

GUIDE ON THE ADOPTION OF PERFORMANCE STANDARDS

PART I

1. Introduction

- 1.1 This guide gives guidance on how the performance requirements on natural lighting and ventilation in buildings may be met.

2. Performance Requirements

- 2.1 The BA recognizes that a performance-based approach to the provision of natural lighting and ventilation in buildings is an acceptable alternative option in satisfying the health and safety requirements. The BA will accept a proposal meeting the following performance standards as an acceptable practice in fulfilling the requirements of B(P)Reg. 30, 31 & 32:

a) Natural Lighting

<i>Room of domestic building</i>	<i>Vertical Daylight Factor (VDF) (measurement taken on the centre of the window pane)</i>
Habitable Room	8%
Kitchen	4%

b) Natural Ventilation

<i>Room of domestic building</i>	<i>Air Change per Hour (ACH)</i>
Habitable Room	1.5 (natural means)
Kitchen	1.5 (natural means) plus 5 (mechanical means)

- 2.2 The performance standards are deemed to be met if it can be proved that the provision of window(s) meets the simplified test on natural lighting requirements stipulated in Part II and the ventilation requirements stipulated in Part III.
- 2.3 There are a number of assessment tools available in the market for assessment of the performance of lighting in buildings. Consideration for acceptance will be given if the validity and appropriateness of the tools are substantiated to the satisfaction of the BA. In this respect, guidance notes on validation are at Appendix B.

3. Interpretation

“Centre line of street” is half distance of the 2 opposite lot boundaries with a street in between.

“Cross ventilation” means the situation in which outdoor air can flow from the window opening(s) in the front half of the room (the primary opening),

through the room, and out via the other window opening(s) located in the rear half of the room (the secondary opening) which is not located on the same plane of the primary opening(s).

"Height of facade", when used in relation to the natural lighting and ventilation requirements, means the height of a building measured from the top of the window head at the lowermost storey in which the window is provided to the top of the parapet of the main roof of the building.

"Illuminance" means the amount of light falling on a surface.

"Open air" has the same meaning as defined in Regulation 2 of the B(P)Reg.

"Primary opening" means any window opening which is located in or within 1.5 m from end of the external wall where the window locates and satisfying the natural lighting requirements stipulated under the B(P)Reg or in Paragraph 2.1(a).

"Secondary opening" means any window opening which is located at an external wall, other than that defined for the primary opening, in the rear half of the room and facing open air.

"Vertical Daylight Factor" means the ratio in percentage of the total amount of illuminance falling onto a vertical surface of a building to the instantaneous horizontal illuminance from a complete hemisphere of sky excluding direct sunlight. It takes into account light coming from the sky directly and from reflected light of surrounding buildings and the ground both above and below the horizon.

"Window sill", when used in relation to the window for achieving natural lighting and ventilation, means the lowermost level of the glazing in the room for which the window is provided.

PART II

4. Provision of Natural Lighting

Whilst there are a number of assessment tools available in the market for assessment of the performance of lighting in buildings, the BA will accept the "Unobstructed Vision Area" method as a reliable way to demonstrate compliance with the performance requirements. For other assessment tools such as computer simulation software, consideration for acceptance will also be given if the validity and appropriateness of the tools proposed are substantiated to the satisfaction of the BA.

The Unobstructed Vision Area Method

4.2 The Unobstructed Vision Area (UVA) method is scientifically developed with respect to the following:

Daylight in Hong Kong

- a) The amount of light receivable at the surface of a building facade is related to the extent of its exposure to the natural environment. Most of the natural light for windows of lower floors in the dense, high-rise development comes from reflected light of the surrounding surfaces. The amount of this reflected light is dependent on how well these surrounding surfaces are illuminated (which are in turn dependent on both site and building layouts) and the reflectance of these surfaces.
- b) Moreover, most useful light entering the glazing into building interiors comes from a cone of light 100 degrees centered to the normal of the glazing.

