Wind Load Report

1. Site & Building Data

Roof Type:	Gable
Wind Speed (ult):	200 mph
Exposure Category:	D
Enclosure Class:	Partially Enclosed
Building Width (W):	62 ft.
Building Length (L):	160 ft.
Eave Height (h_e):	20 ft.
Foundation Height (h_f):	0 ft.
Roof Pitch:	3 /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):	14.04 deg.
Mean Roof Height (h):	23.88 ft.
Ridge Height (h_r):	27.75 ft.
Pos. Internal Pressure (+GCpi):	+0.55
Neg. Internal Pressure (-GCpi):	-0.55
Velocity Pressure Exp. Coeff. (K_h):	1.12 @ z=h
Velocity Pressure (q_h):	97.22 psf
End Zone Width (a):	3.00 ft.
Zone 2/2E Dist.:	31.00 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)	(w/ -GCpi)
1	0.48	-6.97	99.97
2	-0.69	-120.55	-13.61
3	-0.44	-95.89	11.06
4	-0.37	-89.86	17.08
1E	0.72	16.96	123.90
2E	-1.07	-157.50	-50.55
3E	-0.63	-114.37	-7.43
4E	-0.56	-107.58	-0.63
2OH	-0.69	-67.08	
2EOH	-1.07	-104.03	
3OH	-0.44	-42.41	
3EOH	-0.63	-60.90	
2OH+W	-0.69/-0.7	-133.07	
2EOH+W	-1.07/-0.7	-170.02	

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	-97.22	9.72
2	-0.69	-120.55	-13.61
3	-0.37	-89.44	17.50
4	-0.45	-97.22	9.72
5	0.40	-14.58	92.36
6	-0.29	-81.67	25.28
1E	-0.48	-100.14	6.81
2E	-1.07	-157.50	-50.55
3E	-0.53	-105.00	1.94
4E	-0.48	-100.14	6.81
5E	0.61	5.83	112.78
6E	-0.43	-95.28	11.67
2OH	-0.69	-67.08	
2EOH	-1.07	-104.03	
3OH	-0.37	-35.97	
3EOH	-0.53	-51.53	
2EOH+W	-1.07/-0.7	-172.08	
3EOH+W	-0.53/-0.7	-119.58	

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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Torsional Load Cases

