Wind Load Report - Morley Res. Remodel

1. Site & Building Data

Roof Type:	Gable
Wind Speed (ult):	115 mph
Exposure Category:	C
Enclosure Class:	Enclosed
Building Width (W):	34 ft.
Building Length (L):	75.5 ft.
Eave Height (h_e):	8 ft.
Foundation Height (h_f):	0 ft.
Roof Pitch:	6 /12
Eave Overhang (OH_e):	2 ft.
Gable Overhang (OH_g):	2 ft.

2. Parameters & Coefficients

Topographic Factor (K_{zt}):	1.0
Directionality Factor (K_d):	.85
Roof Angle (θ):	26.57 deg.
Mean Roof Height (h):	12.25 ft.
Ridge Height (h_r):	16.50 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.:	17.00 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:	10 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	0.55	9.03	17.83
2	-0.10	-6.82	1.98
3	-0.45	-15.32	-6.53
4	-0.39	-13.94	-5.14
1E	0.73	13.38	22.18
2E	-0.19	-9.05	-0.25
3E	-0.58	-18.69	-9.89
4E	-0.53	-17.47	-8.67
2OH	-0.10	-2.42	
2EOH	-0.19	-4.65	
3OH	-0.45	-10.92	
3EOH	-0.58	-14.29	
2OH+W	-0.10/-0.7	-19.52	
2EOH+W	-0.19/-0.7	-21.75	

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		2649 Irene Way, Bishop, CA	23-005

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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.
e) Min. wind load for enclosed or partially enclosed bldg.: 16 psf wall, 8 psf roof.
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Torsional Load Cases

Surface	Load Case	GCpf	Design Pressure (psf)	
			(w/ +GCpi)	(w/ -GCpi)
1T	A	-	2.26	4.46
2T	A	-	-1.70	0.49
3T	A	-	-3.83	-1.63
4T	A	-	-3.48	-1.29
5T	B	-	1.34	3.54
6T	B	-	-2.87	-0.67
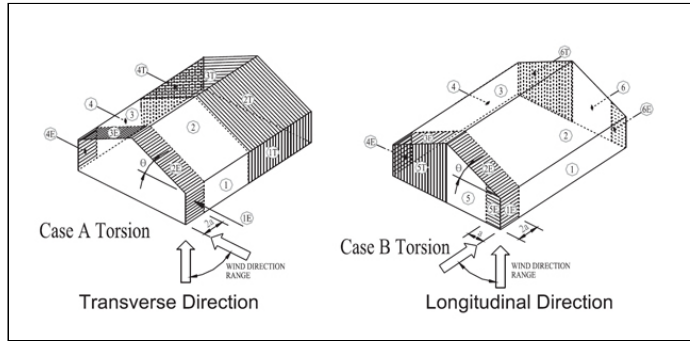
a) (+) and (-) signs signify wind pressures acting toward & away from surfaces.
b) Pressures designated with a "T" are 25% of full design wind pressures.
c) Torsional loading shall apply to all 8 load patterns using the figures shown.
d) Design pressures are for strength design, multiply by 0.6 for ASD.
e) Torsional Design Exceptions: One story bldg. with h ≤ 30 ft,
  Two stories or less framed with light frame construction,
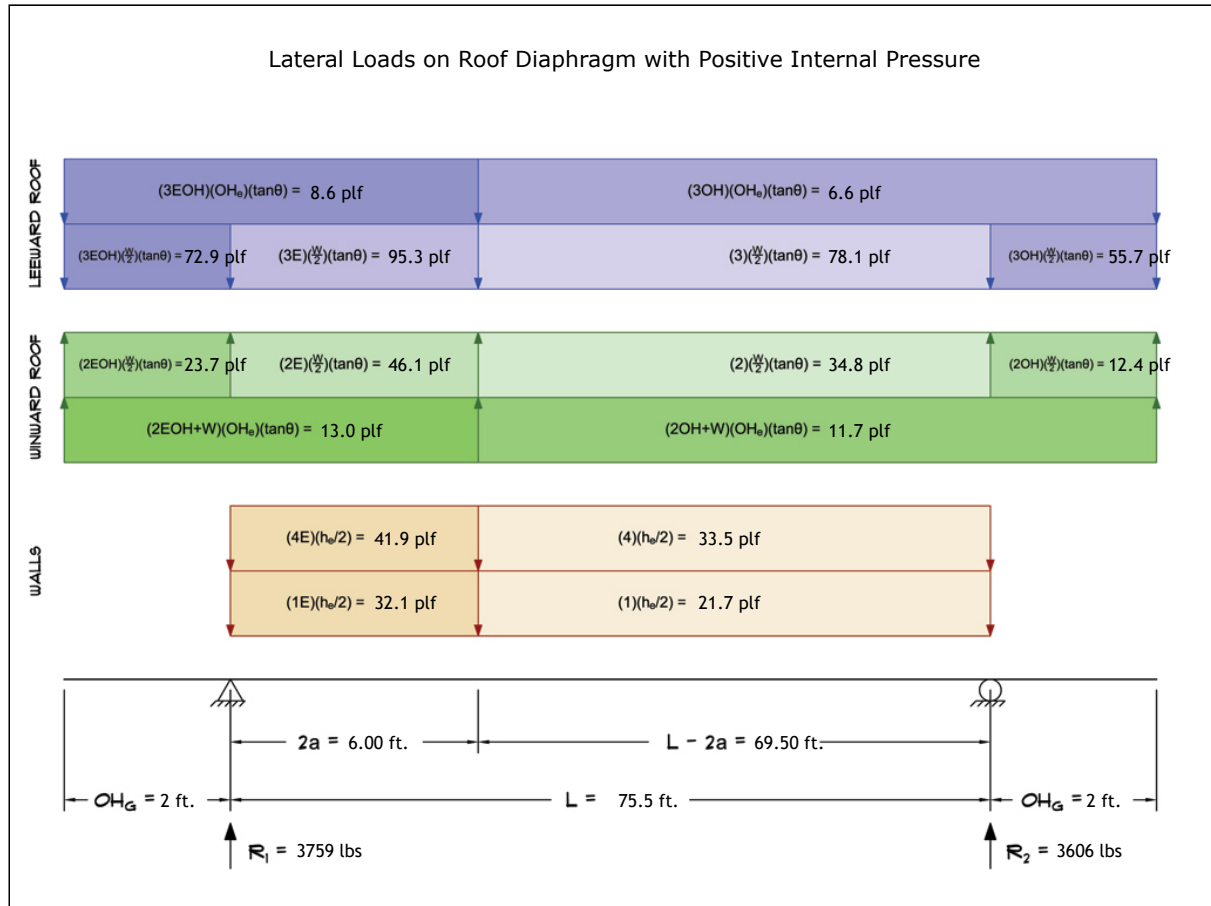 Two stories or less with flexible diaphragms.