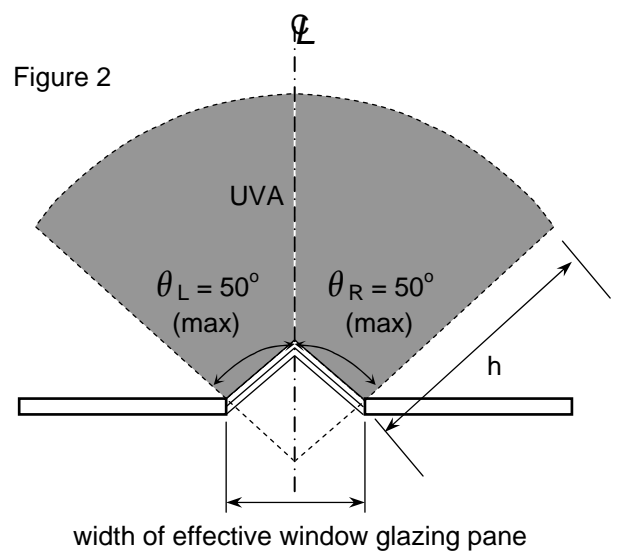
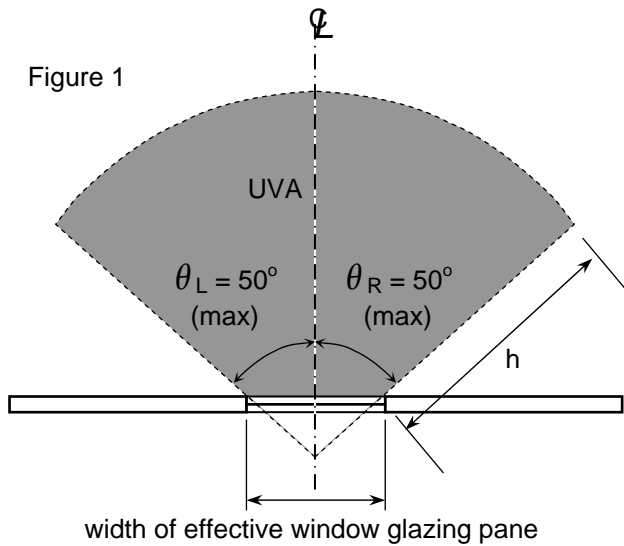
Simplified, Performance-based Method

- c) The above physical phenomena could be simplified and two-dimensionally proportioned to an aggregated horizontal open area (UVA) in front of the window that effectively contributes to the daylight performance. The higher the height of facade is, the larger the UVA is required.
- d) Larger glazing area could also be accounted for scientifically in the calculation of UVA requirement to allow further design flexibility.

4.3 The principles of the Unobstructed Vision Area Method are as follows:

- a) the unobstructed vision area of a window is the unobstructed area bounded by a cone with the horizontal angle measuring 100 degree up to both edges of the window glazing pane, symmetrical and perpendicular to the window plane (see Diagram A). For the purpose of measurement of the unobstructed vision area, the currently accepted amenity features including drying racks, small projecting air-conditioner platforms or hoods and window eaves protruding onto the unobstructed vision area may be disregarded if the size of these features is not excessive;
- b) the maximum length of the cone of the unobstructed vision area is equal to the height of facade in which the window is provided (see Diagram B);

Diagram A : Measurement of the cone of UVA from both edges of window pane



UVA = unobstructed vision area
 h = maximum length of the cone
 = height of facade
 $\theta = \theta_L + \theta_R = 100^\circ$

