Appendix A
(PNAP APP-130)

Simplified Assessment Method for Natural Lighting and Ventilation Requirements

Part I

1. Introduction

1.1 The performance standards stipulated in paragraph 1 of PNAP APP-130 are deemed to be met if it can be proved that the provision of windows meets the simplified assessment method on natural lighting requirements stipulated in Part II and the ventilation requirements stipulated in Part III below.

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

"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 Building (Planning) Regulations (B(P)Rs).

"Primary opening" means any window opening which satisfies the natural lighting requirements stipulated under the B(P)Rs or in paragraph 1(a) of PNAP APP-130 or any window opening locates in or within 1.5m from end of the external wall where the aforementioned window locates.

"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

3. Provision of Natural Lighting by Unobstructed Vision Area Method

3.1 The BA accepts the unobstructed vision area (UVA) method as a reliable way to demonstrate compliance with the performance requirements.

3.2 The UVA method is scientifically developed with respect to the daylight characteristics in Hong Kong as follows :-

(a) The amount of light receivable at the surface of a building facade is related to the extent of its exposure to the 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^{o} centered to the normal of the glazing.

(c) The above physical phenomena could be simplified as proportional to an aggregated horizontal open area (i.e. UVA) in front of the window that effectively contributes to the daylight performance and the height of facade. A higher height of facade will require a larger UVA.

(d) Larger glazing area could also be accounted for scientifically in the calculation of UVA requirement to allow further design flexibility.

3.3 The principles of the UVA method are as follows:

(a) the UVA of a window is the unobstructed area bounded by a cone with the horizontal angle measuring 100^{o} 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 UVA, the currently accepted amenity features including drying racks, small projecting air-conditioner platforms or hoods and window eaves protruding onto the UVA may be disregarded if the size of these features is not excessive;

(b) the maximum length of the cone of the UVA 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

Figure 1

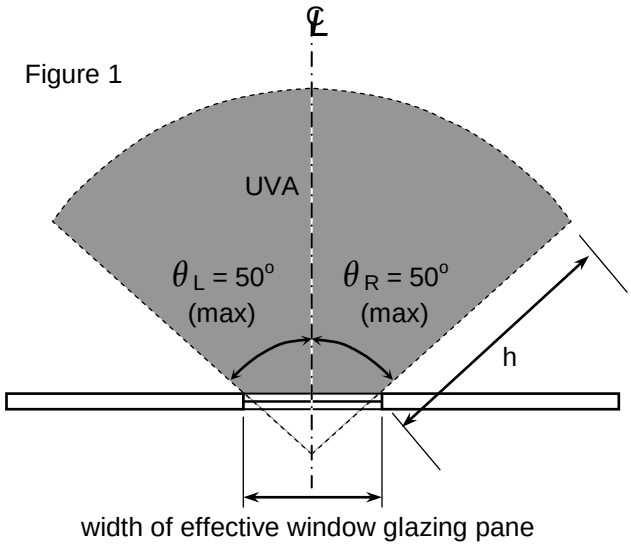
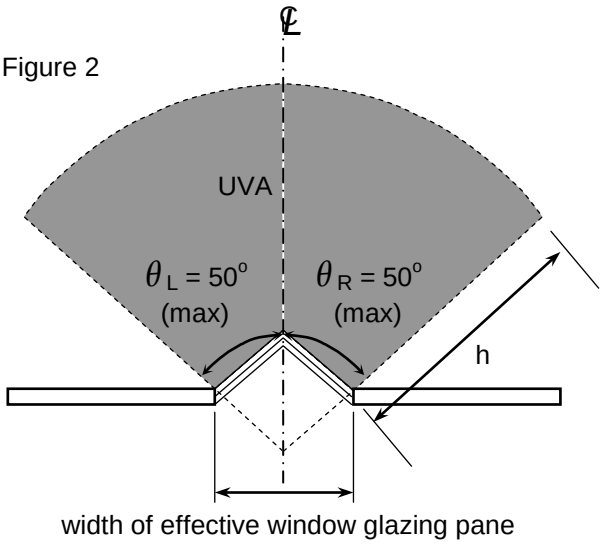


