TABLE C3

EXTERNAL PRESSURE COEFFICIENTS ($C_{p,e}$)—CURVED ROOFS WITH $h/r \leq 2$

Rise-to-span ratio, (r/d)	Windward quarter (U)	Centre half (T)	Leeward quarter (D)
0.05	$-(0.2 + 0.4\ h/r)$ or 0.0	$-(0.55 + 0.2\ h/r)$ or 0.0	$-(0.4 + 0.2\ h/r)$ or 0.0
0.2	$(0.3 - 0.4\ h/r)$ or 0.0		$-(0.25 + 0.2\ h/r)$ or 0.0
0.5	$(0.5 - 0.4\ h/r)$ or 0.0		$-(0.1 + 0.2\ h/r)$ or 0.0

NOTES:

1 h is the average roof height and r is the rise of the arch (see Figure C3).

2 For intermediate values of rise to span ratio, use linear interpolation.

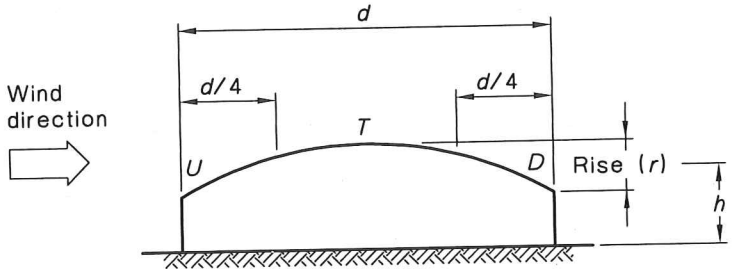

FIGURE C3 EXTERNAL PRESSURE COEFFICIENTS ($C_{p,e}$)—CURVED ROOFS

C4 MANSARD ROOFS

The external pressure coefficients ($C_{p,e}$) for a flat-topped mansard roof (see Figure C4) for the wind direction $\theta = 0°$ shall be determined as follows:

(a) *For upwind slope* (U)—using values for upwind slope given in Clause 5.4.1.

(b) *For downwind slope* (D)—using values for downwind slope given in Clause 5.4.1, using the same roof pitch α as for the upwind slope.

(c) *For flat top* (T)—using the same values as determined for downwind slope.

The external pressure coefficients ($C_{p,e}$) for the wind direction $\theta = 90°$ shall be determined from Clause 5.4.1 assuming R for gable roofs.

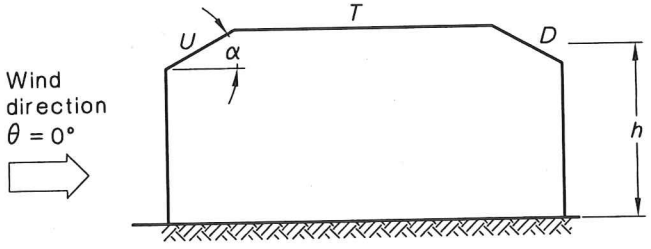

FIGURE C4 EXTERNAL PRESSURE COEFFICIENTS ($C_{p,e}$) FOR MANSARD ROOFS

C5 CIRCULAR BINS, SILOS AND TANKS

C5.1 General

Grouped circular bins, silos and tanks with spacing between walls greater than two diameters shall be treated as isolated silos. Closely spaced groups with spacing less than 0.1 diameters shall be treated as a single structure for wind actions and pressure determined using Tables 5.2 and 5.3. For intermediate spacings use linear interpolation.

C5.2 Isolated circular bins, silos and tanks

C5.2.1 *Walls*

The aerodynamic shape factor (C_{fig}) for calculating external pressures on the walls of bins, silos and tanks of circular cross-section shall be equal to the external pressure coefficients ($C_{p,b}$) as a function of the angle θ_b (see Figure C5), given as follows for shapes in the ranges indicated:

$$C_{p,b}(\theta_b) = k_b C_{p1}(\theta_b) \quad \ldots \text{C5(1)}$$

where

the cylinder is standing on the ground or supported by columns of a height not greater than the height of the cylinder (c),

c/b is in the range 0.25 to 4.0 inclusive

θ_b = angle from the wind direction to a point on the wall of a circular bin, silo or tank, in degrees

k_b = factor (or function) for a circular bin, given as follows:

= 1.0 for $C_{p1} \geq -0.15$

= $1.0 - 0.55(C_{p1}(\theta_b) + 0.15)\log_{10}(c/b)$ for $C_{p1} < -0.15$ . . . C5(2)

$$C_{p1}(\theta_b) = -0.5 + 0.4\cos\theta_b + 0.8\cos 2\theta_b + 0.3\cos 3\theta_b - 0.1\cos 4\theta_b - 0.05\cos 5\theta_b \quad \ldots \text{C5(3)}$$

For calculating the overall drag force on the wall section of circular bins, silos and tanks (both elevated and on ground) C_{fig} shall be taken as 0.63 (based on an elevation area $b \times c$). This drag force coefficient arises from an integration of the along-wind component of the normal pressures given by Equations C5(2) and C5(3).

External pressure coefficients for the underside of elevated bins, silos and tanks shall be calculated as for elevated enclosed rectangular buildings (see Clause 5.4.1).