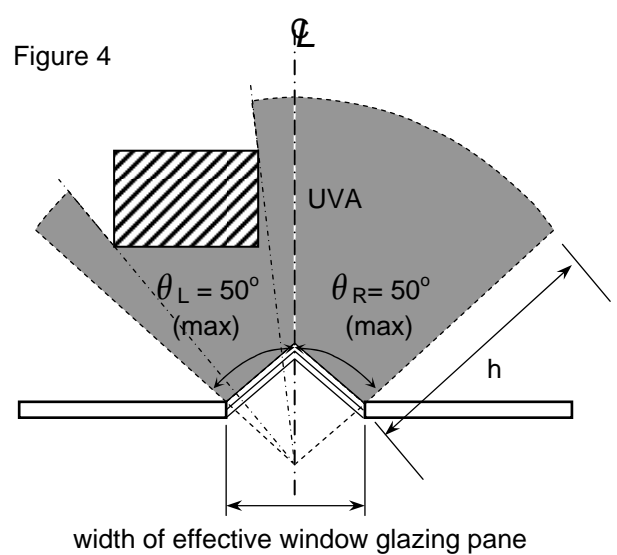
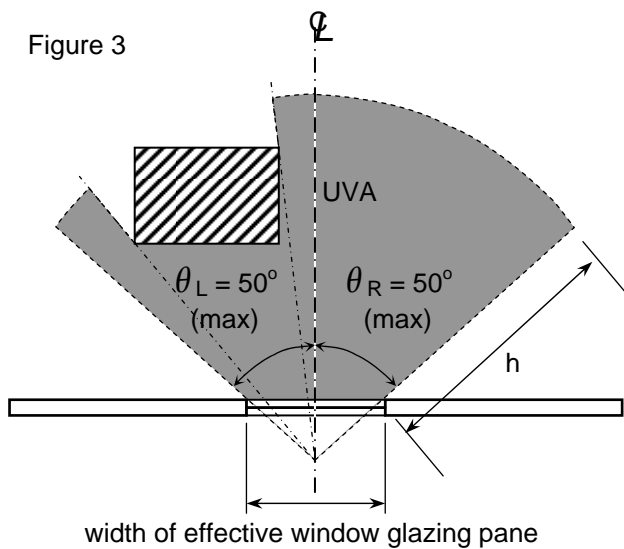
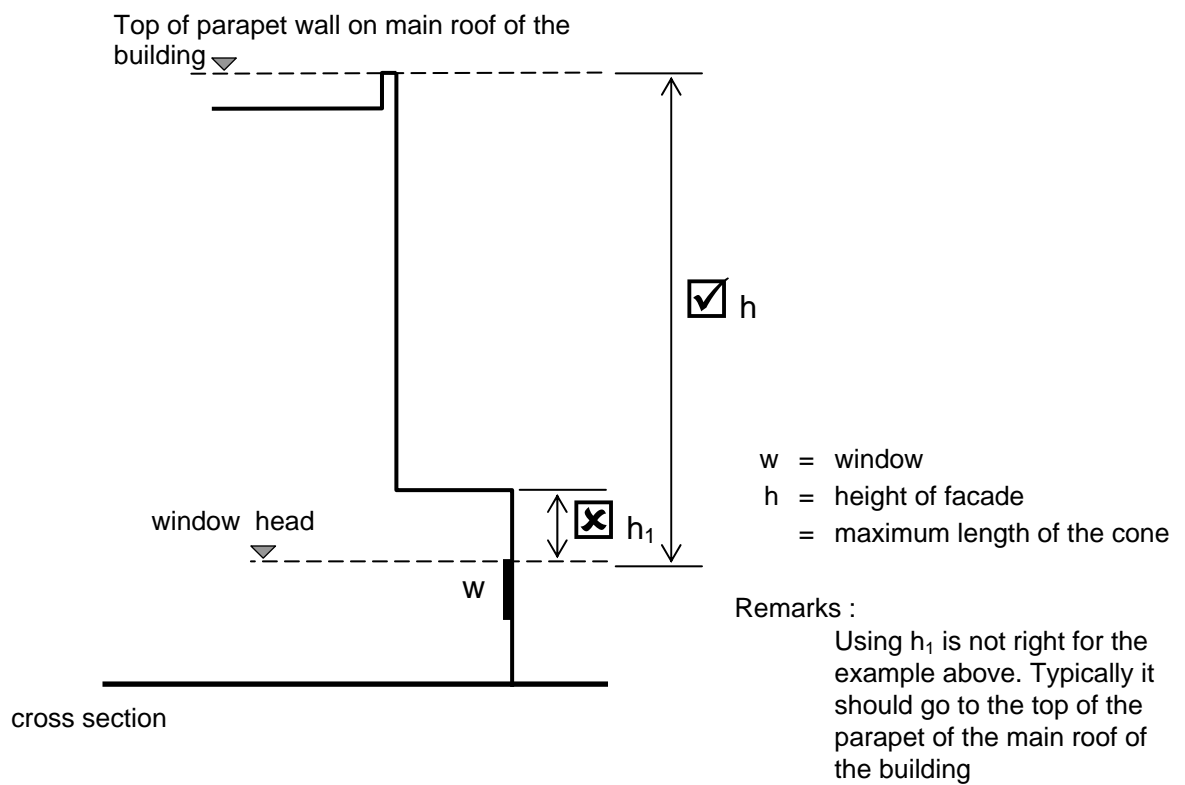
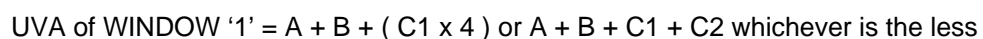


