Wind Load Report - DRF Design

1. Site & Building Data

Roof Type:	Gable
Wind Speed (ult):	115 mph
Exposure Category:	C
Enclosure Class:	Enclosed
Building Width (W):	30 ft.
Building Length (L):	60 ft.
Eave Height (h_e):	10 ft.
Foundation Height (h_f):	0 ft.
Roof Pitch:	5 /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):	22.62 deg.
Mean Roof Height (h):	13.13 ft.
Ridge Height (h_r):	16.25 ft.
Pos. Internal Pressure (+GCpi):	+0.18
Neg. Internal Pressure (-GCpi):	-0.18
Velocity Pressure Exp. Coeff. (K_h):	0.85 @ z=h
Velocity Pressure (q_h):	24.43 psf
End Zone Width (a):	3.00 ft.
Zone 2/2E Dist.:	15.00 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:	7 psf
Bottom Chord Dead Load:	10 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)	Design Pressure (psf) (w/ -GCpi)
1	0.54	8.74	17.54
2	-0.45	-15.49	-6.70
3	-0.47	-15.80	-7.01
4	-0.41	-14.52	-5.72
1E	0.77	14.44	23.24
2E	-0.72	-21.96	-13.17
3E	-0.65	-20.23	-11.43
4E	-0.60	-19.01	-10.21
2OH	-0.45	-11.10	
2EOH	-0.72	-17.56	
3OH	-0.47	-11.41	
3EOH	-0.65	-15.83	
2OH+W	-0.45/-0.7	-28.20	
2EOH+W	-0.72/-0.7	-34.66	

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.

Subject	Customer	Location	Job No.
Wind Loads			Pole Building

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Load Case B: Longitudinal Direction

Surface	GCpf	Design Pressure (psf)	
		(w/ +GCpi)	(w/ -GCpi)
1	-0.45	-15.39	-6.60
2	-0.69	-21.25	-12.46
3	-0.37	-13.44	-4.64
4	-0.45	-15.39	-6.60
5	0.40	5.37	14.17
6	-0.29	-11.48	-2.69
1E	-0.48	-16.12	-7.33
2E	-1.07	-30.54	-21.74
3E	-0.53	-17.34	-8.55
4E	-0.48	-16.12	-7.33
5E	0.61	10.50	19.30
6E	-0.43	-14.90	-6.11
2OH	-0.69	-16.86	
2EOH	-1.07	-26.14	
3OH	-0.37	-9.04	
3EOH	-0.53	-12.95	
2EOH+W	-1.07/-0.7	-43.24	
3EOH+W	-0.53/-0.7	-30.05	

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.
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Torsional Load Cases

