# Wind Load Report

## 1. Site & Building Data

| | |
|---|---|
| Roof Type: | Gable |
| Wind Speed (ult): | 200 mph |
| Exposure Category: | C |
| Enclosure Class: | Enclosed |
| Building Width (W): | 40 ft. |
| Building Length (L): | 100 ft. |
| Eave Height ($h_e$): | 12 ft. |
| Foundation Height ($h_f$): | 1 ft. |
| Roof Pitch: | 4 /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 ($\theta$): | 18.43 deg. |
| Mean Roof Height (h): | 15.33 ft. |
| Ridge Height ($h_r$): | 18.67 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 ($q_h$): | 74.23 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: | 15 psf |
| Bottom Chord Dead Load: | 10 psf |
| Truss/Rafter Spacing: | 16 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 | 24.97 | 51.70 |
| 2 | -0.69 | -64.58 | -37.86 |
| 3 | -0.47 | -48.14 | -21.42 |
| 4 | -0.42 | -44.20 | -17.47 |
| 1E | 0.78 | 44.55 | 71.27 |
| 2E | -1.07 | -92.79 | -66.06 |
| 3E | -0.67 | -63.34 | -36.62 |
| 4E | -0.62 | -59.24 | -32.52 |
| 2OH | -0.69 | -51.22 | |
| 2EOH | -1.07 | -79.43 | |
| 3OH | -0.47 | -34.78 | |
| 3EOH | -0.67 | -49.98 | |
| 2OH+W | -0.69/-0.7 | -102.94 | |
| 2EOH+W | -1.07/-0.7 | -131.15 | |



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) | Design Pressure (psf) (w/ -GCpi) |
|---------|------|-----------|-----------|
| 1 | -0.45 | -46.76 | -20.04 |
| 2 | -0.69 | -64.58 | -37.86 |
| 3 | -0.37 | -40.83 | -14.10 |
| 4 | -0.45 | -46.76 | -20.04 |
| 5 | 0.40 | 16.33 | 43.05 |
| 6 | -0.29 | -34.89 | -8.17 |
| 1E | -0.48 | -48.99 | -22.27 |
| 2E | -1.07 | -92.79 | -66.06 |
| 3E | -0.53 | -52.70 | -25.98 |
| 4E | -0.48 | -48.99 | -22.27 |
| 5E | 0.61 | 31.92 | 58.64 |
| 6E | -0.43 | -45.28 | -18.56 |
| 2OH | -0.69 | -51.22 | |
| 2EOH | -1.07 | -79.43 | |
| 3OH | -0.37 | -27.46 | |
| 3EOH | -0.53 | -39.34 | |
| 2EOH+W | -1.07/-0.7 | -131.39 | |
| 3EOH+W | -0.53/-0.7 | -91.30 | |

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.



## Torsional Load Cases

| Surface | Load Case | GCpf | Design Pressure (psf) (w/ +GCpi) | Design Pressure (psf) (w/ -GCpi) |
|---------|-----------|------|-----------|-----------|
| 1T | A | - | 6.24 | 12.92 |
| 2T | A | - | -16.14 | -9.46 |
| 3T | A | - | -12.03 | -5.35 |
| 4T | A | - | -11.05 | -4.37 |
| 5T | B | - | 4.08 | 10.76 |
| 6T | B | - | -8.72 | -2.04 |