Figure 3 & 4 help to explain how the UVA is drawn when there is an obstruction

Diagram B : Measurement of height of facade and unobstructed vision area

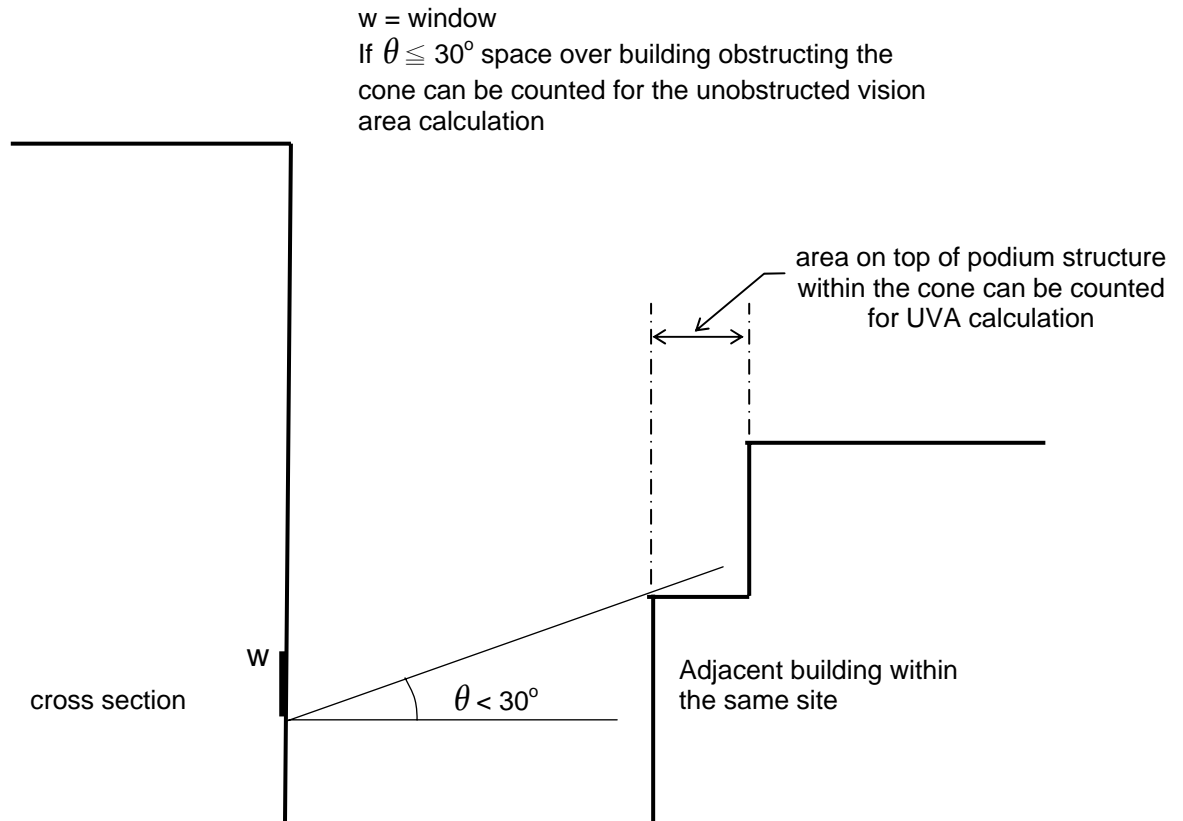


- Diagram C : Measurement of unobstructed vision area with the cone protruding beyond the site boundary



