplied by 0.6 to obtain ASD values.

3.) <u>Roof Truss Reactions:</u>

Roof Truss/Rafter Reactions: Transverse End Zone

Max. Horz. ① = 119 lbs
Max. Uplift ① = 529 lbs

U_1 = 529 lbs U_2 = 369 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	56	1017	511	305	206
Transverse End Zone	95	1404	899	529	369
Longitudinal Int. Zone	71	930	424	268	157
Longitudinal End Zone	119	1288	782	485	297

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 24" 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).

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

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