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,
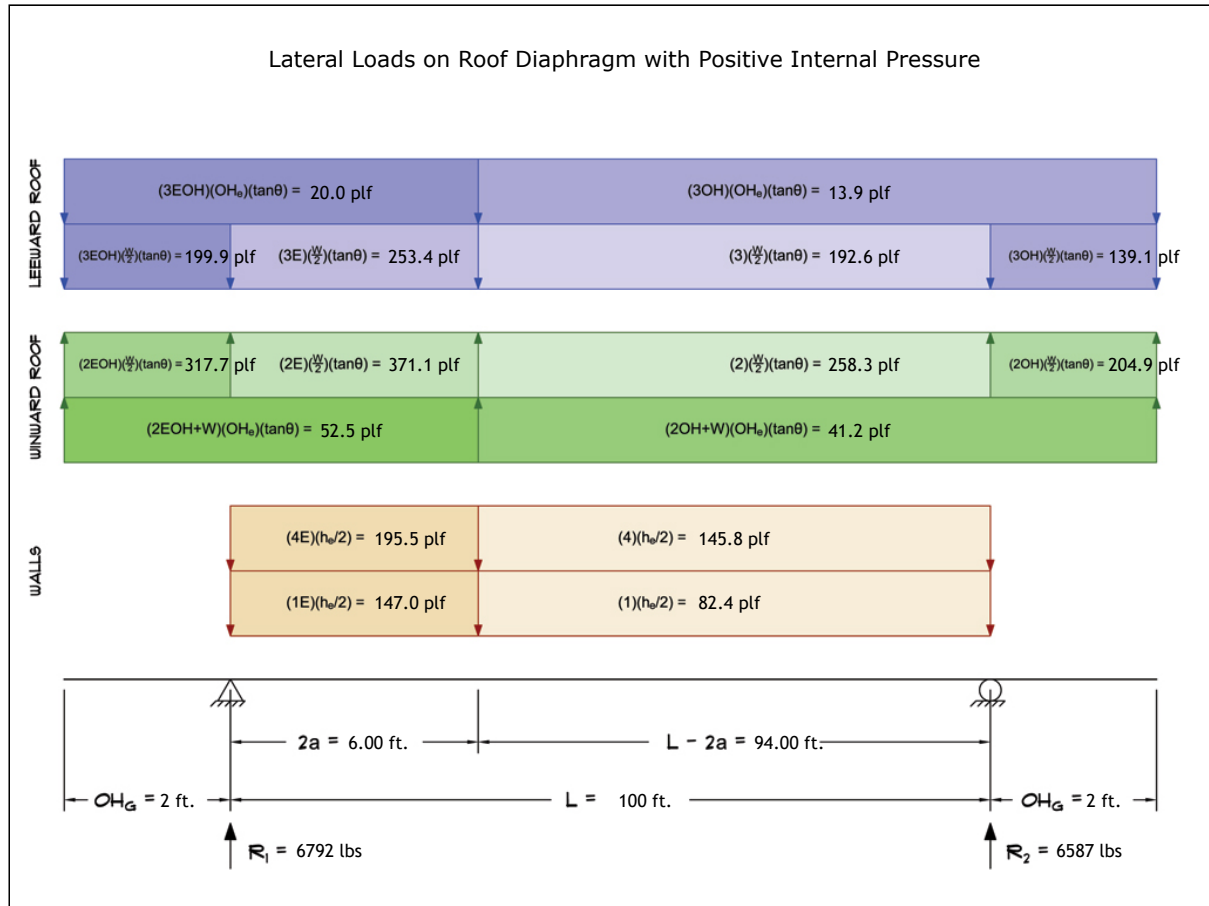   Two stories or less with flexible diaphragms.



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**
- $(3EOH)(OH_e)(\tan\theta) = 20.0$ plf
- $(3OH)(OH_e)(\tan\theta) = 13.9$ plf
- $(3EOH)(\frac{\Psi}{2})(\tan\theta) = 199.9$ plf
- $(3E)(\frac{\Psi}{2})(\tan\theta) = 253.4$ plf
- $(3)(\frac{\Psi}{2})(\tan\theta) = 192.6$ plf
- $(3OH)(\frac{\Psi}{2})(\tan\theta) = 139.1$ plf

**WINWARD ROOF**
- $(2EOH)(\frac{\Psi}{2})(\tan\theta) = 317.7$ plf
- $(2E)(\frac{\Psi}{2})(\tan\theta) = 371.1$ plf
- $(2)(\frac{\Psi}{2})(\tan\theta) = 258.3$ plf
- $(2OH)(\frac{\Psi}{2})(\tan\theta) = 204.9$ plf
- $(2EOH+W)(OH_e)(\tan\theta) = 52.5$ plf
- $(2OH+W)(OH_e)(\tan\theta) = 41.2$ plf

**WALLS**
- $(4E)(h_e/2) = 195.5$ plf
- $(4)(h_e/2) = 145.8$ plf
- $(1E)(h_e/2) = 147.0$ plf
- $(1)(h_e/2) = 82.4$ plf

$2a = 6.00$ ft.  $L - 2a = 94.00$ ft.

$OH_G = 2$ ft.  $L = 100$ ft.  $OH_G = 2$ ft.

$R_1 = 6792$ lbs  $R_2 = 6587$ 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.