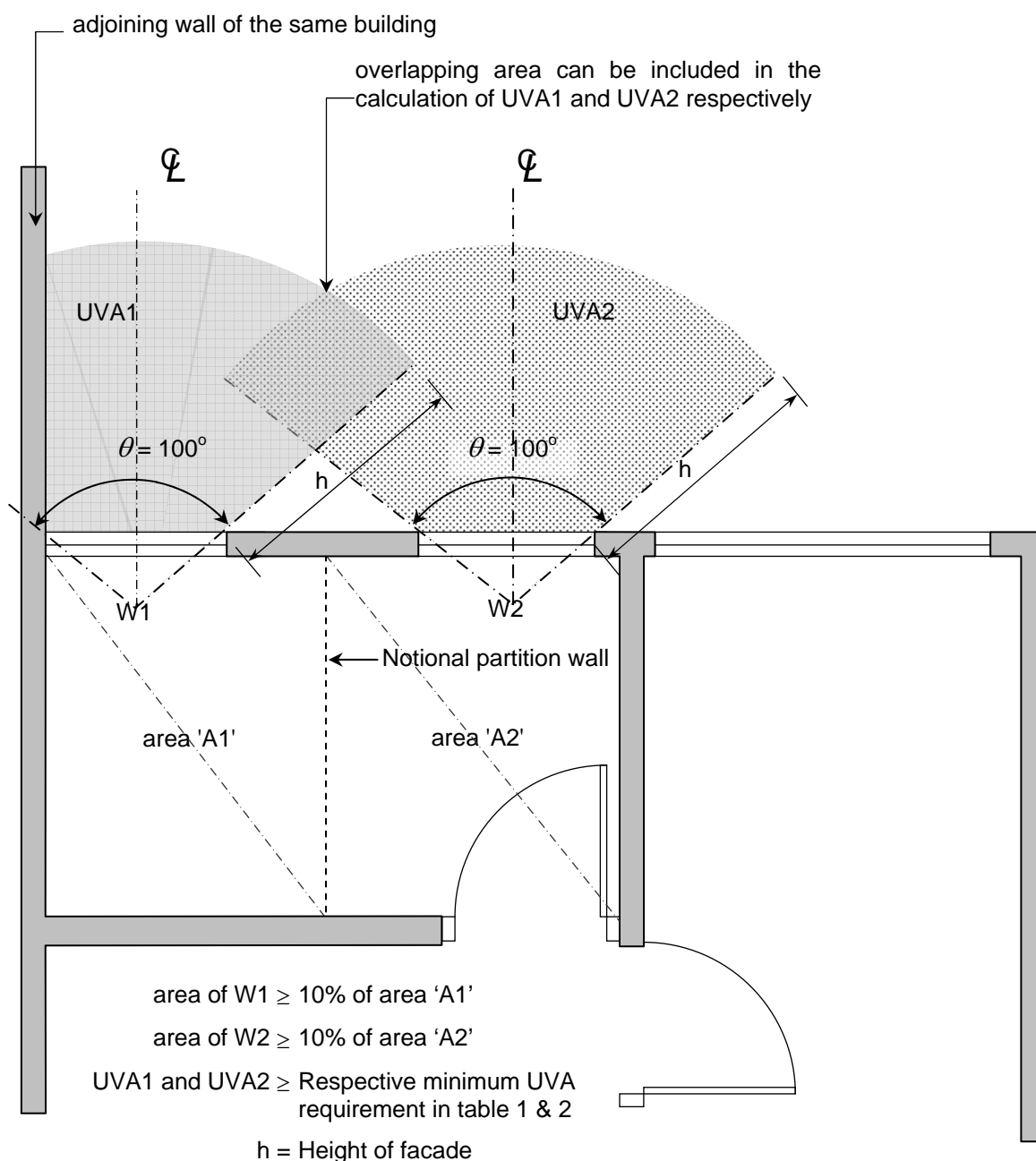
- e) where the highest point of the adjacent structure within the same site fronting the window does not sustain a vertical obstruction of more than 30 degree, the area on top of that structure within the cone may be counted for the calculation of the unobstructed vision area (see Diagram D); and

Diagram D : Measurement of unobstructed vision area on top of building obstructing the cone



- f) for a room requiring more than one window to comply with the minimum day-lighting requirement, the total room area can be considered as an amalgamation of subdivision rooms separated by notional partitions and each of which is provided with a window that satisfies the respective minimum day-lighting requirement corresponding to the area of each subdivision (see Diagram E).