Figure 2



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

Figure 3

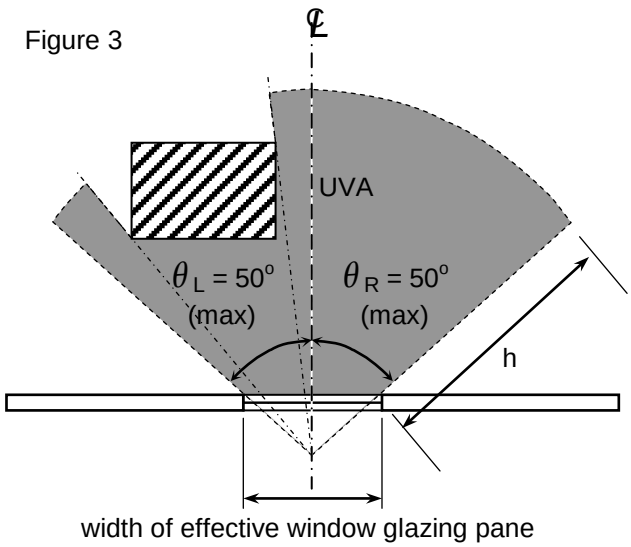
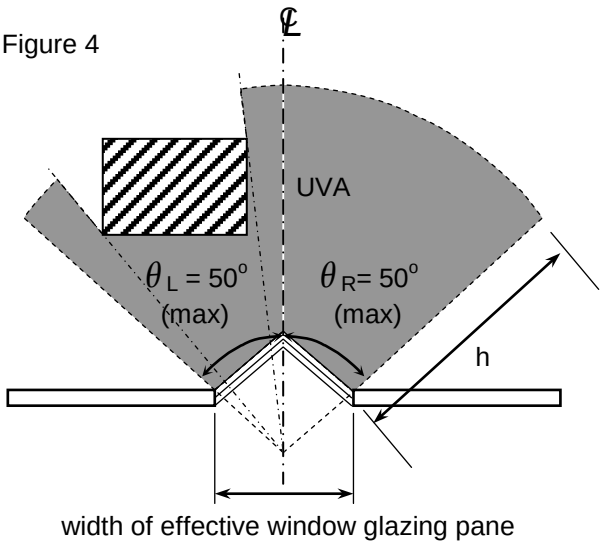
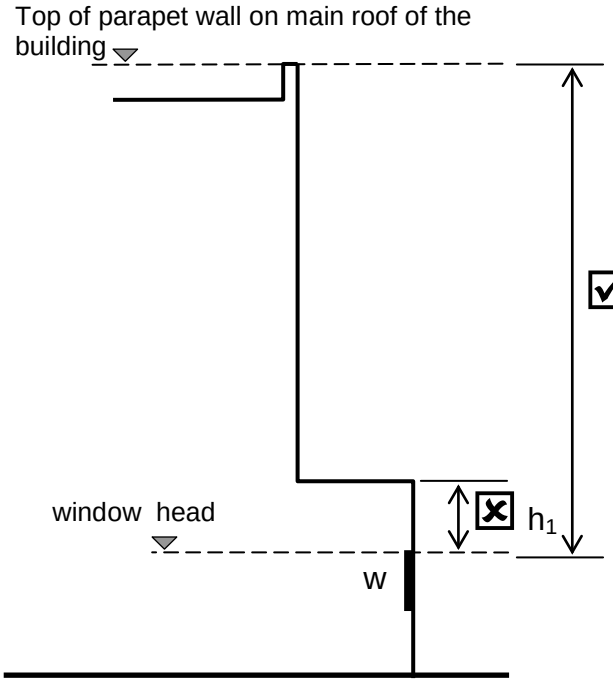


