

Sustainable Building Design Guidelines

This practice note promulgates guidelines on building design which will enhance the quality and sustainability of the built environment in Hong Kong. These guidelines are the Sustainable Building Design Guidelines (SBD Guidelines) referred to in Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAP) APP-151, the compliance with which the Building Authority (BA) will take into account, where applicable, as a pre-requisite in exempting or disregarding green and amenity features and non-mandatory / non-essential plant rooms and services from gross floor area and/or site coverage calculations (GFA concessions) for new building developments. Terminology and definitions of terms used in the SBD Guidelines are listed in Appendix A.

Objectives

2. In the SBD Guidelines, 3 key building design elements to enhance the environmental sustainability of our living space are identified. They are building separation, building set back and site coverage of greenery. The objectives are to achieve better air ventilation, enhance the environmental quality of our living space, particularly at pedestrian level, provide more greenery and mitigate the heat island effect.

Application of the SBD Guidelines

3. It is recognized that compliance with the SBD Guidelines on building separation, building set back and site coverage of greenery may have been imposed in the lease conditions of new land sale sites or lease modifications or land exchanges or private treaty grants, or incorporated in some planning proposals submitted to the Town Planning Board or imposed as conditions in the planning approvals. During building plan submission stage, the BA will take into account the compliance with the SBD Guidelines, where applicable, when granting GFA concessions in new building developments. Further details on the prerequisites for granting GFA concessions are set out in PNAP APP-151.

Building Separation

4. In order to improve air ventilation, enhance the environmental quality at pedestrian level and mitigate heat island effect arising from the undesirable walling effect of “long buildings”, buildings in large development sites should be separated by intervening spaces.

5. Subject to paragraphs 8 to 11 below and the detailed requirements in Appendix B, for sites that are two hectares or above, or for sites that are less than two hectares and proposed with any building or any group of buildings having a continuous projected façade length¹ (Lp) of 60m or above, buildings thereon shall comply with the building separation requirement such that:

- (a) the individual Lp of any building or any group of buildings that abuts a street² shall not exceed the maximum permissible Lp;
- (b) when projected onto the chosen projection planes, the separating distance between the projected façade(s) of the building(s) and the site boundaries or the centreline of adjoining streets shall not be less than 7.5m; and the permeability³ (P) of the buildings on one projection plane shall not be less than 20% and onto the other projection plane shall not be less than 20%, 25% or 33.3%⁴, depending on the site area and the height of the tallest building, in accordance with Table 1.

Height ⁵ (H) of the tallest building	Permeability (P) of Buildings	
	Site area < 20,000 m ² and with building(s) of Lp ≥ 60m long	Site area ≥ 20,000 m ² (regardless of the length of buildings)
H ≤ 60m	20%; 20%	20%; 25%
H > 60m	20%; 20%	20%; 33.3%

Table 1 - Minimum permeability (P) of buildings.

6. Detailed requirements and method of measurement are given in Appendix B. A sample case is given in Appendix C. Any covered areas providing permeability of the buildings will be accountable for GFA and/or site coverage, except where exempted or disregarded if they satisfy the requirements stipulated in the relevant PNAP or Joint Practice Notes (JPN).

7. Subject to paragraphs 8 to 11 below, the building separation requirement shall be met in each of the following assessment zones:

Vertical division	Height ⁵
• Low Zone	0 – 20m
• Middle Zone	20 – 60m
• High Zone	Above 60m

/ 8 ...

¹ See Appendix A for definition and Figures 2 and 3 of Appendix B for illustration

² Street has the same meaning as that given in Regulation 18A(3)(a)(i) & (ii) of the Building (Planning) Regulations (B(P)R)

³ See Appendix A for definition.

⁴ The plane with the higher permeability should preferably be set perpendicular to the summer prevailing wind direction with plus or minus 30 degree flexibility or existing street pattern. At the present stage, characteristic natural wind availability data of the site may be simulated using wind tunnel and topographical models and/or computer simulations as appropriate.

⁵ Height of a building has the same meaning as that given in B(P)R23(1).