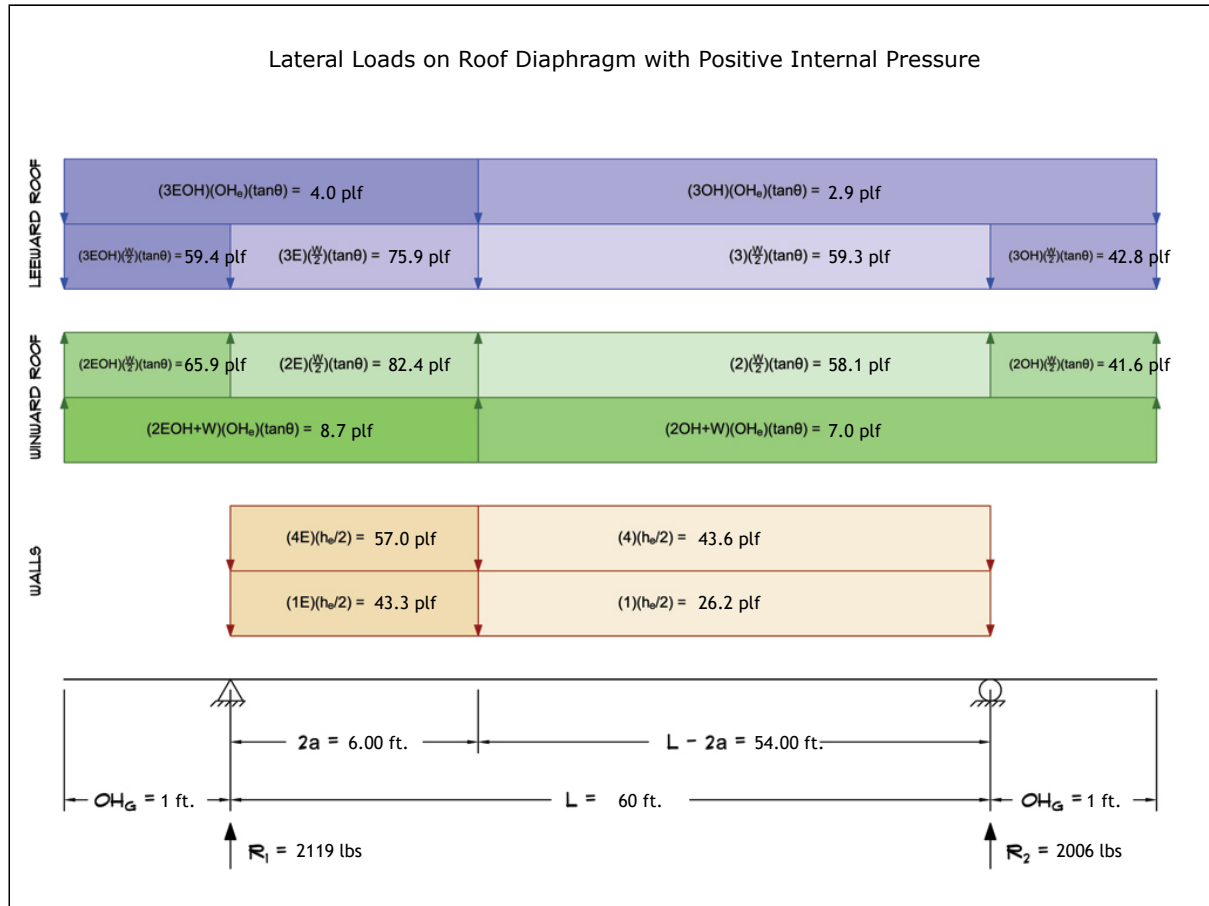| Surface	Load Case	GCpf	Design Pressure (psf)	
			(w/ +GCpi)	(w/ -GCpi)
1T	A	-	2.19	4.38
2T	A	-	-3.87	-1.67
3T	A	-	-3.95	-1.75
4T	A	-	-3.63	-1.43
5T	B	-	1.34	3.54
6T	B	-	-2.87	-0.67
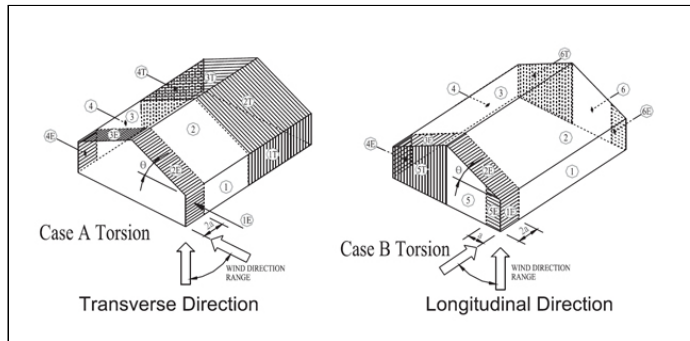
a) (+) and (-) signs signify wind pressures acting toward & away from surfaces.
b) Pressures designated with a "T" are 25% of full design wind pressures.
c) Torsional loading shall apply to all 8 load patterns using the figures shown.
d) Design pressures are for strength design, multiply by 0.6 for ASD.
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				Pole Building

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5. Wind Load Calculations

1.) Lateral Loads - Transverse Direction:

Lateral Loads on Roof Diaphragm with Positive Internal Pressure

LEEWARD ROOF
- $(3EOH)(OH_e)(\tan\theta) = 4.0$ plf
- $(3OH)(OH_e)(\tan\theta) = 2.9$ plf
- $(3EOH)(\frac{W}{2})(\tan\theta) = 59.4$ plf
- $(3E)(\frac{W}{2})(\tan\theta) = 75.9$ plf
- $(3)(\frac{W}{2})(\tan\theta) = 59.3$ plf
- $(3OH)(\frac{W}{2})(\tan\theta) = 42.8$ plf