Figure 4



Figures 3 & 4 Measurement of UVA when there is an obstruction

Diagram B : Measurement of height of facade and UVA



w = window
h = height of facade
= maximum length of the cone

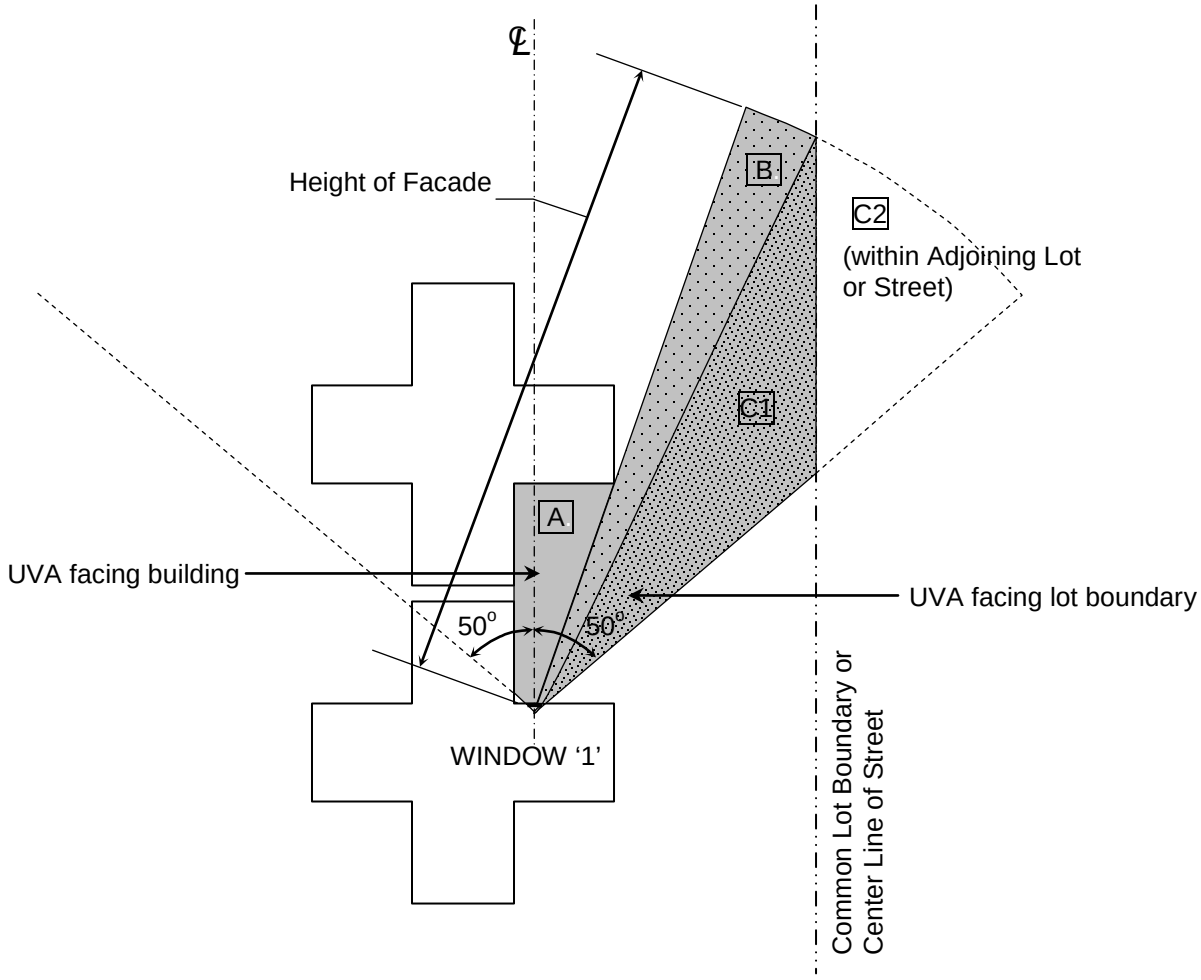
Remarks :

Using h_1 is not right for the example above. Typically it should go to the top of the parapet of the main roof of the building

(c) the UVA bounded by the cone shall be measured up to the lot boundary only unless such boundary adjoins a street in which case the full width of the street bounded by the cone may also be counted for the calculation of the UVA.

(d) where the UVA bounded by the cone protrudes beyond the common lot boundary or the centre line of the street as shown in Diagram C, a multiplying factor of 4 can be applied to this sector (i.e. C1) of cone but the resultant UVA should not in any case exceed the UVA of this sector of the cone that can be measured up to the height of the façade (i.e. C1 + C2).