8. The building separation requirement at the low zone may be waived if:
- (a) the site coverage for the building(s) including any podium above ground level does not exceed 60%, 62.5% or 65% of the area of the site for a Class A, Class B or Class C site⁶ respectively; and
 - (b) the full height of the building(s) is set back from the site boundary abutting on a street; the total frontage of such set back is not less than 50% of the length of the site boundary that abuts on a street and not less than 10m long or the full frontage for site with frontage less than 10m in length; and the total area of such set back(s) is not less than 15% of the area of the site.
9. For buildings that are served by surrounding pedestrian networks at an elevated level rather than at grade, justification may be made to demonstrate that the air ventilation performance for the building portion below such raised pedestrian level will not cause any material concerns to any sensitive users in general. Subject to the special circumstances of each case, the BA may exempt the portion of building below such raised pedestrian level from the building separation requirement.
10. The building separation requirement is not applicable to domestic developments comprising buildings of height not exceeding 15 meters or not more than four storeys. For sites comprising buildings with mixed uses and/or varying building heights, domestic buildings of height not exceeding 15 meters or not more than four storeys can be disregarded in the building separation assessment, provided that these domestic buildings are not connected to the other buildings.
11. It is recognized that certain buildings with special functional requirements in building length and/or bulk e.g. infrastructural facilities, transport terminus, sports and civic facilities, may not be able to comply with the building separation requirements. The BA may consider exempting such special facilities from the building separation requirement if the following compensatory measures are provided:
- (a) According to the methodology and requirements as stipulated under the category of Microclimate Around Buildings (S_A8) of the BEAM Plus⁷ certification, an Air Ventilation Assessment (AVA) by wind tunnel or Computational Fluid Dynamics (CFD) has been conducted to demonstrate that the optimal design option has been selected in comparing with different design options; and either one of the following three requirements under the aforesaid category of the BEAM Plus certification has also been complied with and all results of which are considered acceptable by the BA;
 - (i) On wind amplification / stagnant air – demonstrating that no pedestrian areas will be subject to excessive wind speeds and there are no stagnant areas not flushed by breezes;
 - (ii) ...

⁶ Site classification has the same meaning as that given in B(P)R18A

⁷ HKGBC and BEAM Society. BEAM Plus for New Buildings.

<http://hkgbc.org.hk/upload/beamdocuments/beamplusdoc/BEAM-Plus-1-1-NB.pdf>

- (ii) On elevated temperatures – providing shade; or
 - (iii) On elevated temperatures – providing high emissivity roofing material or vegetation roof.
- (b) Building features such as additional building set back, stepped profile of the podium from the adjoining streets and communal podium garden to separate the podium from the tower above and to promote air flow at pedestrian level, etc. have been considered in the assessment described in item (a) above and incorporated in the optimal option, where appropriate; and
- (c) Building separation requirement is fully complied with for other buildings on the same site or other parts of the building that are located above such special facilities, where applicable.

Building Set Back

12 In order to improve air ventilation, enhance the environmental quality at pedestrian level and mitigate deep street canyon effect, buildings abutting a narrow street less than 15m wide shall be set back.

13 Building set back should allow the flow of air volume with a minimum sectional area of 15m x 15m along the street. Where the level of the street varies, the minimum sectional area of set back shall follow the profile of the street. Subject to paragraphs 15 and 16 below, a building abutting on any narrow street less than 15m wide should be set back to comply with one of the following requirements: -

- (a) No part of the building, up to a level of 15m above the street level, shall be within 7.5m from the centreline of the street as shown in figure 1 of Appendix D; or
- (b) Where a communal podium garden is provided, the building abutting on the street shall comply with the following requirements:
 - (i) no part of the building, upto a level of 15m above the street level, shall protrude above the 45 degrees inclined plane, the base of which is placed at street level at the boundary line of the lot on the opposite side of the street as shown in figures 2 and 3 of Appendix D; and
 - (ii) such communal podium garden shall comply with the height, openness, size and greenery area requirements as stipulated in paragraph 1(d) of Appendix A to JPN1, to enhance air flow to reach the street.

14. In determining the compliance with the set back requirement, the BA may take into account the following factors where applicable: -

/(a) ...