WINWARD ROOF
- $(2EOH)(\frac{W}{2})(\tan\theta) = 65.9$ plf
- $(2E)(\frac{W}{2})(\tan\theta) = 82.4$ plf
- $(2)(\frac{W}{2})(\tan\theta) = 58.1$ plf
- $(2OH)(\frac{W}{2})(\tan\theta) = 41.6$ plf
- $(2EOH+W)(OH_e)(\tan\theta) = 8.7$ plf
- $(2OH+W)(OH_e)(\tan\theta) = 7.0$ plf

WALLS
- $(4E)(h_e/2) = 57.0$ plf
- $(4)(h_e/2) = 43.6$ plf
- $(1E)(h_e/2) = 43.3$ plf
- $(1)(h_e/2) = 26.2$ plf

$2a = 6.00$ ft. $L - 2a = 54.00$ ft.
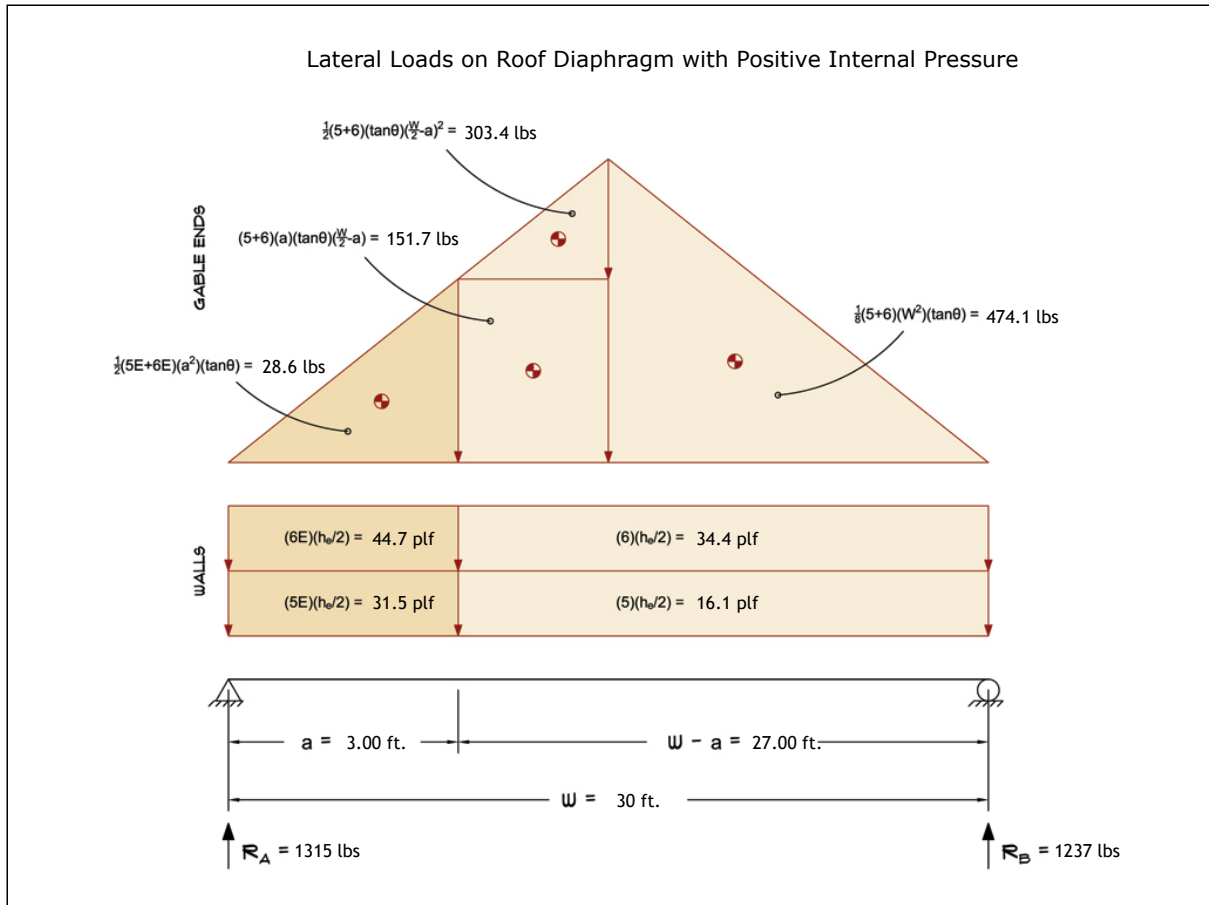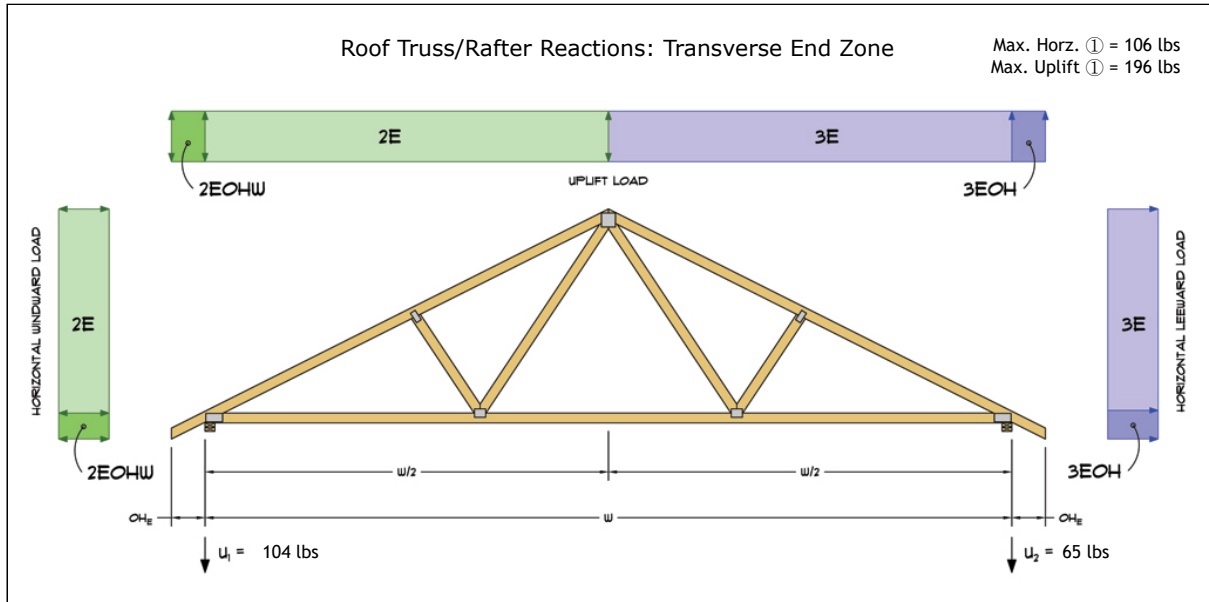$OH_G = 1$ ft. $L = 60$ ft. $OH_G = 1$ ft.
$R_1 = 2119$ lbs $R_2 = 2006$ lbs