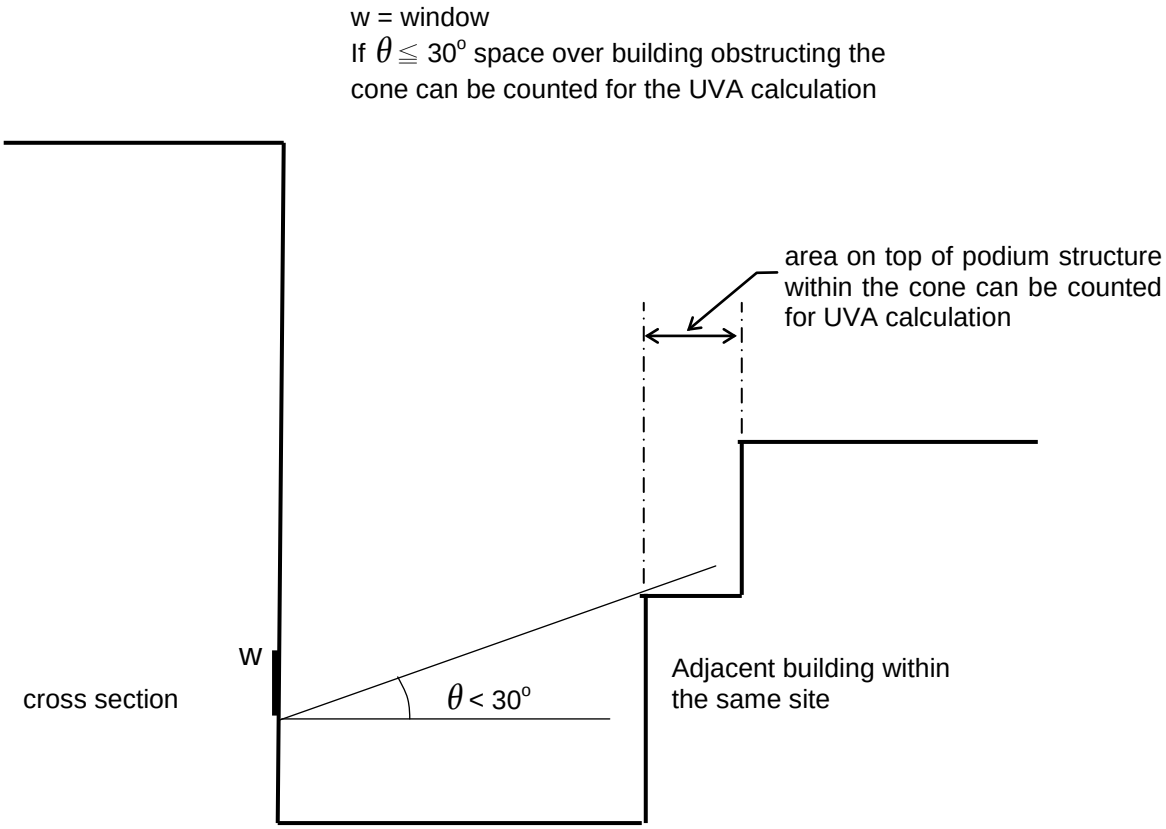
Diagram C : Measurement of UVA with the cone protruding beyond the site boundary