- (a) Structures at levels higher than 15m above the street level may be allowed to project over the set back area. The set back area at ground level under the footprint of such structures may be exempted from GFA calculation if it is designated as common areas accessible by all occupants of the building and without any commercial activities. Where the covered area is not designated as common areas but complies with the height and width requirements as stipulated in paragraph 6 of PNAP APP-19, the covered area may not be accountable for GFA;
 - (b) Minor projecting features as described in paragraph 3(a) and (d) to (g) of PNAP APP-19; signboards projecting not more than 600mm from the external walls and at a clear height of not less than 2.5m above the street level; and single storey footbridges that are open on both sides and provided with perforated railing, may be permitted within the set back area. If the set back area is uncovered, a canopy that complies with the projection and height limits stipulated in Regulation 10 of the B(P)R may also be permitted. For the covered areas under the canopy, the criteria for exemption from GFA or not being accountable for GFA as stipulated in item (a) above are also applicable;
 - (c) Structural columns supporting the tower above may be permitted within the set back area provided that any resultant clear space between the columns and/or between the column and other parts of the building is not less than 3m and, where the building is set back in accordance with paragraph 13(a) above, the minimum sectional area for building set back shall not be less than 112.5 m² (i.e. the same as the required building set back sectional area of 7.5m x 15m);
 - (d) Subject to item (f) below, the set back area should be properly landscaped and/or paved, and be open and without any permanent building structures other than landscaped features, perforated balustrades, perforated boundary walls⁸ and/or structural columns as described in item (c) above;
 - (e) There will be satisfactory arrangements for the management and maintenance of the set back area and any resultant flat roofs and covered areas; and
 - (f) The part of the set back area that forms the means of escape from or access to the building shall be properly paved, unobstructed and lead directly to a street.
15. Where the set back of the building in accordance with paragraph 13(a) above will result in a set back area of more than 15% of the area of the site, requirement for building set back may be relaxed if the following compensatory measures are provided : -

- (a) Full height and full frontage set back of the building from the site boundary abutting on the narrow street(s) by an area which is not less than 15% of the area of the site; and

/(b) ...

⁸

The set back area shall be so designed to provide high degree of visual connectivity and openness fronting the street

- (b) For small sites not exceeding 1,000 m², greenery should be provided at the pedestrian zone such that the greenery area is not less than 50% of the set back area. For other sites, site coverage of greenery to be provided at the pedestrian zone should be increased by 5 % of the area of the site in addition to the respective requirements as stated in paragraph 18 below. For the avoidance of doubt, the required **total** greenery areas as stated in paragraph 18 below remains the same and all greenery areas shall comply with the requirements in paragraph 19 below.

16. Taking into account the genuine need to improve air ventilation at pedestrian level, development sites meeting the following criteria may be exempted from whole or parts of the building set back requirement: -

- (a) Where the height of the building⁹ is less than 2 times the mean width of the street; or
- (b) Where there are special constraint rendering the building set back requirement undesirable and that other parts of the proposed building not affected by the special constraints will comply with the building set back requirements.

17. For the avoidance of doubt, non-building area and set back area required under the OZP or lease conditions, area dedicated for public passage or surrendered for street widening at street level under B(P)R 22 and set back area provided under PNAP APP-132 facing the subject narrow street may form part or whole of the set back area required under this PNAP provided that the criteria as stated in paragraphs 13 to 15 above are complied with where applicable.

Site Coverage of Greenery

18. In order to improve the environmental quality of the urban space, particularly at the pedestrian level and to mitigate the heat island effect, new building developments with site areas of 1,000 m² or more, shall be provided with greenery areas¹⁰ at the pedestrian zone, communal podium roof / flat roof / main roof, slope and retaining structure, where appropriate, to meet the minimum site coverage of greenery as specified in Table 2 below.

Site Area (A)	Minimum Site Coverage of Greenery (i.e. percentage of greenery area over site area)		
	Pedestrian zone	Other locations	Total greenery areas
$1,000 \text{ m}^2 \leq A < 20,000 \text{ m}^2$	10%	no limit	20%
$A \geq 20,000 \text{ m}^2$	15%	no limit	30%

Table 2 Site coverage of greenery requirement

19. In determining the compliance with the greenery requirement, the BA may take into account the following factors where applicable :-

/(a) ...