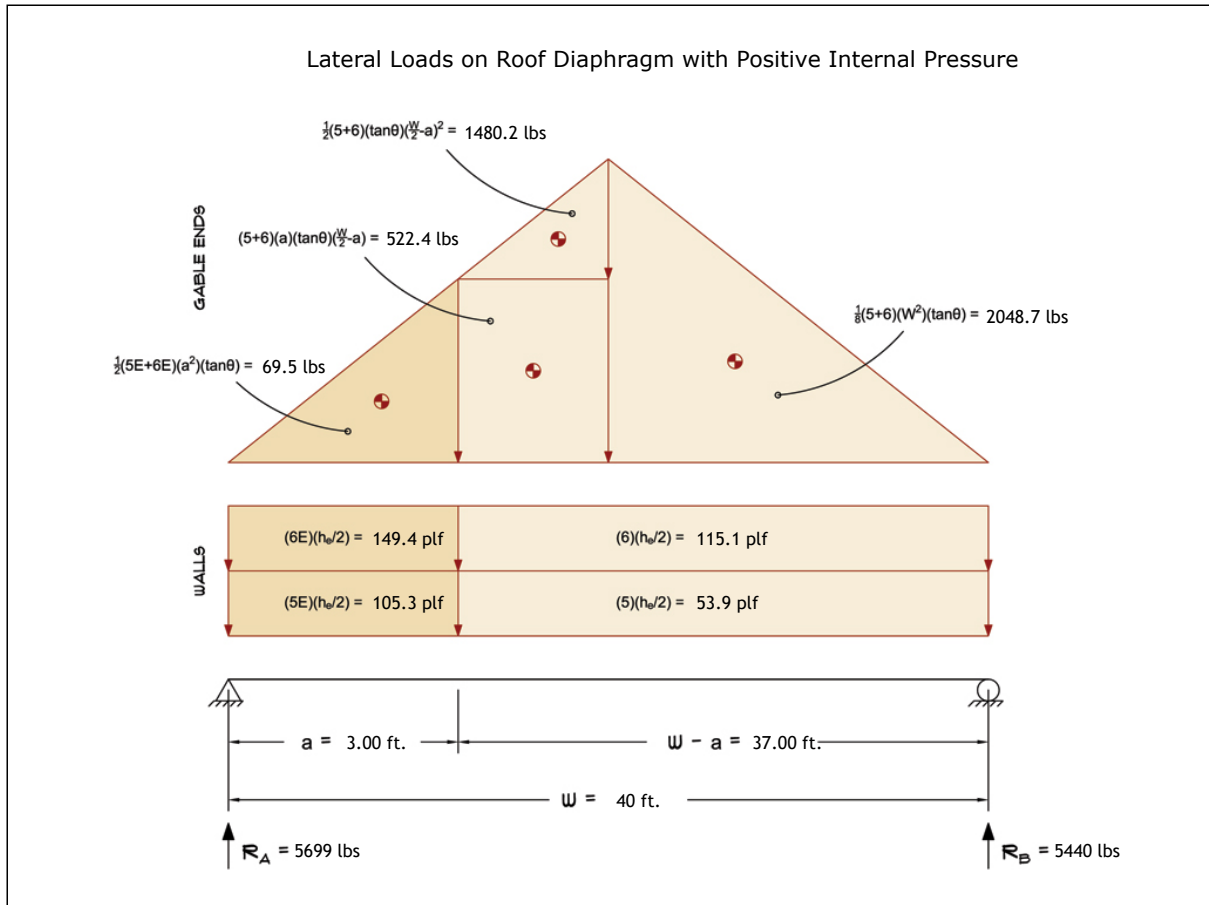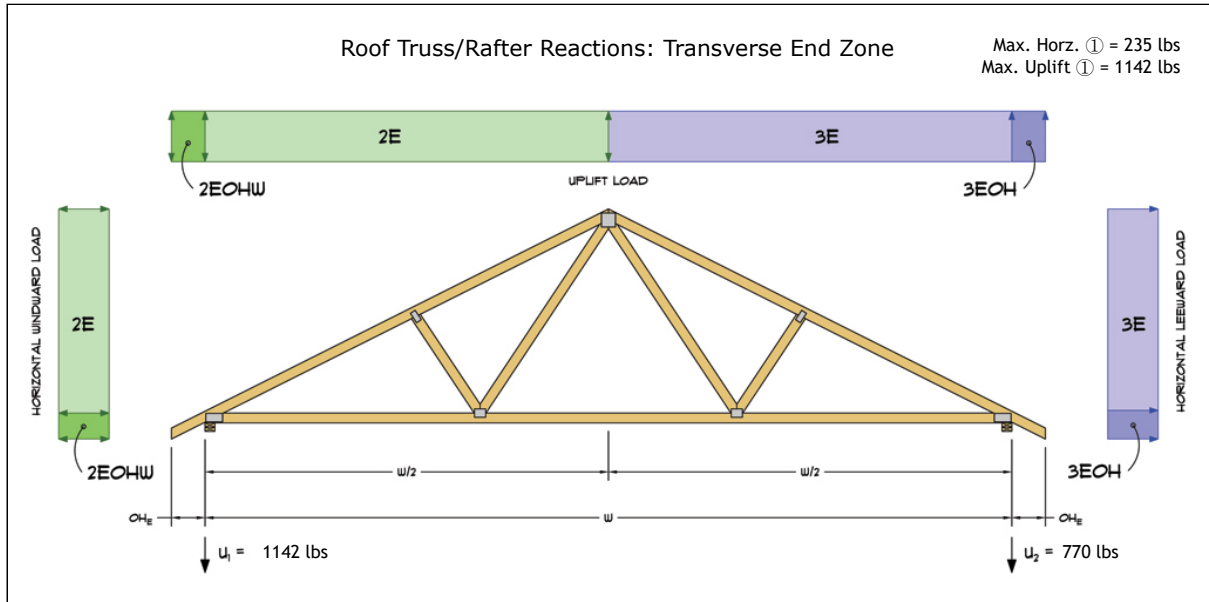| Wind Base Shear (ASD) | | | | | | |
|---|---|---|---|---|---|---|
| Load Case A: Transverse Direction | | | | | | |
| Load Case | Walls (lbs) | Roof (lbs) | Roof Overhangs (lbs) | Total Lateral Load (lbs) | $R_1$ (lbs) | $R_2$ (lbs) |
| Positive Internal Pressure | 23511 | -6888 | -3244 | 13379 | 6792 | 6587 |
| Negative Internal Pressure | 23511 | -6888 | -3244 | 13379 | 6792 | 6587 |
| Roof Pressure = 0 | 23511 | 0 | 0 | 23511 | 12078 | 11433 |
| Min. Pressures (8 psf, 16 psf) | 5280 | 3200 | 461 | 8941 | 4470 | 4470 |

