WINDLOADS.AI

ENGINEERING CALCULATIONS
Prepared with the Windloads.ai Wind Load Calculator

Fenestration & Wall Cladding Wind Load Engineering Package for Permitting

Window, Door, and Garage Door Openings.

PROJECT NAME

Demonstration building

PROJECT ADDRESS

Fictional Florida project - illustrative inputs only

CLIENT NAME

JOB ID

SAMPLE

PROFESSIONAL ENGINEER

Signature

Date

SEAL

Draft calculation package. Valid only after review, signature and seal by a licensed Professional Engineer.

By signing and sealing, the Professional Engineer confirms review and acceptance of this package for the stated project.

Wall components and cladding

ASCE 7-22 / FBC 2023 (8th Edition)

Draft - professional review required

SHEET INDEX

Prepared Oct 8, 2026

1 Cover and sheet index
2 Design summary
3 Pressure schedules
4 Calculations
5 Glass railing wind loads

Design summary

ASCE 7-22 / FBC 2023 (8th Edition) - wall components and cladding

WORST-CASE PRESSURES / ASD

Reference effective area: 10 sq ft

ZONES 4 + 5 / INWARD	ZONE 4 / SUCTION	ZONE 5 / SUCTION
+43.35 psf	**-47.03 psf**	**-58.05 psf**

Sheet 3: window, door and garage-door pressures by size. Sheet 4: calculations.

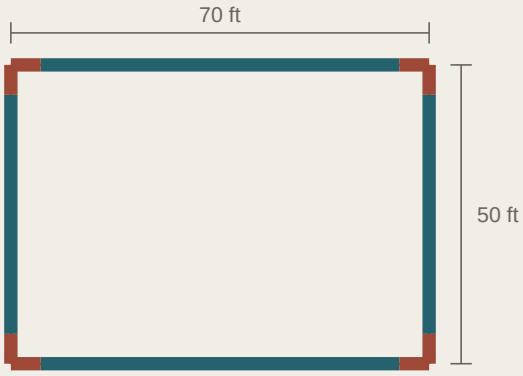
Design criteria

Basic wind speed, V	**170 mph**	Mean roof height, h	**29 ft**
Risk category	**II**	Least dimension, B	**50 ft**
Exposure	**C**	Corner zone width, a	**5 ft**
Enclosure	**Enclosed**	Velocity pressure, qh	**72.04 psf**
Internal pressure, GCpi	**±0.18**	Kd / Kzt / Ke	**0.85 / 1 / 1**
Roof type	**Sloped**	Procedure	**Eq. 30.3-1, Fig. 30.3-1**
County	**Illustrative Florida location**		

Enclosed: glazing is impact-resistant or protected where wind-borne debris rules apply (FBC 1609.2).

Building plan / wall-zone layout

PROJECT PLAN



Colored perimeter: calculated wall zones.

Zone 4 / wall field

Zone 5 / corner wall strips

Signs: + inward pressure, toward the wall surface; - outward suction, away from it. Zone 5 extends a from each building corner, measured along the wall; colored lines are wall zones, not roof zones.

Scope: Wall components and cladding pressures plus the three-condition solid-glass railing reference schedule. Roof, MWFRS and component/connection capacities are not calculated.

Pressure schedules

Typical installations - by effective wind area or door width - pressures in psf

Calculated pressures - draft for professional review

Allowable Stress Design (ASD) Wind Loads

No further 0.6 reduction allowed.

Window and door pressures

Area, sq ft	Both zones +	Zone 4 -	Zone 5 -
10	**+43.35**	**-47.03**	**-58.05**
20	+41.40	-45.07	-54.14
30	+40.26	-43.93	-51.86
40	+39.45	-43.12	-50.24
50	+38.82	-42.49	-48.98
60	+38.31	-41.98	-47.95
70	+37.87	-41.55	-47.08
80	+37.50	-41.17	-46.33
90	+37.16	-40.84	-45.67
100	+36.87	-40.54	-45.07

Positive pressure is the same in both zones; negative values are outward suction. Zone 5 extends a = 5 ft from each building corner; openings within that distance use Zone 5 values.
Between rows, use the smaller tabulated area (higher pressure); openings under 10 sq ft use the 10 sq ft row.