⁹ Under this criterion, height of the building is measured from the mean level of the street on which the building abuts to the mean height of the roof over the highest usable floor space in the building.

¹⁰ See Appendix A for definitions.

- (a) Greenery areas shall be uncovered¹¹ except at the pedestrian zone where they may be covered under projecting features, provided that the clear height of the projecting features above the covered area is not less than 8 times the horizontal width of the covered area as shown in Appendix E;
- (b) While trees, larger size vegetation and horizontal greenery are preferred, features that may improve the micro-climate such as water features¹², grass paver, vertical greening and landscape-treated slopes / retaining structures may also be accepted for computing not more than 30% of the total required greenery areas, as detailed in Appendix F;
- (c) Subject to paragraph 20 below, all greenery areas are designated as common areas accessible by all occupants of the building except vertical greening and greenery on slopes and retaining structures need not be accessible by all occupants;
- (d) Where greenery is provided on the roof, the roof shall be of impervious construction and the calculation of the minimum imposed load on the roof shall also take into account the anticipated loads of the soil, plants, trees, etc. in the design; and
- (e) Irrigation point(s) and drainage provision shall be provided to facilitate future maintenance¹³.

20. For a development that comprises a single family house only, the restriction on the location of greenery as given in Table 2 and paragraph 19(c) above will not be applicable.

21. There are different types of green roof systems and reference can be made to the “Study on Green Roof Application in Hong Kong Final Report” accessible from the website of the Development Bureau at http://www.devb.gov.hk/filemanager/en/content_29/Green%20roof%20study_final%20report.pdf.

Approval Conditions

22. PNAP APP-151 specifies the compliance with the SBD guidelines as one of the pre-requisites for granting GFA concessions. When granting such modifications under section 42 of the Buildings Ordinance, the BA may impose the following conditions: -

/(a) ...

¹¹ For the avoidance of doubt, covered greenery above the pedestrian zone such as in covered communal podium garden or sky garden shall be excluded from the greenery area calculation.

¹² Water filtration plant room for water feature if so provided, may be exempted from GFA subject to compliance with the pre-requisites and the overall GFA cap on GFA concessions stipulated in PNAP APP-151.

¹³ A maintenance and management manual for the greenery to be made available for the end-users can help safeguard public hygiene and safety of the greenery areas.

- (a) The greenery areas shall not be used for any other purpose without the prior consent of the Building Authority.
- (b) The restriction on the use as stated in item (a) above and the greenery areas to be designated as common areas shall be incorporated into the Deed of Mutual Covenant (DMC) with details of their size (in area), locations and the common access thereto clearly indicated on a plan(s). Where no DMC is to be in force, such restriction and designation shall be incorporated into the Sales and Purchase Agreement, Assignment or Tenancy Agreement.
- (c) The letter of undertaking for complying with the requirements as stated in items (a) and (b) above, submitted by the developer or owner in support of the application for GFA concessions shall be registered in the Land Registry before applying for the occupation permit.

Information and Documents to be Submitted

23. To demonstrate compliance with the building separation, building set back and site coverage of greenery requirements, information as detailed in Appendix G and such other information as may be required by the BA should be provided.

24. If a performance-based design alternative is proposed for demonstrating compliance with the building separation requirements, additional information as detailed in Appendix B should be provided for consideration. Any alternative design proposals and applications for exemption or modification of the building separation, building set back and site coverage of greenery requirements shall be supported by justifications. Such proposals and applications may be examined by the expanded Building Committee (BC) composing of external experts in the relevant fields. The BA may take into account recommendations from the BC and any other relevant considerations in determining acceptance of the proposal.

Disclosure for Public Information

25. To increase the transparency of information to the public, the following information may be uploaded onto the BD website after the issuance of the occupation permit : -

- (a) Building plans showing the greenery areas together with the access thereto which shall be designated as common areas, and a schedule of such areas.

26. For ease of reference and to facilitate review of the AVA requirements, AVA submitted to BD as part of the above submission will be included in the AVA Register maintained by the Planning Department (PlanD) (format of the AVA register is attached in Appendix H)¹⁴. AP is requested to seek consent from the owners to release the information contained in the AVA proforma and /or the AVA reports for public inspection. For projects which cannot be disclosed to the public due to confidentiality or consent from owners has not been given, the information would be kept solely for the government's internal reference.