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

2.) Lateral Loads - Longitudinal Direction:

## Lateral Loads on Roof Diaphragm with Positive Internal Pressure

$\frac{1}{2}(5+6)(\tan\theta)(\frac{W}{2}-a)^2$ = 1480.2 lbs

$(5+6)(a)(\tan\theta)(\frac{W}{2}-a)$ = 522.4 lbs

$\frac{1}{8}(5+6)(W^2)(\tan\theta)$ = 2048.7 lbs

$\frac{1}{2}(5E+6E)(a^2)(\tan\theta)$ = 69.5 lbs

**GABLE ENDS**

**WALLS**

$(6E)(h_e/2)$ = 149.4 plf

$(6)(h_e/2)$ = 115.1 plf

$(5E)(h_e/2)$ = 105.3 plf

$(5)(h_e/2)$ = 53.9 plf

a = 3.00 ft.

W − a = 37.00 ft.

W = 40 ft.

$R_A$ = 5699 lbs

$R_B$ = 5440 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 | 7018 | 4121 | 0 | 11139 | 5699 | 5440 |
| Negative Internal Pressure | 7018 | 4121 | 0 | 11139 | 5699 | 5440 |
| Roof Pressure = 0 | 7018 | 4121 | 0 | 11139 | 5699 | 5440 |
| Min. Pressures (8 psf, 16 psf) | 2112 | 1280 | 0 | 3392 | 1696 | 1696 |

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 = 235 lbs
Max. Uplift ① = 1142 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 | 124 | 2024 | 1147 | 697 | 451 |
| Transverse End Zone | 200 | 2788 | 1911 | 1142 | 770 |
| Longitudinal Int. Zone | 139 | 1812 | 936 | 583 | 353 |
| Longitudinal End Zone | 235 | 2518 | 1641 | 1015 | 627 |

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 16" 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).