Diagram E : Measurement of unobstructed vision area for a room requiring more than one window



4.4 No window in the building shall, for the purpose of paragraph 4.1, be counted for the calculation of unobstructed vision area unless-

- it faces into a space which is uncovered and not bounded on the side opposite the window by any obstruction of the building;
- the top of the window is at least 2m above the floor level; and
- the superficial area of glass in the window or the aggregate superficial area of glass in the windows (calculated from width of effective window glazing pane), as the case may be, shall not be less than 10% of the usable floor area of the room in which the window or windows are located.

- 4.5 Where the aggregate superficial area of glass in the window or windows (i.e. actual glazing area excluding window frames) is equal to 10%, 15% or 20% of the usable floor area of the room, the total unobstructed vision area shall not be less than the corresponding area shown in Table 1 and Table 2 according to respective use and the height of façade in which the window or windows is provided.

Table 1 Unobstructed Vision Area Requirement for Habitable Room (8% VDF)

Height of façade (m)	Minimum UVA (s.m.)		
	Glazing Area: 10% of UFA	Glazing Area: 15% of UFA	Glazing Area: 20% of UFA
10 or below	50	30	20
20	100	100	60
30	250	200	150
40	400	300	200
50	600	500	400
60	900	700	500
70	1,200	900	700
80	1,600	1,200	900
90	2,000	1,500	1,100
100	2,400	1,800	1,300
110	2,900	2,200	1,600
120	3,500	2,600	1,900
130	4,100	3,100	2,200
140	4,800	3,600	2,600
150	5,400	4,100	3,000
160	6,200	4,600	3,400
170	7,000	5,200	3,800
180	7,800	5,900	4,300
190	8,700	6,500	4,700
200 or above	9,600	7,200	5,200

Table 2 Unobstructed Vision Area Requirement for Domestic Kitchen (4% VDF)

Height of façade (m)	Minimum UVA (s.m.)		
	Glazing Area: 10% of UFA	Glazing Area: 15% of UFA	Glazing Area: 20% of UFA
10 or below	20	15	10
20	60	40	30
30	150	100	70
40	200	200	100
50	400	300	200
60	500	400	300
70	700	500	400
80	900	700	500
90	1,100	900	700
100	1,300	1,000	800
110	1,600	1,300	1,000
120	1,900	1,500	1,200
130	2,200	1,700	1,400
140	2,600	2,000	1,600
150	3,000	2,300	1,800
160	3,400	2,600	2,000
170	3,800	2,900	2,300
180	4,300	3,300	2,600
190	4,700	3,700	2,900
200 or above	5,200	4,000	3,200

Notes:

- (i) In the case of the height of façade lies within the ranges shown in the table, the unobstructed vision area should be derived from interpolation method.

- 4.6 Where the aggregate superficial area of glass in the window or windows lies within the range between 10% to 15% or 15% to 20% of the usable floor area of

the room, the Building Authority would accept interpolation of the area fallen within the range shown in Table 1 and Table 2 according to respective use. For the window area greater than 20% of the usable floor area of the room, the total unobstructed vision area shall not be less than the area required for 20% of the usable floor area of the room shown in Table 1 and Table 2, as the case may be.

PART III

5. Ventilation

5.1 The BA would accept a room used for habitation or as a kitchen to have met the performance standard of ventilation if the following conditions are satisfied:-

