Wind Load Calculation Package

MWFRS design wind pressures · 60 × 120 × 52 ft · V = 115 mph · Exposure C

PRELIMINARY — NOT FOR CONSTRUCTION

Preliminary — for review by the Engineer of Record. Not for construction until reviewed and sealed by a licensed professional engineer.

Design Criteria

Wind loads are determined per ASCE 7-16 for the Main Wind Force Resisting System. The building measures 60 ft by 120 ft in plan with a mean roof height of 52 ft. The site basic wind speed is 115 mph (3-second gust) with Exposure C. The building is classified as enclosed. The governing velocity pressure at the mean roof height is qh = 31.74 psf, applied with a gust-effect factor G = 0.85 and an internal pressure coefficient (GCpi) = ±0.18.

Governing qh	Gust factor G	(GCpi)	Enclosure
31.74 psf	0.850	±0.18	enclosed

Load Derivation

Each quantity below is a pure function of its inputs, shown with the clause it comes from and the formula with values substituted in.

Velocity pressure exposure coefficient — ASCE 7 7-16 §26.10.1, Table 26.10-1

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Kz = 2.01 · (z / zg)^(2/α)
Kz = 2.01 · (52.0 / 900)^(2/9.5) = 1.103
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Topographic factor — ASCE 7 7-16 §26.8.2, Eq. 26.8-1

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Kzt = 1.0 where the §26.8.1 speed-up conditions are not met
Kzt = 1.000
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Wind directionality factor — ASCE 7 7-16 §26.6, Table 26.6-1

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Kd from Table 26.6-1
Kd = 0.85 (buildingMwfrs)
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Ground elevation factor

ASCE 7 7-16 §26.9, Eq. 26.9-1

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Ke = e^(−0.0000362 · zg)
Ke = e^(−0.0000362 · 0) = 1.000
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Velocity pressure

ASCE 7 7-16 §26.10.2, Eq. 26.10-1

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qz = 0.00256 · Kz · Kzt · Kd · Ke · V²
qz = 0.00256 · 1.103 · 1.000 · 0.850 · 1.000 · 115² = 31.737 psf
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Gust-effect factor (rigid building)

ASCE 7 7-16 §26.11.1

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G = 0.85 for a rigid building (§26.11.1)
G = 0.85
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Internal pressure coefficient

ASCE 7 7-16 §26.13.1, Table 26.13-1

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(GCpi) = ± value from Table 26.13-1, applied with both signs
(GCpi) = ±0.18 (enclosed)
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Design Wind Pressures

Wind along X (L = 60 ft, B = 120 ft)

Surface	z	q (psf)	Cp	p +(GCpi)	p −(GCpi)
windward	15 ft	24.43	0.80	10.90	22.32
windward	30 ft	28.27	0.80	13.51	24.93
windward	45 ft	30.79	0.80	15.22	26.65
windward	52 ft	31.74	0.80	15.87	27.29
leeward	h	31.74	-0.50	-19.20	-7.78
side	h	31.74	-0.70	-24.60	-13.17

Wind along Y (L = 120 ft, B = 60 ft)

Surface	z	q (psf)	Cp	p +(GCpi)	p −(GCpi)
windward	15 ft	24.43	0.80	10.90	22.32
windward	30 ft	28.27	0.80	13.51	24.93
windward	45 ft	30.79	0.80	15.22	26.65
windward	52 ft	31.74	0.80	15.87	27.29

Surface	z	q (psf)	Cp	p +(GCpi)	p −(GCpi)
leeward	h	31.74	-0.30	-13.81	-2.38
side	h	31.74	-0.70	-24.60	-13.17

Torsional Load Cases · ASCE 7-16 Fig. 27.3-8

Case	Pressure factor	Both axes	Eccentricity (ft)
1	1.0000	no	eX=±0.00, eY=±0.00
2	0.7500	no	eX=±9.00, eY=±18.00
3	0.7500	yes	eX=±0.00, eY=±0.00
4	0.5625	yes	eX=±9.00, eY=±18.00

Items for Engineer of Record Review

Before sealing, the Engineer of Record must review the following: (1) G = 0.85 assumes a rigid building (fundamental frequency n1 ≥ 1 Hz, §26.2). The Engineer of Record must confirm rigidity; a flexible building requires Gf (§26.11.5). (2) The 0.75 pressure reduction, the 0.15 eccentricity fraction and the Case 4 combined factor are transcribed from Fig. 27.3-8 but not yet verified against the official figure (VERIFICATION_QUEUE.md). Confirm before relying on Cases 2–4. (3) Roof pressures are not included: the Fig. 27.3-1 roof coefficients are not yet transcribed (VERIFICATION_QUEUE.md). This package covers wall MWFRS pressures only. These items were flagged automatically and are not a substitute for the Engineer of Record's independent judgment.

- G = 0.85 assumes a rigid building (fundamental frequency n1 ≥ 1 Hz, §26.2). The Engineer of Record must confirm rigidity; a flexible building requires Gf (§26.11.5).
- The 0.75 pressure reduction, the 0.15 eccentricity fraction and the Case 4 combined factor are transcribed from Fig. 27.3-8 but not yet verified against the official figure (VERIFICATION_QUEUE.md). Confirm before relying on Cases 2–4.
- Roof pressures are not included: the Fig. 27.3-1 roof coefficients are not yet transcribed (VERIFICATION_QUEUE.md). This package covers wall MWFRS pressures only.

Narrative source: deterministic-fallback. Numeric results are computed by the StructCalc engine (pure functions); narrative text is descriptive only and is never the source of a number.