UVA of WINDOW '1' = A + B + (C1 x 4) or A + B + C1 + C2 whichever is the less

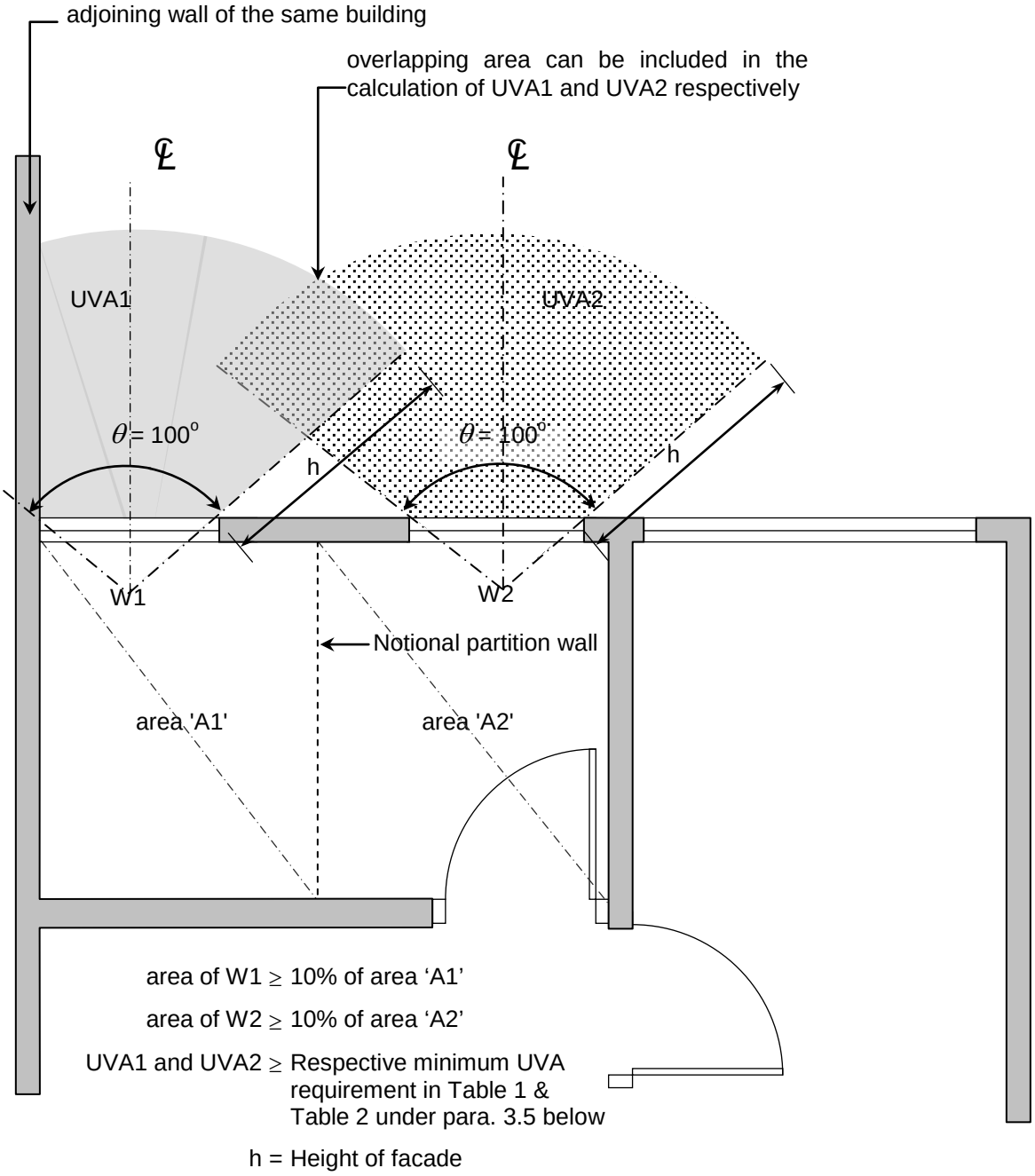
(e) where the highest point of the adjacent structure within the same site fronting the window does not sustain a vertical obstruction of more than 30°, the area on top of that structure within the cone may be counted for the calculation of the UVA (see Diagram D); and

Diagram D : Measurement of UVA 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 sub-divided 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 sub-divided room (see Diagram E).

Diagram E : Measurement of UVA for a room requiring more than one window



3.4 No window in the building shall, for the purpose of paragraph 3.1 above, be counted for the calculation of UVA unless-

(a) it faces into a space which is uncovered and not bounded on the side opposite the window by any obstruction of the building;

(b) the top of the window is at least 2m above the floor level; and

(c) 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 floor area of the room in which the window or windows are located.

3.5 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 floor area of the room, the total UVA shall not be less than the corresponding area shown in Table 1 and Table 2 according to respective use and the height of facade in which the window or windows is provided.

Table 1 UVA Requirement for Habitable Room (8% VDF)

Height of facade (m)	Minimum UVA (m^2)		
	Glazing Area : 10% of Floor Area of the Room	Glazing Area : 15% of Floor Area of the Room	Glazing Area: 20% of Floor Area of the Room
10 or below	50	30	20
20	100	80	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 UVA Requirement for Domestic Kitchen (4% VDF)

Height of facade (m)	Minimum UVA (m^2)		
	Glazing Area : 10% of Floor Area of the Room	Glazing Area : 15% of Floor Area of the Room	Glazing Area : 20% of Floor Area of the Room
10 or below	20	15	10
20	60	40	30
30	150	100	70
40	200	150	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

3.6 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 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 window area greater than 20% of the floor area of the room, the total UVA shall not be less than the area required for 20% of the floor area of the room shown in Table 1 and Table 2, as the case may be. If the height of facade lies within the ranges shown in the table, the UVA should be derived from interpolation method.