Case A Torsion — Transverse Direction

Case B Torsion — Longitudinal Direction

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5. Wind Load Calculations

1.) Lateral Loads - Transverse Direction:

Lateral Loads on Roof Diaphragm with Positive Internal Pressure

LEEWARD ROOF
- $(3EOH)(OH_e)(\tan\theta) = 8.6$ plf
- $(3OH)(OH_e)(\tan\theta) = 6.6$ plf
- $(3EOH)(\frac{\Psi}{2})(\tan\theta) = 72.9$ plf
- $(3E)(\frac{\Psi}{2})(\tan\theta) = 95.3$ plf
- $(3)(\frac{\Psi}{2})(\tan\theta) = 78.1$ plf
- $(3OH)(\frac{\Psi}{2})(\tan\theta) = 55.7$ plf

WINWARD ROOF
- $(2EOH)(\frac{\Psi}{2})(\tan\theta) = 23.7$ plf
- $(2E)(\frac{\Psi}{2})(\tan\theta) = 46.1$ plf
- $(2)(\frac{\Psi}{2})(\tan\theta) = 34.8$ plf
- $(2OH)(\frac{\Psi}{2})(\tan\theta) = 12.4$ plf
- $(2EOH+W)(OH_e)(\tan\theta) = 13.0$ plf
- $(2OH+W)(OH_e)(\tan\theta) = 11.7$ plf

WALLS
- $(4E)(h_e/2) = 41.9$ plf
- $(4)(h_e/2) = 33.5$ plf
- $(1E)(h_e/2) = 32.1$ plf
- $(1)(h_e/2) = 21.7$ plf

- $2a = 6.00$ ft.
- $L - 2a = 69.50$ ft.
- $OH_G = 2$ ft.
- $L = 75.5$ ft.
- $OH_G = 2$ ft.
- $R_1 = 3759$ lbs
- $R_2 = 3606$ 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.