Implementation

27. This practice note is applicable to all new building plans or major revision of building plans for development proposals submitted to the BA for approval on or after 1 April 2011. For the avoidance of doubt, subject to paragraph 28 below, this practice note is also applicable to building plans which have been previously disapproved and are resubmitted for approval on or after 1 April 2011.

28. For building plans which have been firstly submitted on or before 31 March 2011 and subsequently disapproved by the BA but not on ground relating to proof of ownership or realistic prospect of control of the land forming the site, the first resubmission of such plans to the BA on or after 1 April 2011, which is submitted within 6 months from the date of disapproval of the firstly submitted plans, would not be subject to the requirements of this practice note. For the avoidance of doubt, if such first resubmission of plans eventually has been disapproved by the BA, any further resubmission of the plans would be subject to the requirements of this practice note.



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¹⁴ HPLB TECHNICAL CIRCULAR NO. 1/06, Air Ventilation Assessments at http://www.devb.gov.hk/filemanager/en/content_679/hplb-etwb-tc-01-06.pdf

SBD Guidelines Terminology and Definitions

<i>Air Ventilation Assessment (AVA)</i>	<p>Pursuant to the Team Clean's recommendation in August 2003, Planning Department was requested to promote better layout of building blocks in the city through examination of stipulation of air ventilation assessment as one of the considerations for all major development or redevelopment proposals and in future planning. Accordingly, the "Feasibility Study for Establishment of Air Ventilation Assessment System" (the AVA Study) was conducted and completed in 2005. Air ventilation assessment becomes a protocol to objectively measure the effects of planning and development proposals on external air movement for achieving an acceptable macro wind environment.</p> <p>A technical guide on the performance-based AVA methodology and a set of qualitative guidelines to achieve better air ventilation objectives recommended in the AVA Study was promulgated in 2006. The HKPSG has also been revised to incorporate the guidelines on air ventilation since 2006.</p>
<i>Computational Fluid Dynamics (CFD)</i>	<p>Computational fluid dynamics (CFD) is a branch of fluid mechanics using numerical methods and algorithms to solve and analyze problems that involve fluid flows. Computers are used to perform the millions of calculations required to simulate the interaction of fluids and gases with the complex surfaces used in engineering.</p>
<i>Continuous projected facade length (L_p)</i>	<p>The total projected length of facade of a building or a group of buildings if any separation in-between is less than 15m. (See Figures 2 & 3 of Appendix B)</p>
<i>Grass paver</i>	<p>Paving block having not less than 50% of floor area for the growth of grass.</p>
<i>Greenery area</i>	<p>Area planted with trees, shrubs, annuals, groundcovers, climbers, grasses and other types of living plants. Other greening features including water features, grass paver, vertical greening and landscape-treated slopes/retaining structures with gradient steeper than 45 degree may be accepted as described in Appendix F.</p>
<i>Pedestrian zone/Greenery area at pedestrian zone</i>	<p>To enhance in particular the environmental quality at pedestrian level, greenery area that:</p> <ol style="list-style-type: none"> i. abuts or has visual connection with a street or public pedestrian way/public open space accessible from a street, and the top soil level, or the top level of the frame or stack in the case of vertical greening, is within a level upto 15m above such street (see Figure 1 of Appendix E), and/or ii. is provided at ground level or levels easily accessible to pedestrians which includes greenery areas at street level and at level above street if such level is accessible to pedestrians directly from a street.
<i>Permeability (P) of buildings</i>	<p>The percentage area ratio obtained by dividing the sum of the elevational areas of all accountable intervening space between buildings, intervening space between buildings and boundary lines, intervening space between buildings and centre line of adjoining streets and permeable elements within, above, below or between buildings by the sum of the elevational areas of the buildings and the aforesaid intervening spaces and permeable elements, when projected onto a chosen projection plane. (See Figures 9 to 14 of Appendix B)</p>
<i>Site Coverage of Greenery</i>	<p>The percentage of total greenery area divided by the area of the site.</p>
<i>Site permeability</i>	<p>For better urban air ventilation in a dense, hot-humid city, breezeways and air paths should be provided in order to allow effective air movements into the urban area to remove heat, gases and particulates and to improve the micro-climate of urban environment. Within individual development sites, higher permeability will</p>

help improve air ventilation. The provision for higher permeability of building masses can be achieved by creating gaps between building blocks, between the podium and the building blocks built atop (i.e., a void podium deck), set back from street, and within building blocks at various levels, etc.