Part III

4. Ventilation

4.1 The BA accepts a room used for habitation or as a kitchen as shown in Diagram F to have met the performance standard of ventilation if the following conditions are satisfied:-

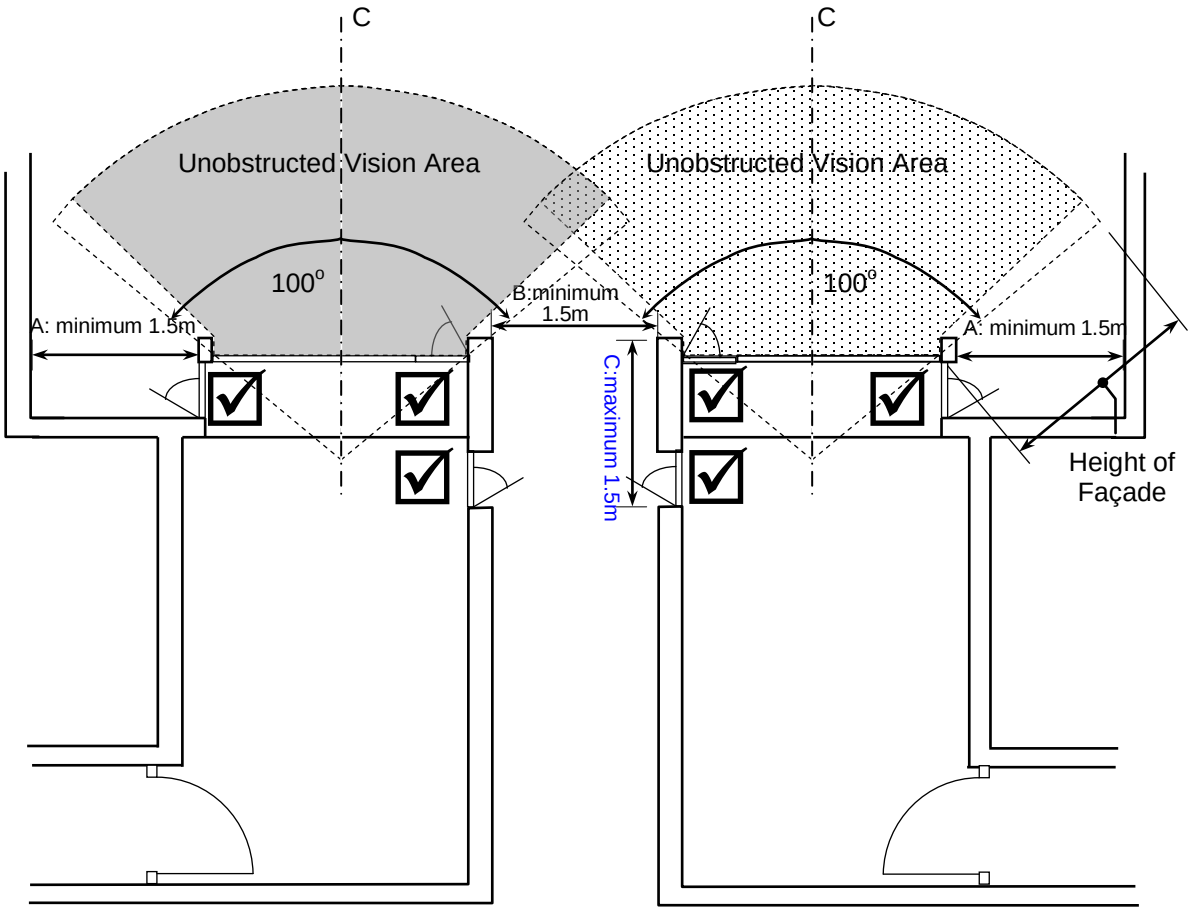
(a) The total area of the primary openings provided in the room is not less than 1/16 of the floor area of the room;

(b) The primary openings face into a clear and unobstructed area complying with at least the open air requirement; and

(c) In the case of a kitchen, 5 ACH mechanical ventilation is provided in addition to the requirements in (a) and (b) above.

4.2 For the purpose of assessing the sizes of the primary and secondary openings for ventilation in paragraphs 4.1 above and 5.1 below, the effective area of the primary and secondary openings, irrespective of the height of the window head and window sill is counted.