Figure C6 is a graphical presentation of the external pressure coefficient (C_{p1}) for circular bins, silos and tanks of unit aspect ratio (i.e., $c/b = 1.0$) at individual locations around the perimeter, and θ_b degrees from the incident wind direction as calculated from Equation C5(1).

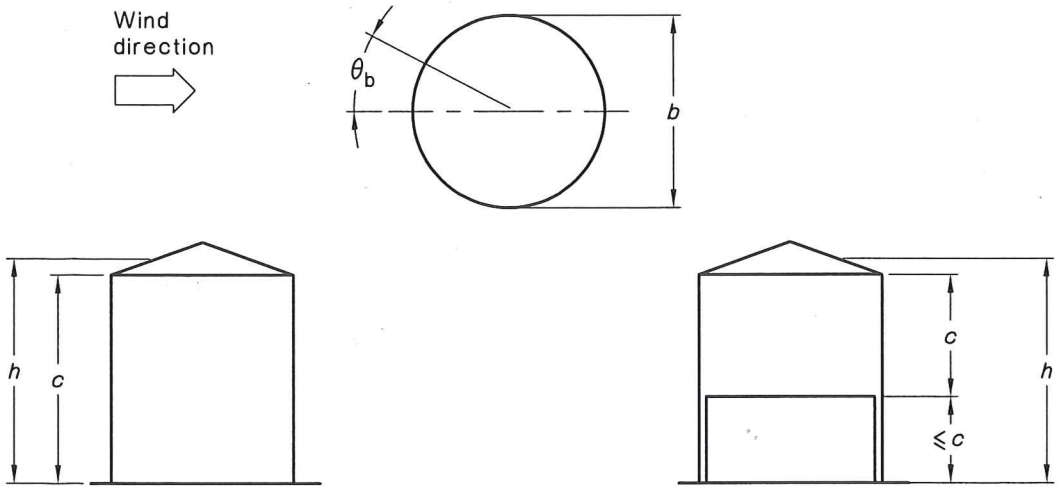

FIGURE C5 EXTERNAL PRESSURE COEFFICIENTS ($C_{p,b}$) ON WALLS OF CIRCULAR BINS, SILOS AND TANKS ($0.25 \leq c/b \leq 4.0$)

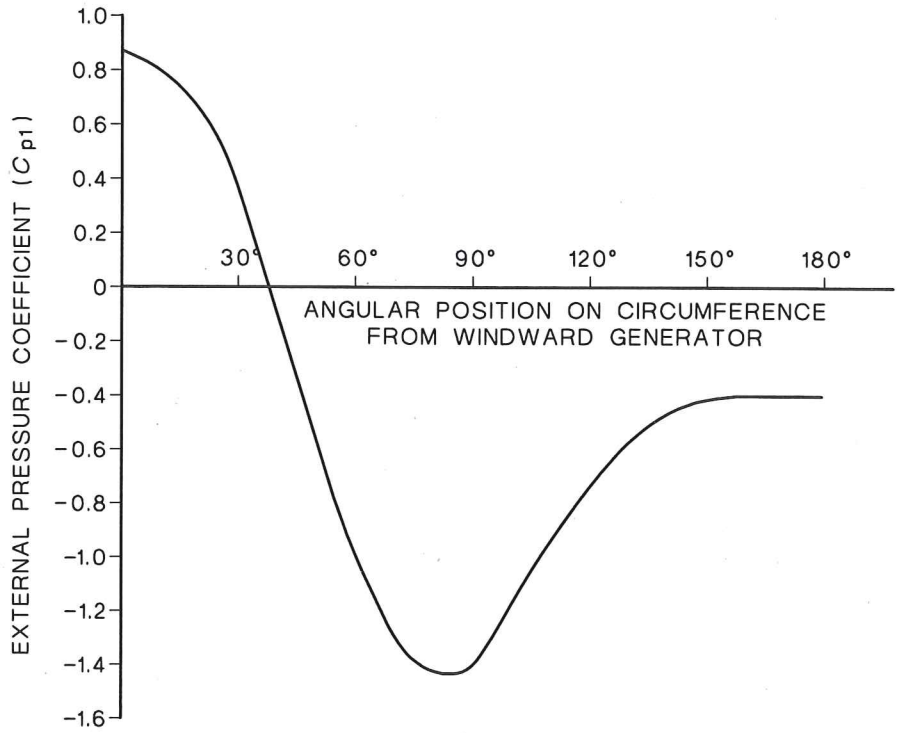

FIGURE C6 PLOT OF EXTERNAL PRESSURE COEFFICIENTS (C_{p1}) ON WALLS OF CIRCULAR BINS, SILOS AND TANKS (c/b = 1)

C5.2.2 *Roofs and lids*

The aerodynamic shape factor (C_{fig}) for calculating external pressures on the roofs or lids of bins, silos or tanks of circular cross-section as shown in Figure C7 shall be as follows:

$$C_{fig} = C_{p,e} K_a K_\ell \quad \ldots C4$$

where $C_{p,e}$ is given in Table C7 for zones A and B as shown in Figure C7, K_a is given in Clause 5.4.2 and K_ℓ is given in Clause 5.4.4.