Street

Street means a street vested in the Government and maintained by the Highways Department or a private street on land held under the same Government lease as the site and under the terms of the lease, the lessee has to surrender (when required to do so) the land on which the street is situated to the Government, as described under B(P)R18A(3)(a)(i) & (ii).

Street canyon

A street canyon is a canyon (a deep narrow valley) formed in a street between tall buildings on both sides. The important geometrical feature of a street canyon, aspect ratio (H/W), is the major parameter influencing air ventilation between the buildings, where H and W are the height of buildings and the width of a street respectively. For canyons aspect ratio higher than 2, the air flow above building height will become highly difficult to reach the pedestrian level where the buildings are tightly packed to form a narrow street, especially when the flow is perpendicular to the axis of the canyon. (See method of measurement of width of street canyon (U) Figures 4-7 of Appendix B)

Vertical greening

Greenery that grows on a vertical surface abutting a street or public pedestrian way/public open space accessible from a street, and the top level of the frame or stack is within a level upto 15m above such street (See Figure 1 of Appendix E). Climbing and/or weeping plants along a frame mounted on the external walls of a building, or other suitable plants on a stack of modular planters or panels that are firmly fixed on permanent structures, or a combination of both are considered as vertical greening for the purpose of compliance with the site coverage of greenery requirements.

Building Separation Requirement

1. Assessment and Method of Measurement

1.1 The design of building(s) above Level Zero (the mean street level on which the site abuts or where the site abuts on streets having different levels, the mean level of the lower or lowest street) of the site shall comply with the Design Requirements (1) and (2) below. They shall be assessed separately for each of the three assessment zones i.e. the low, middle and high zones as described in paragraph 7 of this PNAP.

1.2 All measurements are taken from the external walls of the building. Building features that will not materially affect air ventilation around buildings, including single storey bridges that are open on both sides and provided with perforated railings, signboards, minor projecting features, open sided features such as balconies, utility platforms, covered walkways and trellises and other highly permeable features such as railing (with free area $\geq 2/3$ or equivalent) may be disregarded in the building separation assessment. Individual noise barriers that are not extensive in height and designed to permit air flow through or over the barriers may also be disregarded subject to the provision of appropriate building features or permeable elements such as communal podium gardens to compensate for the barrier's obstruction to free air flow to the satisfaction of the BA. For the avoidance of doubt, buildings acting as noise barriers cannot be disregarded in the building separation assessment.

1.3 Effect on air ventilation around buildings due to topographical features within a site including any slope features and retaining walls may be disregarded. Any parts of a building that are below the site topography may therefore be disregarded (see Figure 1).

Design Requirement (1) - Continuous Projected Façade Length (L_p) of building(s) abutting a street

2.1 This requirement controls the maximum (L_p) of a building or a group of buildings if any part of the building is within 30m from the centreline of the street on which the building(s) abuts.

2.2 Subject to paragraphs 2.3, 2.4 and 2.5 below, the (L_p) of a building or a group of buildings along its long side shall not exceed the maximum permissible L_p which is obtained by multiplying 5 and the mean width of the street canyon(U) on which the building(s) abuts. The width of such a street canyon is measured perpendicular to the centreline of the street from the external wall of the building, that is vertically unobstructed within the assessment zone and within 30m from the centreline of the street, to the lot boundary of the other site on the opposite side of the street (see Figures 2 to 6). If the building or group of buildings abuts two or more streets having different (U), the least (U) shall be adopted.