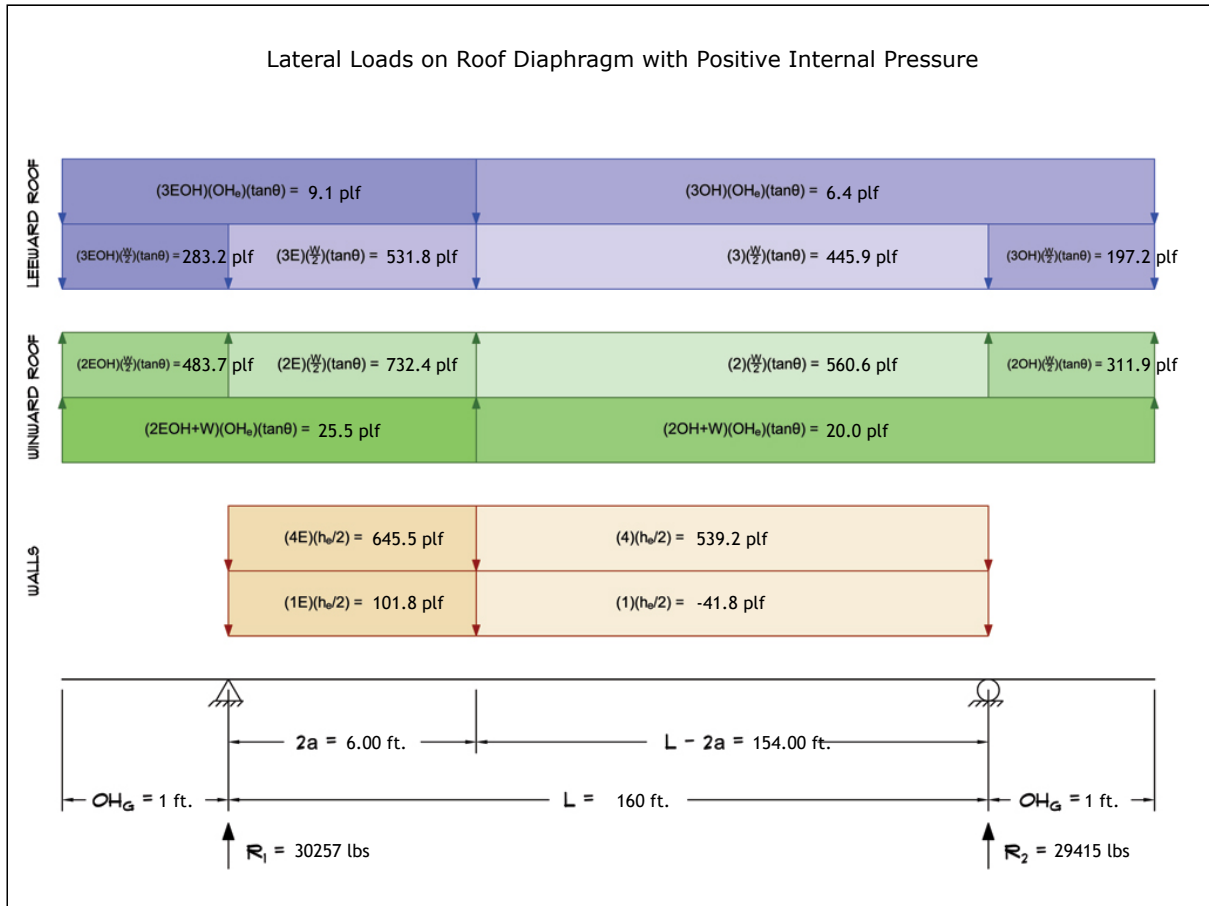| Surface	Load Case	GCpf	Design Pressure (psf)	
			(w/ +GCpi)	(w/ -GCpi)
1T	A	-	-1.74	24.99
2T	A	-	-30.14	-3.40
3T	A	-	-23.97	2.76
4T	A	-	-22.47	4.27
5T	B	-	-3.65	23.09
6T	B	-	-20.42	6.32

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
- $(3EOH)(OH_e)(\tan\theta) = 9.1$ plf
- $(3OH)(OH_e)(\tan\theta) = 6.4$ plf
- $(3EOH)(\frac{\Psi}{2})(\tan\theta) = 283.2$ plf
- $(3E)(\frac{\Psi}{2})(\tan\theta) = 531.8$ plf
- $(3)(\frac{\Psi}{2})(\tan\theta) = 445.9$ plf
- $(3OH)(\frac{\Psi}{2})(\tan\theta) = 197.2$ plf

WINWARD ROOF
- $(2EOH)(\frac{\Psi}{2})(\tan\theta) = 483.7$ plf
- $(2E)(\frac{\Psi}{2})(\tan\theta) = 732.4$ plf
- $(2)(\frac{\Psi}{2})(\tan\theta) = 560.6$ plf
- $(2OH)(\frac{\Psi}{2})(\tan\theta) = 311.9$ plf
- $(2EOH+W)(OH_e)(\tan\theta) = 25.5$ plf
- $(2OH+W)(OH_e)(\tan\theta) = 20.0$ plf

WALLS
- $(4E)(h_e/2) = 645.5$ plf
- $(4)(h_e/2) = 539.2$ plf
- $(1E)(h_e/2) = 101.8$ plf
- $(1)(h_e/2) = -41.8$ plf