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	4370	24	-269	4125	2119	2006
Negative Internal Pressure	4370	24	-269	4125	2119	2006
Roof Pressure = 0	4370	0	0	4370	2268	2103
Min. Pressures (8 psf, 16 psf)	2880	1800	184	4864	2432	2432

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				Pole Building

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2.) Lateral Loads - Longitudinal Direction:

Lateral Loads on Roof Diaphragm with Positive Internal Pressure

$\frac{1}{2}(5+6)(\tan\theta)(\frac{W}{2}-a)^2 = 303.4$ lbs

$(5+6)(a)(\tan\theta)(\frac{W}{2}-a) = 151.7$ lbs

GABLE ENDS

$\frac{1}{2}(5E+6E)(a^2)(\tan\theta) = 28.6$ lbs

$\frac{1}{8}(5+6)(W^2)(\tan\theta) = 474.1$ lbs

WALLS

$(6E)(h_e/2) = 44.7$ plf

$(6)(h_e/2) = 34.4$ plf

$(5E)(h_e/2) = 31.5$ plf

$(5)(h_e/2) = 16.1$ plf

$a = 3.00$ ft.

$W - a = 27.00$ ft.

$W = 30$ ft.

$R_A = 1315$ lbs

$R_B = 1237$ 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	1594	958	0	2552	1315	1237
Negative Internal Pressure	1594	958	0	2552	1315	1237
Roof Pressure = 0	1594	958	0	2552	1315	1237
Min. Pressures (8 psf, 16 psf)	1440	900	0	2340	1170	1170

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 = 106 lbs
Max. Uplift ① = 196 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	6	611	-40	-11	-29
Transverse End Zone	22	820	169	104	65
Longitudinal Int. Zone	63	655	4	42	-38
Longitudinal End Zone	106	909	258	196	61

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).