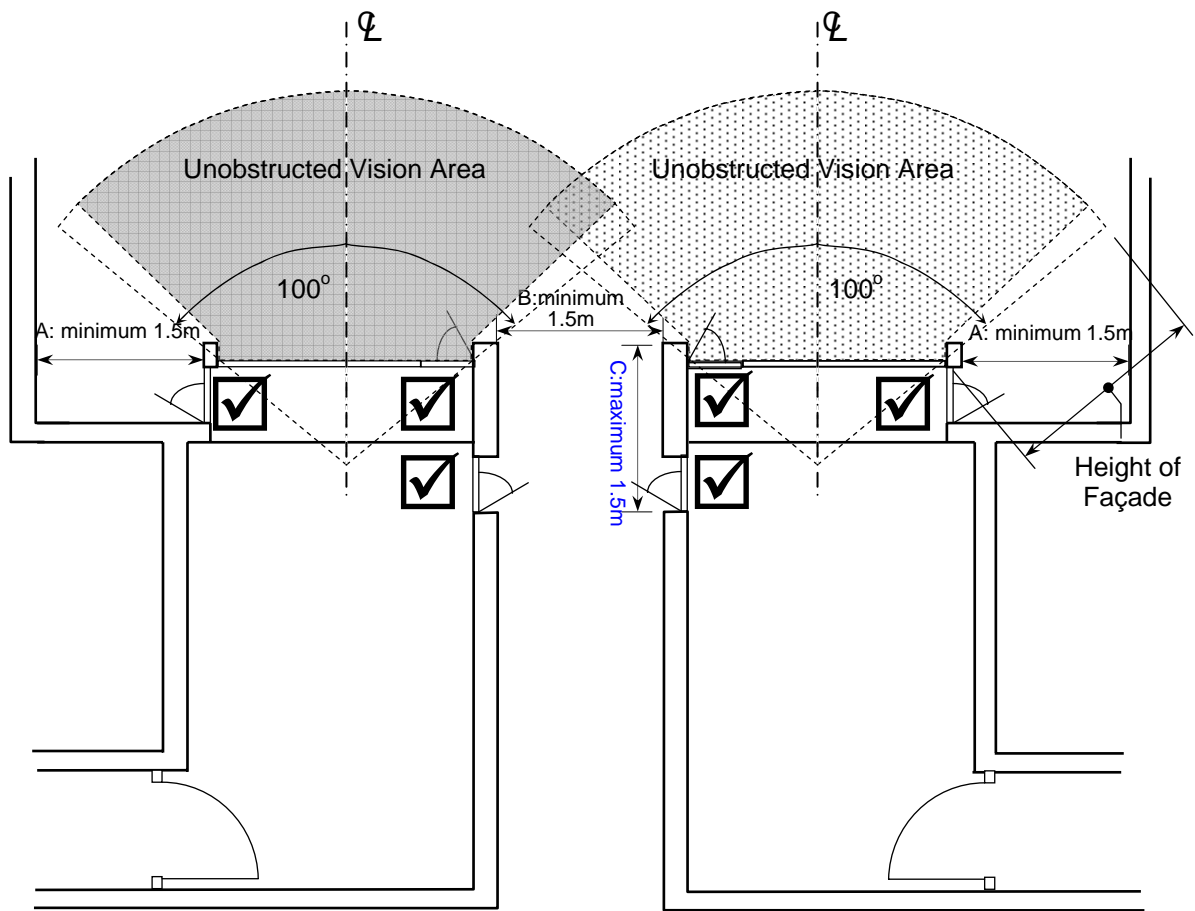
- a) The area of the primary opening(s) provided in the room is not less than one sixteenth of the usable floor area of the room;
- b) The primary opening(s) face into a clear and unobstructed area complying with at least the open air requirement; and
- c) in the case of kitchen, 5 ACH mechanical ventilation is provided in addition to the requirements in (a) and (b) above.

There are a number of assessment tools available in the market for assessment of the performance of ventilation in buildings such as Computational Fluid Dynamic (CFD) tools. Consideration for acceptance will be given if the validity and appropriateness of the tools are substantiated to the satisfaction of the BA.

5.2 For the purpose of assessing the sizes of the primary and secondary openings for ventilation, the effective area of the primary and secondary openings, irrespective of the height of the window head and window sill is counted.

