INTRODUCTION

A parapet is a wall-like structure surrounding the edge of a roof.

Essentially it is a wall or railing at a height of approximately one metre.

This can be a safety feature in that it is designed to stop falls from the edge of the roof but it can also be a defensive, constructional or stylistic feature.

Parapets can be used to give a roof the appearance of a flat roof.

As a parapet shields or breaks the wind flow over the leading edges of a typical roof, it can be used to optimise the framing design in areas of the roof that traditionally experiences higher loadings.

Image 1 – Typical parapet wall in background - courtesy of NextDC

STANDARDS

The AS / NZS 1170.2-2011 standard on wind actions incorporates parapets into building design.

Information on the impact of parapets on wind actions can be found on p. 37- 39 of the standard.

UNDERSTANDING EFFECT OF PARAPETS ON ROOF WIND PRESSURES

On p.37 of the standards, it states:

"For flat or near-flat roofs (slope less than 10°) with parapets, values of K_L for areas RA1 and RA2 in the lee of the parapet may be modified by multiplying the values from Table 5.6 by the parapet reduction factor (K_r), given in Table 5.7.

This essentially means that only the intermediate and edge zones of a roof can be analysed.

Internal and corners zones are exempt from the parapet coefficient reductions.

TABLE 5.6

LOCAL PRESSURE FACTOR (K_ℓ)

Design case	Figure 5.3 reference number	Building aspect ratio (r)	Area (A) m^2	Proximity to edge	K_ℓ
Positive pressures					
Windward wall	WA1	All	$A \le 0.25a^2$	Anywhere	1.5
All other areas	—	All	—	—	1.0
Negative pressures					
Upwind corners of roofs with pitch <10°	RC1	All	$A \le 0.25a^2$	$<a$ from two edges	3.0
Upwind roof edges	RA1 RA2	All All	$A \le a^2$ $A \le 0.25a^2$	$< a$ $< 0.5a$	1.5 2.0
Downwind side of hips and ridges of roofs with pitch ≥10°	RA3 RA4	All All	$A \le a^2$ $A \le 0.25a^2$	$< a$ $< 0.5a$	1.5 2.0
Side walls near windward wall edges	SA1 SA2	≤ 1	$A \le a^2$ $A \le 0.25a^2$	$< a$ $< 0.5a$	1.5 2.0
	SA3 SA4 SA5	>1	$A \le 0.25a^2$ $A \le a^2$ $A \le 0.25a^2$	$>a$ $<a$ $\le 0.5a$	1.5 2.0 3.0
All other areas	—	All	—	—	1.0

Image 2 – Local pressure factors (Kl) - courtesy of AS / NZS 1170.2:2011

TABLE 5.7

REDUCTION FACTOR (K_r) DUE TO PARAPETS

h	h_p (see Note)	K_r
≤ 25 m	≤0.07 h 0.1 h ≥0.2 h	1.0 0.8 0.5
> 25 m	≤0.02 w 0.03 w ≥0.05 w	1.0 0.8 0.5

LEGEND:
h_p = height of parapet above average roof level.
w = shortest horizontal dimension of the building.

NOTE: For intermediate values, linear interpolation shall be used.

Image 3 – Reduction factor (Kr) due to parapets – courtesy of AS / NZS 1170.2:2011

The following information needs to be measured to calculate the shielding effect of a parapet wall on a roof structure:

- Slope of the roof (in degrees).
- Total height of the building (in metres).
- Total height of the tallest parapet wall (in metres).
- Total width of the building (in metres).
- Total length of the building (in metres).

CASE STUDY

Take the example of a commercial building with the following specifications:

- Roof slope of 3 degrees.
- Building height (h) of 5 metres.
- Building width (w) of 20 metres.

- Building length (l) of 50 metres.
- Parapet height (p) is 1 metre.

To determine the width of the intermediate and edge zones, calculate the each of the following values, and then using the smallest:

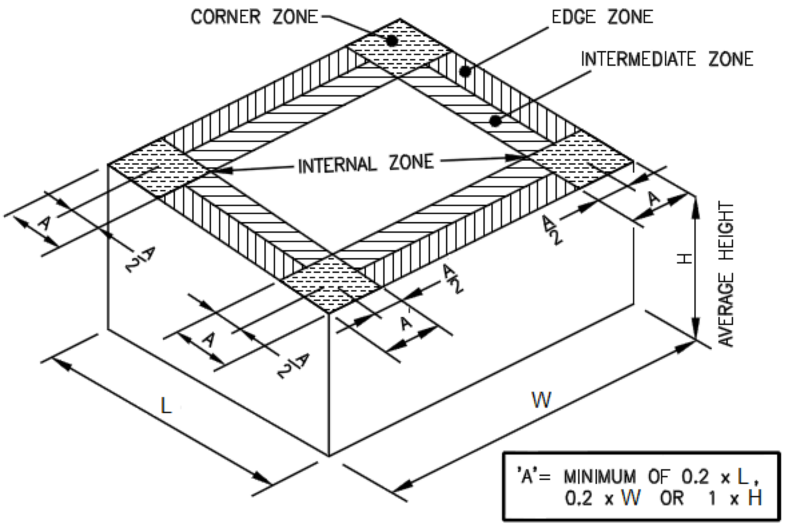
- 0.2 x w (0.2 x 20 = 4 metres)
- 0.2 x l (0.2 x 50 = 10 metres)
- h (1.0 x 5 = 5 metres)

In this case the smallest value is **4 metres.**

Dividing this value by 2 gives you the distance of the edge zone to the edge of the roof.

In summary the roof can be divided up into the following:

- Internal zone **> 4 metres** from roof edge.
- Intermediate zone **2 to 4 metres** from roof edge.
- Edge zone **< 2 metres** from roof edge.
- Corner zone **4 metres (square area)** from both roof edges.



The next step is to divide the height of the parapet (1 metre) by 2 giving a total of **0.5 metres.**

This equates to the height of the parapet at the average roof level (h_p).

Refer to Table 5.7, noting that the building is less than 25 metres tall.

Multiply the following:

- ≤ 0.07 x h (≤ 0.07 x 5) ≤ 0.35 metres
- 0.1 x h (0.1 x 5) 0.50 metres (this value correlates with h_p, thus use the **K_r value of 0.8**)
- ≥ 0.2 x h (≥ 0.2 x 5) ≥ 1.00 metres

For any intermediate values, linear interpretation shall be used.

To conclude, the parapets ensure that the intermediate and edge zones are wind shielded by a factor of 0.8 or **80% compared to a building without a parapet wall.**

This can potentially mean that less fixings / brackets and general PV framing can be used, saving time and money.

FURTHER INFORMATION

For further information contact Apollo Energy on 1300 855 484 or sunlock@apolloenergy.com.au.