Diagram F : Openable window for ventilation



☑ = accountable as primary openings - aggregate size shall not be less than 1/16 of the 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 be 1.5m from end of the external wall

5. Cross Ventilation

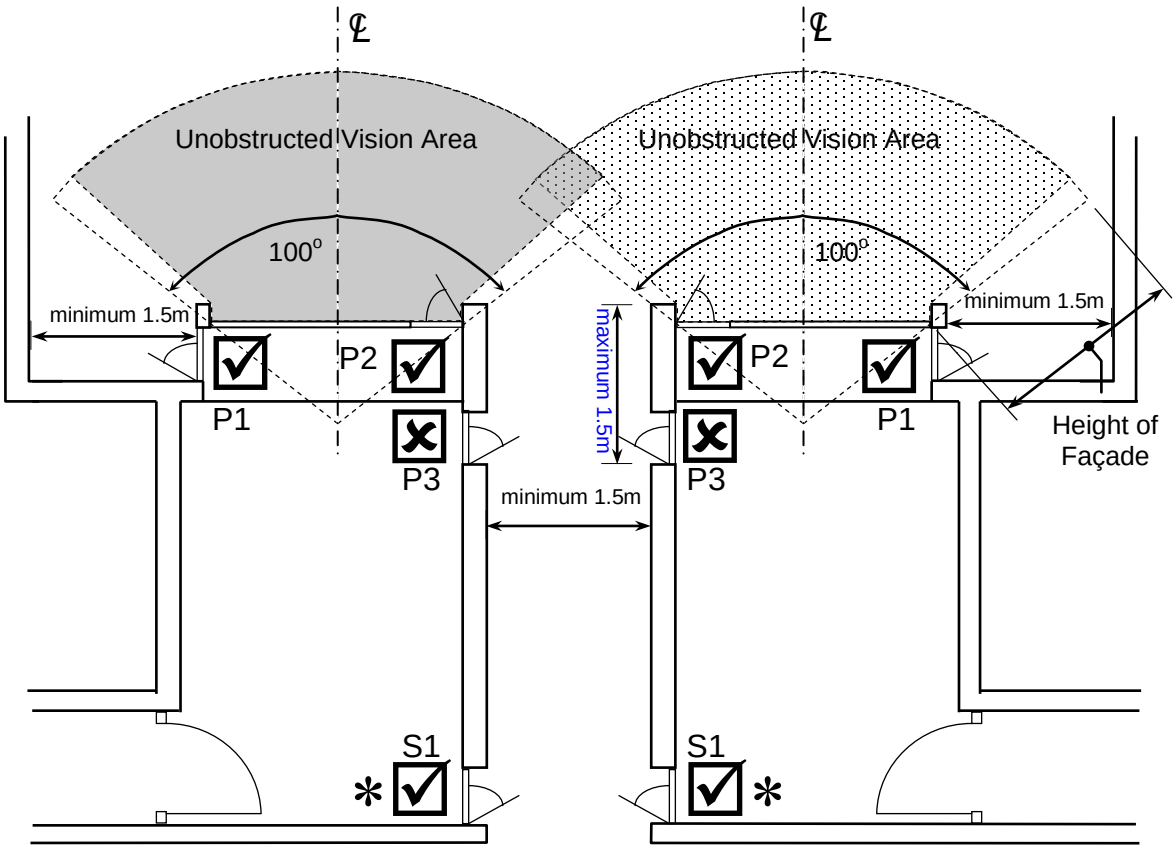
5.1 Where cross ventilation is provided as shown in Diagram G, the requirements on the openable area of the window and the restriction as set out in regulation 32 of the B(P)R on the depth of the room are relaxed as follows:-

(a) the aggregate size of the primary openings shall not be less than 2% of the floor area of the room;

(b) the aggregate size of the secondary openings shall not be less than 2% of the floor area of the room; and

(c) the depth of the room from the primary opening may be extended to a maximum of 12m.

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 openings in rear half of the room accepted for the purpose of cross ventilation only when the primary openings is not located on the same plane of the secondary openings.

6. Acoustic Windows

6.1 For a primary or secondary opening with an acoustic "double glazing" window[1] comprising an outer openable window and an inner sliding glass panel designed for the dual purposes of natural ventilation under the B(P)Rs and noise reduction as shown in Diagrams H and I, its openable window area can be taken as 90% of the cross-sectional area of the air gap between the two panes of glass for the purposes of regulations 30 and 31 of the B(P)Rs and Part III of this Appendix if the window meets the following parameters:-

