PART 1: LOW-RISE BUILDINGS

User Note: Use Part 1 of Chapter 30 to determine wind pressures on C&C of *enclosed, partially enclosed, or partially open low-rise buildings* that have roof shapes as specified in the applicable figures. The provisions in Part 1 are based on the Envelope Procedure, with *wind pressures calculated using the specified equation* as applicable to each building surface. For buildings for which these provisions are applicable, this method generally yields the lowest wind pressures of all analytical methods contained in this standard.

30.3 BUILDING TYPES

The provisions of Section 30.3 are applicable to an enclosed, partially enclosed, or partially open

- Low-rise building (see definition in Section 26.2); or
- Building with $h \le 60$ ft (18.3 m).

The building has a flat roof, gable roof, multispan gable roof, hip roof, monoslope roof, stepped roof, or sawtooth roof. The steps required for the determination of wind loads on C&C for these building types are shown in Table 30.3-1.

30.3.1 Conditions For the determination of the design wind pressures on the C&C using the provisions of Section 30.3.2, the conditions indicated on the selected figure(s) shall be applicable to the building under consideration.

30.3.2 Design Wind Pressures Design wind pressures on C&C elements of low-rise buildings and buildings with $h \le 60$ ft (18.3 m) shall be determined from the following equation:

$$p = q_h K_d[(GC_p) - (GC_{pi})](\text{lb/ft}^2) \qquad (30.3\text{-}1)$$

$$p = q_h K_d[(GC_p) - (GC_{pi})](\text{N/m}^2) \qquad (30.3\text{-}1.\text{SI})$$

where

q_h = Velocity pressure evaluated at mean roof height h as defined in Section 26.10;
K_d = Wind directionality factor, see Section 26.6; and
(GC_p) = External pressure coefficients given in

- Figure 30.3-1 (walls),
- Figures 30.3-2A–G (flat roofs, gable roofs, and hip roofs) and 30.5.2 (pitched free roofs),
- Figure 30.3-3 (stepped roofs),
- Figure 30.3-4 (multispan gable roofs),
- Figsure 30.3-5A–B (monoslope roofs),
- Figure 30.3-6 (sawtooth roofs),
- Figure 30.3-7 (domed roofs),
- Figure 30.3-8 (arched roofs),
- Figure 30.3-2A (bottom surfaces of elevated buildings).

(GC_{pi}) = Internal pressure coefficient given in Table 26.13-1.

30.3.2.1 Bottom Horizontal Surface of Elevated Buildings. Design wind pressures for C&C elements on the bottom flat horizontal surface of elevated buildings shall be determined using the roof pressure coefficients from Figure 30.3-2A with the following modifications:

1. h_B shall be the height above grade of the bottom surface of the elevated building, as depicted in Figure 30.3-1A. The value of h shall equal h_B for determining zone dimensions from Figure 30.3-2A. For elevated buildings with a flat bottom horizontal building surface and situated on a slope, h_B shall be taken as the maximum height between the slope and the bottom of the elevated building.
2. Areas of the horizontal surface above partially enclosed spaces and areas extending a_B perpendicular to walls beneath the elevated building with plan dimension greater than 4 ft (1.2 m), as shown in the shaded regions in Figure 30.3-1A, shall be designed to resist positive pressures equal to the Zone 4 wall pressures obtained using Figure 30.3-1. The value of a_B shall equal 0.4 h_B or the width of the wall, whichever is smaller for determining zone dimensions from Figure 30.3-1A.

The loading convention shall denote downward loading on the bottom surface with negative pressure coefficients and upward loading on the bottom surface with positive pressure coefficients.

EXCEPTION: The provisions of Section 30.3.2.1 do not apply to buildings with $h_B < 2$ ft (0.61 m).

Table 30.3-1. Steps to Determine C&C Wind Loads for Enclosed, Partially Enclosed, and Partially Open Low-Rise Buildings.

Step 1: Determine risk category; see Table 1.5-1.
Step 2: Determine the basic wind speed, V, for applicable risk category; see Figure. 26.5-1.
Step 3: Determine the wind load parameters:

- Wind directionality factor, K_d; see Section 26.6 and Table 26.6-1.
- Exposure Category B, C, or D; see Section 26.7.
- Topographic factor, K_{zt}; see Section 26.8 and Figure 26.8-1.
- Ground elevation factor, K_e; Section 26.9 and Table 26.9-1.
- Enclosure classification; see Section 26.12.
- Internal pressure coefficient, (GC_{pi}); see Section 26.13 and Table 26.13-1.