- $2a = 6.00$ ft.
- $L - 2a = 154.00$ ft.
- $OH_G = 1$ ft.
- $L = 160$ ft.
- $OH_G = 1$ ft.
- $R_1 = 30257$ lbs
- $R_2 = 29415$ lbs
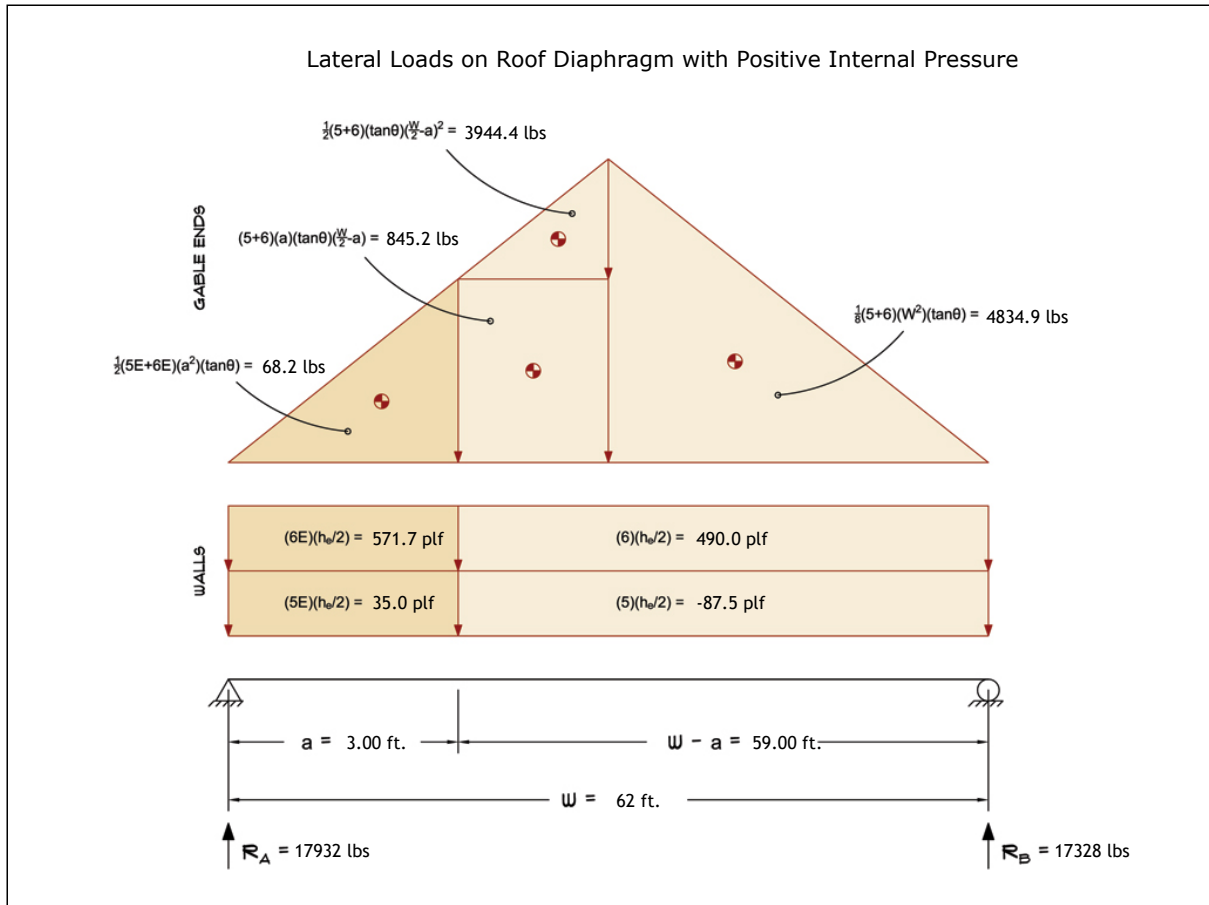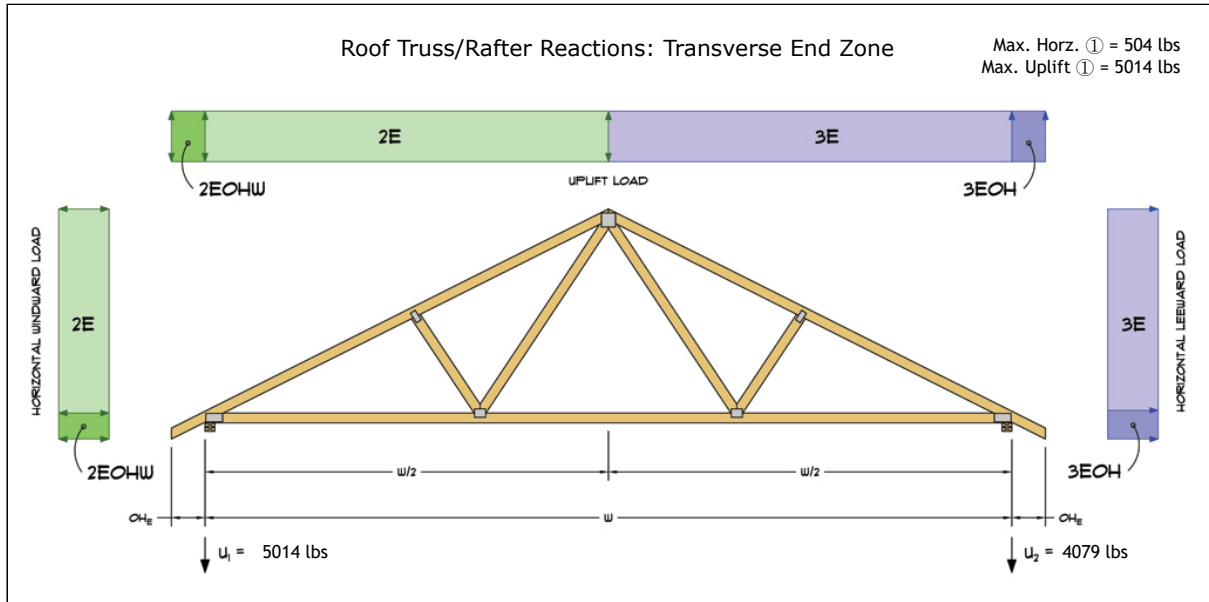
a) (-) signs signify wind lateral forces acting opposite to the direction of the arrows shown.
b) Strength design values multiplied by 0.6 to obtain ASD values.