Garage-door pressures

$$A := W^2 / 3$$

W = horizontal span between side supports, ft; H = door height, ft, at least W/3; A = effective wind area, sq ft. The effective width is taken as W/3, the lower limit in ASCE 7-22 Sec. 26.2, so A is the smallest effective area for span W and gives the highest coefficients.

Width, ft	Area, sq ft	Both zones +	Zone 4 -	Zone 5 -
8	21.33	+41.22	-44.89	-53.78
9	27.00	+40.56	-44.23	-52.45
10	33.33	+39.96	-43.64	-51.27
12	48.00	+38.93	-42.61	-49.21
14	65.33	+38.07	-41.74	-47.47
15	75.00	+37.68	-41.35	-46.70
15.5	80.08	+37.49	-41.17	-46.33
16	85.33	+37.31	-40.99	-45.97
18	108.00	+36.65	-40.32	-44.64

Zone 5 extends a = 5 ft from each building corner; doors within that distance use Zone 5 values. For a width between rows, use the next narrower row (higher pressure).

Displayed values are rounded; calculations use full precision.

Calculations

ASCE 7-22 Chapters 26 and 30 - governing cases at A = 10 sq ft - ASD

Velocity pressure - Equation 26.10-1

$$K_z := 2.41\ (z / z_g)^{2 / alpha} = 2.41\ (29 / 2{,}460)^{2 / 9.8} = 0.973729$$

$$q_h := 0.00256\ K_z\ K_{zt}\ K_e\ V^2 = 0.00256 \times 0.973729 \times 1 \times 1 \times 170^2 = 72.0404\ psf$$

z = max(h, 15 ft) = 29 ft; Exposure C: alpha = 9.8, zg = 2,460 ft. Kzt = 1 (no topographic speed-up), Ke = 1. V = 170 mph (Risk Category II, FBC 1609.3) is used unreduced; the 0.6 ASD factor is applied once, below.

External pressure coefficients - Figure 30.3-1

Effective area	Positive GCp	Zone 4 GCp	Zone 5 GCp
10 sq ft	+1.00	-1.10	-1.40
500 sq ft	+0.70	-0.80	-0.80

$$GCp(A) := GCp_{10} + (GCp_{500} - GCp_{10})\ log_{10}(A / 10) / log_{10}(500 / 10)$$

Used for every area and door width on Sheet 3. External coefficient multiplier = 1.00: the 10% wall reduction Figure 30.3-1 allows where the roof slope is 10 degrees or less is not taken (conservative).

Design pressure - Equation 30.3-1 (ASD)

$$p := 0.60\ q_h\ K_d\ [(GCp) - (GCpi)]$$

0.60 = ASD wind load factor (ASCE 7-22 Sec. 2.4), applied once. Kd = 0.85 (Table 26.6-1). GCpi = ±0.18; each case takes the governing sign. Minimum |p| = 0.60 × 16 psf = 9.60 psf (Sec. 30.2.2).

Zone 4 + $p := 0.60 \times 72.0404 \times 0.85 \times [+1.00 - (-0.18)] = +43.35\ psf$

Zone 4 - $p := 0.60 \times 72.0404 \times 0.85 \times [-1.10 - (+0.18)] = -47.03\ psf$

Zone 5 + $p := 0.60 \times 72.0404 \times 0.85 \times [+1.00 - (-0.18)] = +43.35\ psf$

Zone 5 - $p := 0.60 \times 72.0404 \times 0.85 \times [-1.40 - (+0.18)] = -58.05\ psf$

Geometry and procedure

$$a := max[min(0.10\ B, 0.40\ h), 0.04\ B, 3\ ft] = max[min(5, 11.6), 2, 3] = 5\ ft$$

h = 29 ft, not more than 60 ft: Part 1, Section 30.3, Equation 30.3-1, Figure 30.3-1.