5.3 The arrangement of window openings is illustrated in Diagram F

Diagram F : Openable window for ventilation



☑ = accountable as primary opening(s)

- aggregate size shall not be less than one-sixteenth of the usable floor area of the room

A : Minimum distance of a corner window from the external wall should be 1.5m

B : Minimum distance of a window from opposite external wall should be 1.5m

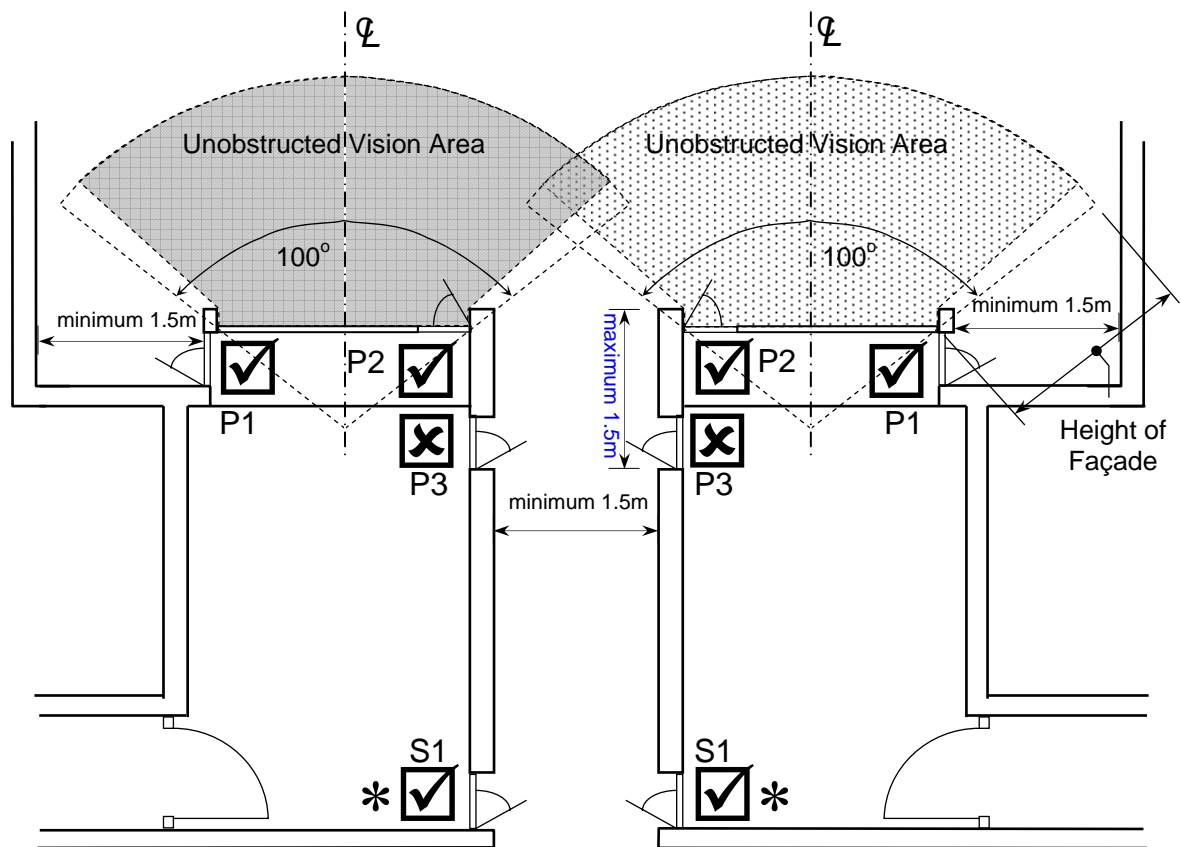
C : Maximum distance of any part of window should not be larger than 1.5m from end of the external wall

6. Cross Ventilation

6.1 Where cross ventilation is provided, the requirements on the openable area of the window and the restriction as set out in B(P)Reg. 32 on the depth of the room are relaxed as follows (see Diagram G):-

- the aggregate size of the primary opening(s) shall not be less than 2% of the usable floor area of the room;
- the aggregate size of the secondary opening(s) shall not be less than 2% of the usable floor area of the room; and
- the depth of the room from the primary opening may be extended to a maximum of 12 m.

Diagram G : Openable window for ventilation when cross-ventilation is provided



☑ = accountable as primary or secondary opening

☒ = not accountable as primary opening for the purpose of cross ventilation.

* = secondary opening(s) in rear half of the room accepted for the purpose of cross ventilation only when the primary opening(s) is not located on the same plane of the secondary opening(s).

- the respective aggregate sizes of the primary and secondary openings shall not be less than 2% of the usable floor area of the room.