PART 1: LOW-RISE BUILDINGS

30.4 BUILDING TYPES

The provisions of Section 30.4 are applicable to an enclosed and partially enclosed:

– Low-rise building (see definition in Section 26.2)
– Building with $h \leq 60$ 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 components and cladding for these building types are shown in Table 30.4-1.

30.4.1 Conditions

For the determination of the design wind pressures on the components and claddings using the provisions of Section 30.4.2 the conditions indicated on the selected figure(s) shall be applicable to the building under consideration.

30.4.2 Design Wind Pressures

Design wind pressures on component and cladding elements of low-rise buildings and buildings with $h \leq 60$ ft (18.3 m) shall be determined from the following equation:

$$p = q_h[(GC_p) - (GC_{pi})] \text{ (lb/ft}^2\text{) (N/m}^2\text{)} \quad (30.4\text{-}1)$$

where

q_h = velocity pressure evaluated at mean roof height h as defined in Section 30.3
(GC_p) = external pressure coefficients given in:
– Figure 30.4-1 (walls)
– Figures. 30.4-2A to 30.4-2C (flat roofs, gable roofs, and hip roofs)
– Figure 30.4-3 (stepped roofs)
– Figure 30.4-4 (multispan gable roofs)
– Figures. 30.4-5A and 30.4-5B (monoslope roofs)
– Figure 30.4-6 (sawtooth roofs)
– Fig. 30.4-7 (domed roofs)
– Fig. 27.4-3, footnote 4 (arched roofs)
(GC_{pi}) = internal pressure coefficient given in Table 26.11-1

User Note: Use Part 1 of Chapter 30 to determine wind pressures on C&C of *enclosed and partially enclosed low-rise buildings* having 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.

Table 30.4-1 Steps to Determine C&C Wind Loads Enclosed and Partially Enclosed 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 Fig. 26.5-1A, B or C

Step 3: Determine 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 Fig. 26.8-1
- Enclosure classification, see Section 26.10
- Internal pressure coefficient, (GC_{pi}), see Section 26.11 and Table 26.11-1

Step 4: Determine velocity pressure exposure coefficient, K_z or K_h, see Table 30.3-1

Step 5: Determine velocity pressure, q_h, Eq. 30.3-1

Step 6: Determine external pressure coefficient, (GC_p)
- Walls, see Fig. 30.4-1
- Flat roofs, gable roofs, hip roofs, see Fig. 30.4-2
- Stepped roofs, see Fig. 30.4-3
- Multispan gable roofs, see Fig. 30.4-4
- Monoslope roofs, see Fig. 30.4-5
- Sawtooth roofs, see Fig. 30.4-6
- Domed roofs, see Fig. 30.4-7
- Arched roofs, see Fig. 27.4-3 footnote 4

Step 7: Calculate wind pressure, p, Eq. 30.4-1

PART 2: LOW-RISE BUILDINGS (SIMPLIFIED)

30.5 BUILDING TYPES

The provisions of Section 30.5 are applicable to an enclosed:

– Low-rise building (see definition in Section 26.2)
– Building with $h \leq 60$ ft (18.3 m)

The building has a flat roof, gable roof, or hip roof. The steps required for the determination of wind loads on components and cladding for these building types are shown in Table 30.5-1.

30.5.1 Conditions

For the design of components and cladding the building shall comply with all the following conditions:

1. The mean roof height h must be less than or equal to 60 ft (18.3 m) ($h \leq 60$ ft (18.3 m)).
2. The building is enclosed as defined in Section 26.2 and conforms to the wind-borne debris provisions of Section 26.10.3.
3. The building is a regular-shaped building or structure as defined in Section 26.2.
4. The building does not have response characteristics making it subject to across wind loading, vortex shedding, or instability due to galloping or flutter; and it does not have a site location for which channeling effects or buffeting in the wake of upwind obstructions warrant special consideration.
5. The building has either a flat roof, a gable roof with $\theta \leq 45°$, or a hip roof with $\theta \leq 27°$.

30.5.2 Design Wind Pressures

Net design wind pressures, p_{net}, for component and cladding of buildings designed using the procedure specified herein represent the net pressures (sum of internal and external) that shall be applied normal to each building surface as shown in Fig. 30.5-1. p_{net} shall be determined by the following equation:

$$p_{net} = \lambda K_{zt} p_{net30} \quad (30.5\text{-}1)$$

where

λ = adjustment factor for building height and exposure from Fig. 30.5-1
K_{zt} = topographic factor as defined in Section 26.8 evaluated at 0.33 mean roof height, $0.33h$
p_{net30} = net design wind pressure for Exposure B, at h = 30 ft (9.1 m), from Fig. 30.5-1

User Note: Part 2 of Chapter 30 is a simplified method to determine wind pressures on C&C of *enclosed low-rise buildings* having flat, gable or hip roof shapes. The provisions of Part 2 are based on the Envelope Procedure of Part 1 with *wind pressures determined from a table* and adjusted as appropriate.

Table 30.5-1 Steps to Determine C&C Wind Loads Enclosed Low-rise Buildings (Simplified Method)

Step 1: Determine risk category, see Table 1.5-1

Step 2: Determine the basic wind speed, V, for applicable risk category see Figure 26.5-1A, B or C

Step 3: Determine wind load parameters:
- Exposure category B, C or D, see Section 26.7
- Topographic factor, K_{zt}, see Section 26.8 and Figure 26.8-1

Step 4: Enter figure to determine wind pressures at h = 30 ft., p_{net30}, see Fig. 30.5-1

Step 5: Enter figure to determine adjustment for building height and exposure, λ, see Fig. 30.5-1

Step 6: Determine adjusted wind pressures, p_{net}, see Eq. 30.5-1.