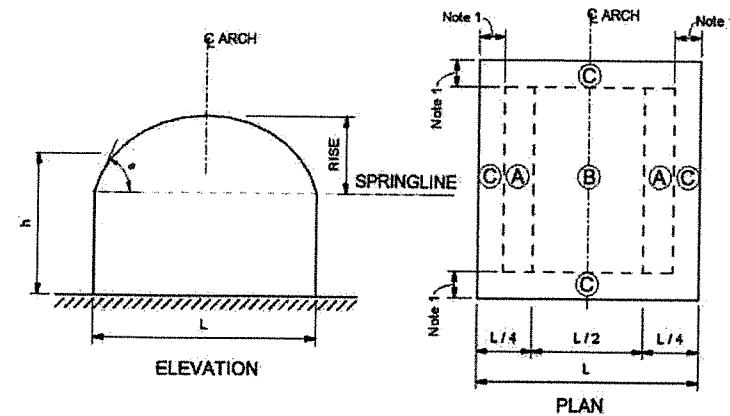


## Diagrams



### Notation

- $L$  = Horizontal dimension of building, ft (m), measured normal to ridge.  
 $r$  = Rise-to-span ratio = 'rise'/ $L$ .  
 $h$  = Roof height as defined in Chapter 26 for roof angle  $\theta$ .  
 $\theta$  = Angle of plane of roof from horizontal, in degrees, measured at eave.

### External Pressure Coefficient, $GC_p$

Conditions	Rise-to-Span Ratio, $r$	$(GC_p)$	
		Zone A	Zone B
Roof on elevated structure	$0 < r < 0.2$	-1.08	-0.84-1.2r
	$0.2 \leq r < 0.3$	1.8r-0.36	-0.84-1.2r
		-0.6	
Roof springing from ground level	$0.3 \leq r \leq 0.6$	3.3r-0.84	-0.84-1.2r
		-0.6	
	$0 < r \leq 0.6$	1.68r	-0.84-1.2r

### Notes

- At roof perimeter Zone C, use the roof zones (Zone 2 and 3) and external pressure coefficients in Fig. 30.3-2A, B, C, and D with " $\theta$ " based on springline slope. In the case of Fig. 30.3-2A, use  $0.6h$  as the size of the roof perimeter Zone C. For roof Zones A and B, use external pressure coefficients shown in this table.
- Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
- Where multiple values of  $(GC_p)$  are listed, the roof zone is subjected to either positive or negative pressures and the structure shall be designed for all conditions.

**Figure 30.3-8. Components and cladding (all heights): external pressure coefficients,  $(GC_p)$ , for enclosed, partially enclosed, and partially open buildings and structures—arched roofs.**

## 30.5 BUILDING TYPES

The provisions of Section 30.5 are applicable to an open building of all heights that has a pitched free roof, monosloped free roof, or troughed free roof. The steps required for the determination of wind loads on C&C for these building types is shown in Table 30.5-1.

**30.5.1 Conditions** For the determination of the design wind pressures on C&Cs using the provisions of Section 30.5.2, the conditions indicated on the selected figure(s) shall be applicable to the building under consideration.

**30.5.2 Design Wind Pressures** The net design wind pressure for component and cladding elements of open buildings of all heights with monoslope, pitched, and troughed roofs shall be determined by the following equation:

$$p = q_h K_d G C_N \quad (30.5-1)$$

where

- $q_h$  = Velocity pressure evaluated at mean roof height  $h$  using the exposure as defined in Section 26.7.3 that results in the highest wind loads for any wind direction at the site; and  
 $K_d$  = Wind directionality factor, see Section 26.6;  
 $G$  = Gust-effect factor from Section 26.11; and  
 $C_N$  = Net pressure coefficient given in

- Figure 30.5-1 for monosloped roof,
- Figure 30.5-2 for pitched roof, and
- Figure 30.5-3 for troughed roof.

Net pressure coefficients,  $C_N$ , include contributions from top and bottom surfaces. All load cases shown for each roof angle shall be investigated. Plus and minus signs signify pressure acting toward and away from the top surface of the roof, respectively.