B = 50 ft, the least horizontal dimension of the confirmed outside-wall outline (50 ft × 70 ft). No roof-overhang deduction is applied.

References: ASCE 7-22 Chapters 26 and 30; FBC 2023 (8th Edition) Section 1609.

Glass railing wind loads

ASCE 7-22 - 44-in solid-glass guardrail - ASD

Calculated pressures - draft for professional review

Allowable Stress Design (ASD) Wind Loads

No further 0.6 reduction allowed.

V = 170 mph / Exposure C / h = 29 ft / qh = 72.0404 psf (Sheet 4) / Rail height 44 in (3.6667 ft)

Railing condition schedule

01 **BALCONY** P1 / UP TO 6 FT DEEP	GOVERNING ASD **±51.44 psf**	Toward +24.98 psf Away -51.44 psf 345.77 lb-ft/ft at base	UNIFORM FORCE **188.60 plf**
02 **TERRACE** P2 / DEEP OR EXPOSED	GOVERNING ASD **±117.57 psf**	Toward +36.74 psf Away -117.57 psf 790.33 lb-ft/ft at base	UNIFORM FORCE **431.09 plf**
03 **ROOFTOP** P3 / ROOF EDGE / CORNER	GOVERNING ASD **±120.46 psf**	Toward +37.64 psf Away -120.46 psf 809.77 lb-ft/ft at base	UNIFORM FORCE **441.69 plf**

Railing calculations

P1 - Shallow balcony, up to 6 ft deep

$p_{toward} := 0.60\ q_h\ K_d\ G\ C_p = 0.60\ q_h\ K_d\ (0.85)(0.80) = +24.98\ psf$

$p_{away} := 0.60\ q_h\ K_d\ (GCp) = 0.60\ q_h\ K_d\ (-1.40) = -51.44\ psf$

Toward: G = 0.85, Cp = 0.80, windward wall (Fig. 27.3-1). Away: wall Zone 5 GCp at 10 sq ft (Fig. 30.3-1).

P2 - Deep balcony / exposed terrace

$p_{toward} := 0.60\ q_h\ K_d\ (GCp) = 0.60\ q_h\ K_d\ (+1.00) = +36.74\ psf$

$p_{away} := 0.60\ q_h\ K_d\ (GCp) = 0.60\ q_h\ K_d\ (-3.20) = -117.57\ psf$

Toward: wall GCp at 10 sq ft (Fig. 30.3-1). Away: roof corner Zone 3 GCp at 10 sq ft (Fig. 30.3-2A).

P3 - Topmost horizontal roof perimeter

$q_p := 0.00256\ K_z\ K_{zt}\ K_e\ V^2 = 73.8122\ psf;\ \ K_z = 0.997678\ at\ z = h + H_{rail} = 32.6667\ ft$

$p_{toward} := 0.60\ q_p\ K_d\ (GCp) = 0.60\ q_p\ K_d\ (+1.00) = +37.64\ psf$

$p_{away} := 0.60\ q_p\ K_d\ (GCp) = 0.60\ q_p\ K_d\ (-3.20) = -120.46\ psf$

Toward: wall GCp at 10 sq ft (Fig. 30.3-1). Away: roof corner Zone 3 GCp at 10 sq ft (Fig. 30.3-2A).

P1 uses the documented shallow-balcony windward check with the external Zone 5 C&C envelope (ASCE 7-22 Ch. 26/30; NCSEA shallow-balcony guidance). Face-pressure peaks are separate; opposing faces are not algebraically summed. Uniform force = governing pressure × H; base moment = governing pressure × H × H / 2, where H = rail height.

Separate guard-load checks

Applicable FBC guard-load checks: 50 plf top-rail load; 200 lb concentrated load. Checked separately from wind.