The local pressure factor (K_ℓ) is applicable to the windward edges of roofs with slope less than or equal to 30°, and to the region near the cone apex for roofs with slope greater than 15°. The applicable areas are shown in Figure C7.

TABLE C7

EXTERNAL PRESSURE COEFFICIENTS ($C_{p,e}$) FOR ROOFS OF CIRCULAR BINS, SILOS AND TANKS

Zone A	Zone B
−0.8	−0.5

A1

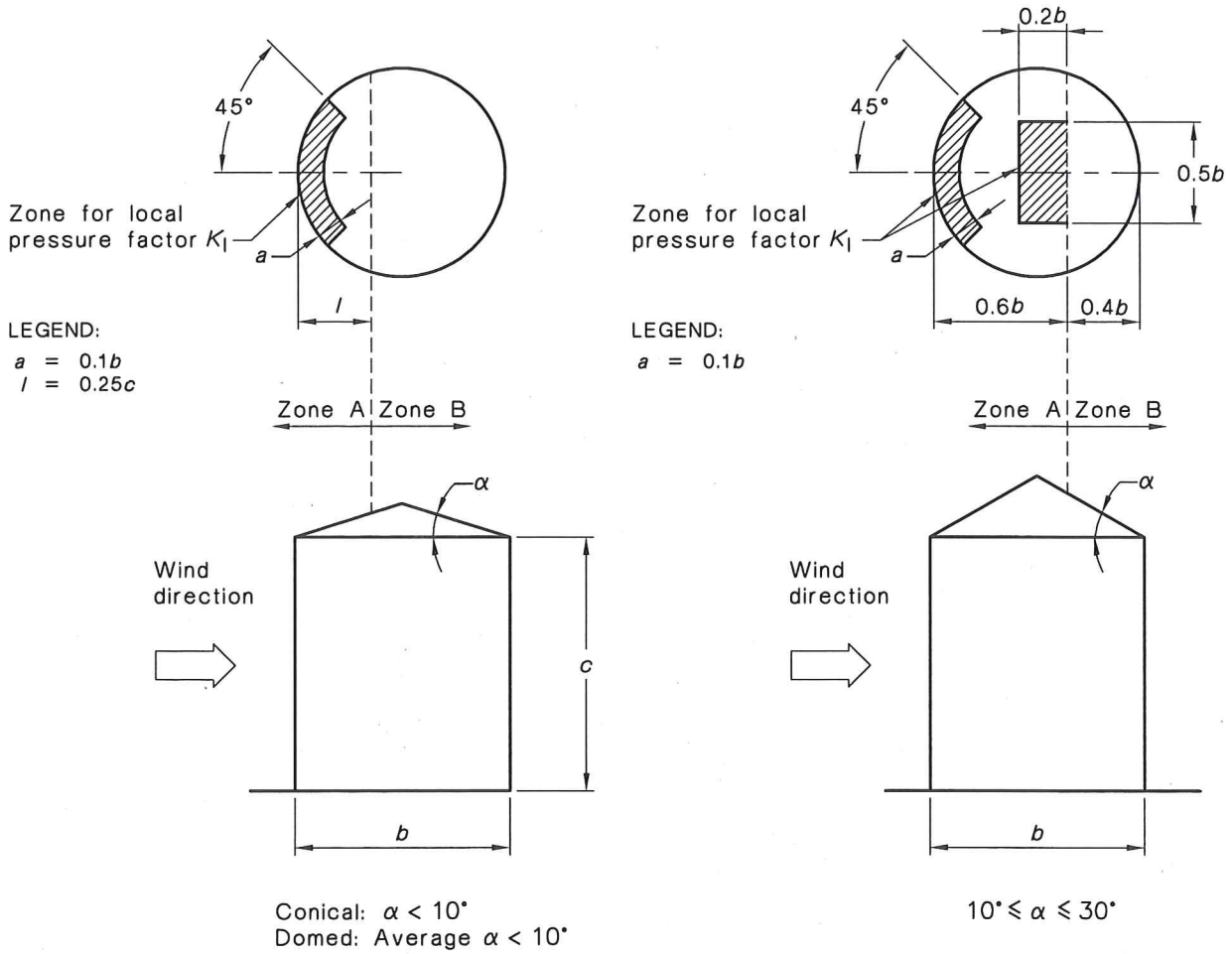

FIGURE C7 EXTERNAL PRESSURE COEFFICIENTS ($C_{p,e}$) FOR ROOFS OF CIRCULAR BINS, SILOS AND TANKS ($0.25 < c/b < 4.0$)

C5.2.3 *Internal pressures in bins, silos and tanks*

Internal pressures within bins, silos and tanks with vented roofs shall be determined as a an area-weighted average of the external pressures at the position of the vents and openings, determined according to Paragraph C5.2.2.

For open-top bins, silos or tanks, the internal pressure shall be determined as follows:

$$C_{fig} = C_{p,i} \qquad \ldots 6.2(2)$$

$$= -0.9 - 0.35 \log_{10}(c/b)$$