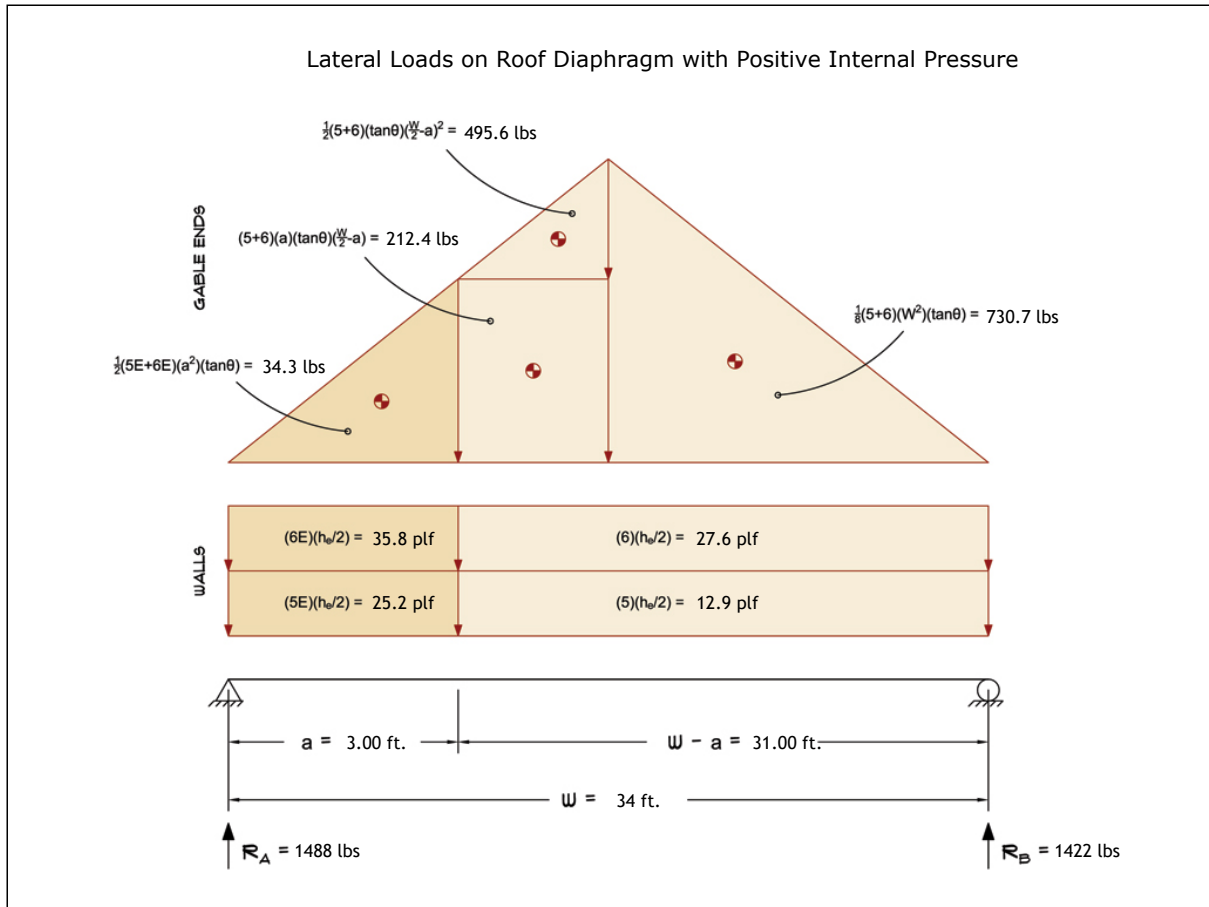| Wind Base Shear (ASD)						
Load Case A: Transverse Direction						
Load Case	Walls (lbs)	Roof (lbs)	Roof Overhangs (lbs)	Total Lateral Load (lbs)	R₁ (lbs)	R₂ (lbs)
Positive Internal Pressure	4276	3309	-220	7365	3759	3606
Negative Internal Pressure	4276	3309	-220	7365	3759	3606
Roof Pressure = 0	4276	0	0	4276	2190	2086
Min. Pressures (8 psf, 16 psf)	2899	3080	545	6524	3262	3262