## PART 4: BUILDING APPURTENANCES, ROOFTOP STRUCTURES AND EQUIPMENT

**User Note:** Use Part 4 of Chapter 30 for determining wind pressures for C&C on roof overhangs or parapets of buildings. These provisions are based on the Directional Procedure with wind pressures calculated from the specified equation applicable to each roof overhang or parapet surface.

### Table 30.5-1. Steps to Determine C&C Wind Loads for Open 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 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,  $K_z$ ; see Section 26.8 and Figure 26.8-1.
  - Ground elevation factor,  $K_g$ ; see Section 26.9 and Table 26.9-1.
  - Gust-effect factor,  $G$ ; see Section 26.11.
- Step 4:** Determine velocity pressure exposure coefficient,  $K_z$  or  $K_h$ ; see Table 26.10-1.
- Step 5:** Determine velocity pressure,  $q_h$ , Equation (26.10-1).
- Step 6:** Determine net pressure coefficients,  $C_N$ :
  - Monoslope roof; see Figure 30.5-1.
  - Pitched roof; see Figure 30.5-2.
  - Troughed roof; see Figure 30.5-3.
- Step 7:** Calculate wind pressure,  $p$ , Equation (30.5-1).

## 30.6 PARAPETS

The design wind pressure for C&C elements of parapets for all building types and heights shall be determined from the following equation:

$$p = q_p K_d ((GC_p) - (GC_{pi})) \quad (30.6-1)$$

where

- $q_p$  = Velocity pressure evaluated at the top of the parapet;  
 $K_d$  = Wind directionality factor, see Section 26.6;  
 $(GC_p)$  = External pressure coefficient given in

- Figure 30.3-1 for walls with  $h \leq 60$  ft (18.3 m);
  - Figure 30.3-2A-C for flat roofs, gable roofs, and hip roofs;
  - Figure 30.3-3 for stepped roofs;
  - Figure 30.3-4 for multispans gable roofs;
  - Figure 30.3-5A-B for monoslope roofs;
  - Figure 30.3-6 for sawtooth roofs;
  - Figure 30.3-7 for domed roofs of all heights;
  - Figure 30.4-1 for walls and flat roofs with  $h > 60$  ft (18.3 m);
  - Figure 30.3-8 for arched roofs.
- $(GC_{pi})$  = Internal pressure coefficient from Table 26.13-1, based on the porosity of the parapet envelope.

Two load cases from Figure 30.6-1 shall be considered:

- **Load Case A:** Windward parapet shall consist of applying the applicable positive wall pressure from Figure 30.3-1 [ $h \leq 60$  ft ( $h \leq 18.3$  m)] or Figure 30.4-1 [ $h > 60$  ft ( $h > 18.3$  m)] to the

### Table 30.6-1. Steps to Determine C&C Wind Loads for Parapets.

- Step 1:** Determine risk category of building; 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 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,  $K_z$ ; see Section 26.8 and Figure 26.8-1.
  - Ground elevation factor,  $K_g$ ; see 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,  $K_h$ , at top of the parapet; see Table 26.10-1.
- Step 5:** Determine velocity pressure,  $q_p$ , at the top of the parapet using Equation (26.10-1).
- Step 6:** Determine external pressure coefficient for wall and roof surfaces adjacent to parapet,  $(GC_p)$ :
  - Walls with  $h \leq 60$  ft (18.3 m); see Figure 30.3-1.
  - Flat, gable, and hip roofs; see Figure 30.3-2A-I.
  - Stepped roofs; see Figure 30.3-3.
  - Multispans gable roofs; see Figure 30.3-4.
  - Monoslope roofs; see Figure 30.3-5A-B.
  - Sawtooth roofs; see Figure 30.3-6.
  - Domed roofs of all heights; see Figure 30.3-7.
  - Walls and flat roofs with  $h > 60$  ft ( $h > 18.3$  m); see Figure 30.4-1.
  - Arched roofs; see Figure 30.3-8.
- Step 7:** Calculate wind pressure,  $p$ , using Equation (30.6-1) on windward and leeward face of parapet, considering two load cases (Case A and Case B) as shown in Figure 30.6-1.