Step 4: Determine velocity pressure exposure coefficient, K_h; see Table 26.10-1.
Step 5: Determine velocity pressure, q_h, Equation (26.10-1).
Step 6: Determine external pressure coefficient, (GC_p):

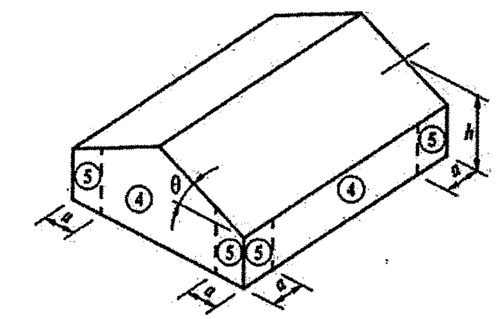
- Walls; see Figure 30.3-1.
- Flat roofs, gable roofs, hip roofs; see Figure 30.3-2.
- Stepped roofs; see Figure 30.3-3.
- Multispan gable roofs; see Figure 30.3-4.
- Monoslope roofs; see Figure 30.3-5.
- Sawtooth roofs; see Figure 30.3-6.
- Domed roofs; see Figure 30.3-7.
- Arched roofs; see Figure 30.3-8.
- Bottom horizontal surface of elevated buildings; see Section 30.3.2.1.

Step 7: Calculate wind pressure, p; Equation (30.3-1).

PART 2: BUILDINGS WITH $h > 60$ ft [($h > 18.3$ m)]

User Note: Use Part 2 of Chapter 30 for determining wind pressures for C&C of *enclosed, partially enclosed, or partially open buildings with* $h \le 60$ ft (18.3 m) that have roof shapes as specified in the applicable figures. These provisions are based on the Directional Procedure with *wind pressures calculated from the specified equation* applicable to each building surface.

Diagram



ELEVATION

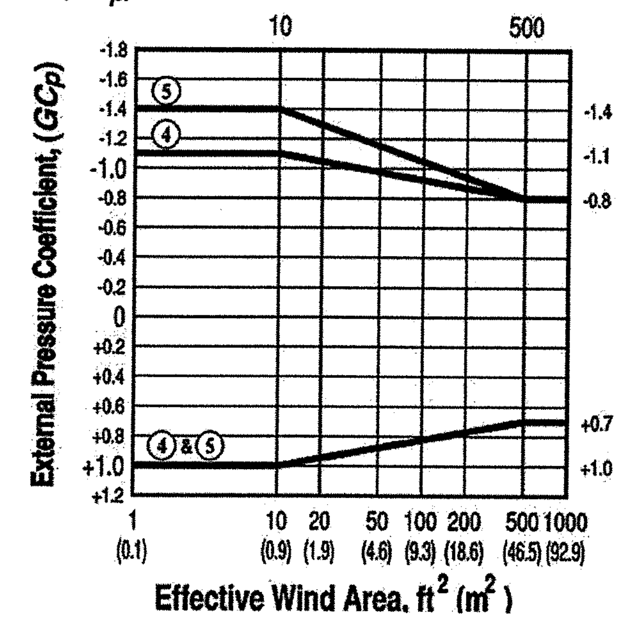
Notation

a = 10% of least horizontal dimension or $0.4h$, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m).

Exception: For buildings with $\theta = 0°$ to 7° and a least horizontal dimension greater than 300 ft (90 m), dimension a shall be limited to a maximum of $0.8h$.

h = Mean roof height, ft (m), except that eave height shall be used for $\theta \le 10°$.
θ = Angle of plane of roof from horizontal, degrees.

External Pressure Coefficient, (GC_p) - Walls



Notes

1. Vertical scale denotes (GCp) to be used with qh.
2. Horizontal scale denotes effective wind area A, ft^2 (m^2).
3. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
4. Each component shall be designed for maximum positive and negative pressures.
5. Values of (GCp) for walls shall be reduced by 10% when $\theta \le 10°$.

Figure 30.3-1. Components and cladding, $h \le 60$ ft (18.3 m): external pressure coefficients (GC_p) for enclosed, partially enclosed, and partially open buildings—walls.