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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2.) Lateral Loads - Longitudinal Direction:

Lateral Loads on Roof Diaphragm with Positive Internal Pressure

$\frac{1}{2}(5+6)(\tan\theta)(\frac{W}{2}-a)^2 = 495.6$ lbs

$(5+6)(a)(\tan\theta)(\frac{W}{2}-a) = 212.4$ lbs

$\frac{1}{8}(5+6)(W^2)(\tan\theta) = 730.7$ lbs

$\frac{1}{2}(5E+6E)(a^2)(\tan\theta) = 34.3$ lbs

GABLE ENDS

WALLS

$(6E)(h_e/2) = 35.8$ plf

$(6)(h_e/2) = 27.6$ plf

$(5E)(h_e/2) = 25.2$ plf

$(5)(h_e/2) = 12.9$ plf

$a = 3.00$ ft.

$W - a = 31.00$ ft.

$W = 34$ ft.

$R_A = 1488$ lbs

$R_B = 1422$ 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

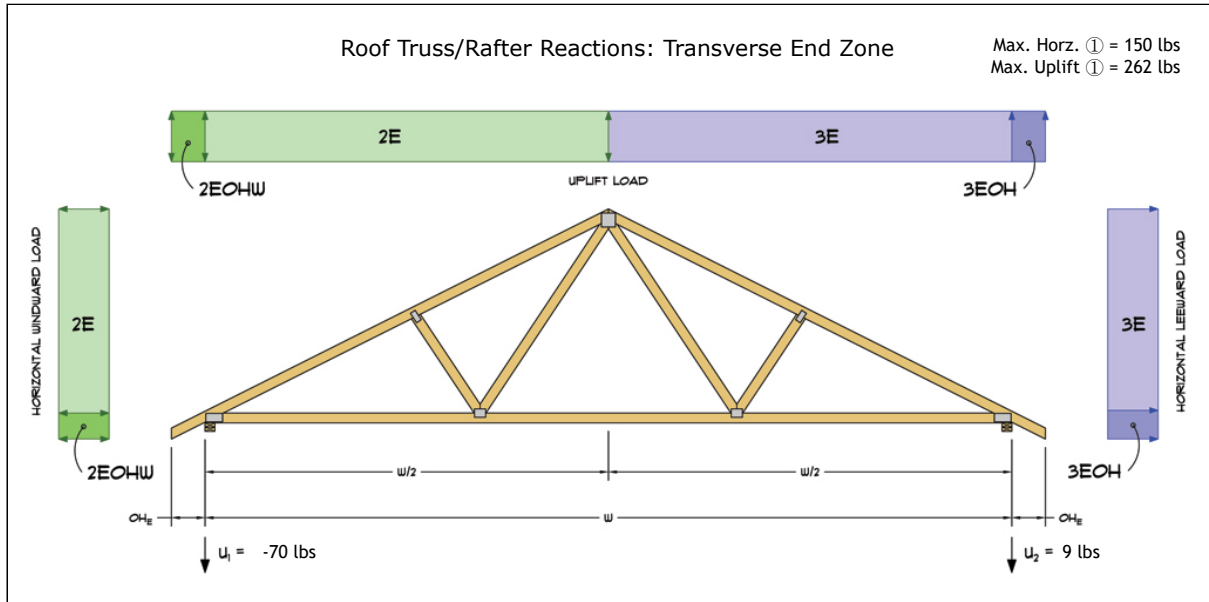| Load Case	Walls (lbs)	Gable Ends (lbs)	Roof (lbs)	Total Lateral Load (lbs)	R_A (lbs)	R_B (lbs)
Positive Internal Pressure	1437	1473	0	2910	1488	1422
Negative Internal Pressure	1437	1473	0	2910	1488	1422
Roof Pressure = 0	1437	1473	0	2910	1488	1422
Min. Pressures (8 psf, 16 psf)	1306	1387	0	2693	1346	1346

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 = 150 lbs
Max. Uplift ① = 262 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	-76	525	-189	-127	-62
Transverse End Zone	-89	652	-62	-70	9
Longitudinal Int. Zone	89	770	56	78	-22
Longitudinal End Zone	150	1071	357	262	94

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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