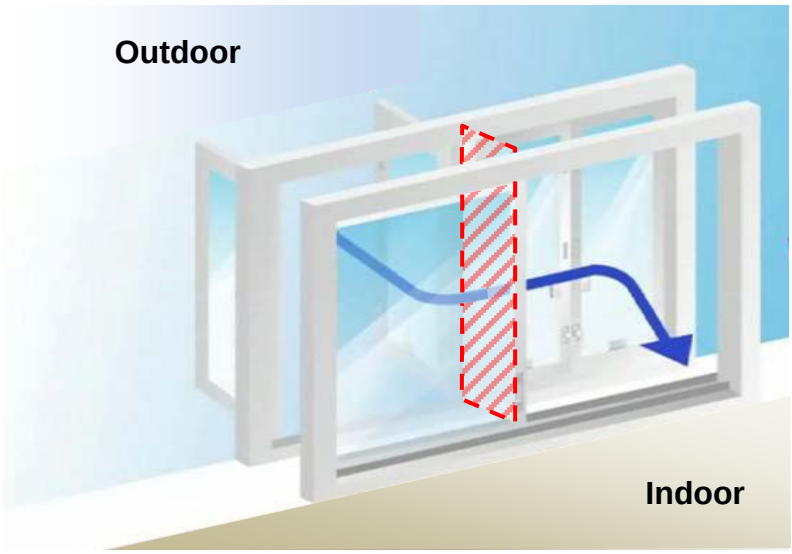
(a) the width of the air gap is between 100mm to 175mm;

(b) the length of the air gap is not less than 100mm;

(c) the outer openable window satisfies the natural lighting requirements stipulated under the B(P)Rs or in paragraph 1(a) of PNAP APP-130; and

(d) the openable area of the outer openable window is not less than the cross-sectional area of the air gap.

Diagram H : Acoustic window designed for the dual purposes of natural ventilation under the B(P)R and noise reduction

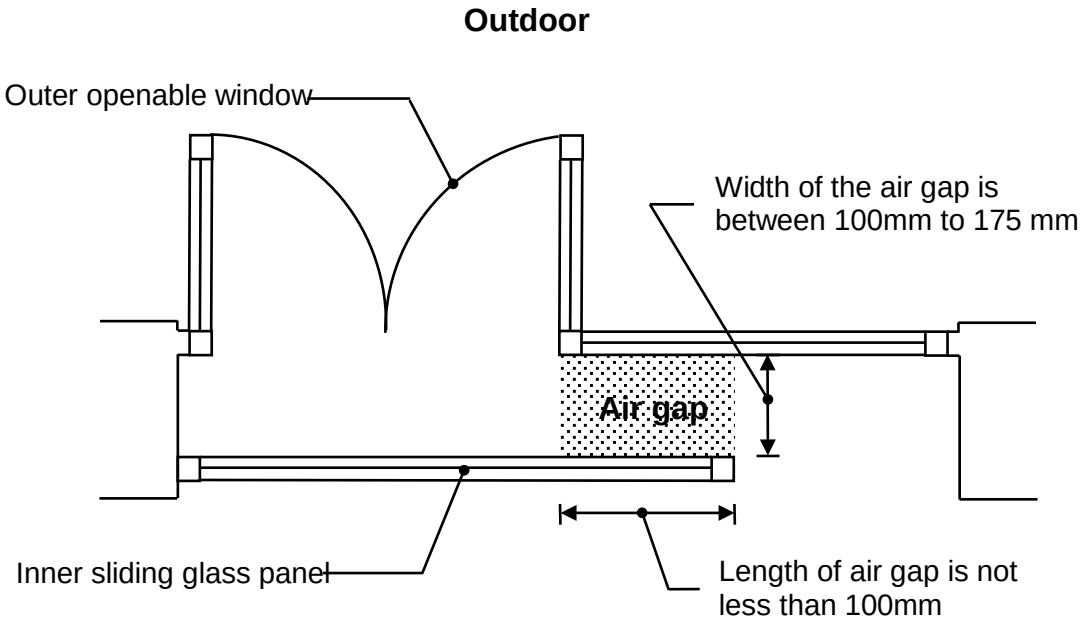


Wind direction

Cross-sectional area of the air gap

[1] This type of window has an inner sliding glass panel behind an openable window for creating an air gap for the supply of fresh air with noise mitigation effect. To optimise the noise reduction function, the sliding glass panel will be slid open only for maintenance, repair, opening or closing the outer window.

Diagram I : Air gap of an acoustic window



PLAN (NOT TO SCALE)

(Rev. 2/2015)