Wind Base Shear (ASD)						
Load Case A: Transverse Direction						
Load Case	Walls (lbs)	Roof (lbs)	Roof Overhangs (lbs)	Total Lateral Load (lbs)	R₁ (lbs)	R₂ (lbs)
Positive Internal Pressure	81079	-18868	-2538	59673	30257	29415
Negative Internal Pressure	81079	-18868	-2538	59673	30257	29415
Roof Pressure = 0	81079	0	0	81079	41261	39818
Min. Pressures (8 psf, 16 psf)	15360	5952	269	21581	10790	10790

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

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Wind Loads				2024D331

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2.) Lateral Loads - Longitudinal Direction:

Lateral Loads on Roof Diaphragm with Positive Internal Pressure

GABLE ENDS

$\frac{1}{2}(5+6)(\tan\theta)(\frac{W}{2}-a)^2 = 3944.4$ lbs

$(5+6)(a)(\tan\theta)(\frac{W}{2}-a) = 845.2$ lbs

$\frac{1}{8}(5+6)(W^2)(\tan\theta) = 4834.9$ lbs

$\frac{1}{2}(5E+6E)(a^2)(\tan\theta) = 68.2$ lbs

WALLS

| $(6E)(h_e/2) = 571.7$ plf | $(6)(h_e/2) = 490.0$ plf |
| $(5E)(h_e/2) = 35.0$ plf | $(5)(h_e/2) = -87.5$ plf |

a = 3.00 ft.   W – a = 59.00 ft.

W = 62 ft.

R_A = 17932 lbs R_B = 17328 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	25567	9693	0	35260	17932	17328
Negative Internal Pressure	25567	9693	0	35260	17932	17328
Roof Pressure = 0	25567	9693	0	35260	17932	17328
Min. Pressures (8 psf, 16 psf)	5952	2306	0	8258	4129	4129

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 = 504 lbs
Max. Uplift ① = 5014 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	257	8262	6964	3767	3197
Transverse End Zone	434	10391	9092	5014	4079
Longitudinal Int. Zone	299	7936	6637	3627	3010
Longitudinal End Zone	504	9951	8653	4847	3806

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).

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