2.3 If the width of a street canyon varies (on plan), (U) is the width obtained by dividing the area of such a street canyon by its length as measured along the centreline of the street. If only a part of the building is within 30m from the centreline of the street, (U) is the mean width of the street canyon that abuts such part of the building. If there is more than one such street canyon along the same street, (U) is the width obtained by dividing the sum of the areas of such street canyons by the sum of the lengths, as measured along the centreline of the street, of such street canyons. (see Figure 7)

2.4 For the purpose of measuring individual L_p of a building or a group of buildings along its long side, the part of the building(s) that is within the low zone and of a height of not more than 6.67m ($1/3$ of 20m which is the height of the low zone) may be disregarded.

2.5 This Design Requirement on the maximum permissible L_p may not be applicable under the following circumstances:

- (a) If the site does not abut a street;
- (b) If no building is within 30m from the centreline of any streets on which the site abuts;
- (c) If no parts of the building within an assessment zone is within 30m from the centreline of any streets on which the site abuts, this Design Requirement may not be applicable to such parts of the building within the assessment zone only; or
- (d) If there are such other special circumstances rendering the control on the maximum permissible L_p undesirable or unnecessary, as may be accepted by the BA.

For the avoidance of doubt, compliance with the following Design Requirement (2) is still required unless otherwise exempted.

Design Requirement (2) - Separating Distance (S) & Permeability (P) of Buildings

3. Projection Planes for Assessment

3.1 Subject to paragraph 3.3 below, assessment on compliance with the Design Requirement (2) shall be made through a pair of vertical projection planes (x, y) at an orthogonal relationship to each other. (see Figure 8) At least one of the projection planes for the low zone shall be set parallel to a street on which the site abuts. For a site that abuts on a curvilinear street, the projection plane for the low zone shall be set along any tangent of the street. For the middle/high zones, such pair of projection planes may be set to suit the building disposition or the site wind environment.

3.2 To allow more flexibility in building design, the angle between each pair of projection planes may vary from 75 to 105 degrees.

3.3 For a site that is less than 2 hectares, assessment on compliance with the Design Requirement (2) may only be required on one projection plane (instead of a pair), if the total width of all projected building facades as projected onto the other projection plane is less than 60m.

/4. ...

4. Separating Distance (S) & Permeability (P) of Buildings

4.1 Subject to paragraphs 4.6 and 4.7 below, elevation of all buildings within the site shall be projected onto the chosen projection planes. On each projection plane, the required permeability (P) of buildings as stipulated in Table 1 of this PNAP shall be achieved (see Figure 9).

4.2 Not less than 2/3 of the required (P) shall be provided by intervening spaces. All intervening spaces shall be open to above or of a clear height of not less than 2/3 of the assessment zone. There shall be intervening space(s) between the ends of the projected building facades and the adjacent site boundaries or where the site abuts a street or a lane¹, the centreline of such adjoining street or lane. Such intervening space(s) as projected onto the chosen projection plane shall have a separating distance (S) of not less than 7.5m wide. If the distance between the end of a projected building facade and the boundary line or the centreline of the adjoining street / lane varies on plan, the mean (S) shall not be less than 7.5m subject to no part of the building be within 3m from the boundary line. (See Figures 10 to 12) If such intervening spaces are not sufficient to meet 2/3 of the required (P), buildings shall also be separated by intervening spaces. Intervening space(s) between 2 projected building facades shall have an (S) of not less than 15m wide.

4.3 Not more than 1/3 of the required (P) may be provided by permeable elements. Permeable elements may be provided within, above, below or between buildings e.g. refuge floors, communal sky gardens etc. (see Figures 13 & 14)

4.4 The minimum clear width / height of all permeable elements as projected onto the chosen projection plane is 3m.

4.5 To allow more design flexibility, the projected façade of the intervening space between buildings and between buildings and the boundary lines within an assessment zone may follow the path of a notional air corridor that starts at 90 degrees from the projection plane (on plan). The air corridor may flow between buildings and may change direction without changing its width, when it meets the boundary line or anywhere within the site, by not more than 15 degrees provided the direction of the air corridor after the change of course is always within 15 degrees from its original path before it enters the site. The minimum width of the air corridor along its path between buildings shall not be less than 15m. (See Figures 15 to 18).

4.6 When the site is large and / or of irregular shape, the site may be subdivided into two or more notional sites provided that the line of the sub-divisioning is located along the centreline of a notional wind path that complies with the following requirements:

- (a) the wind path is open to above from the lowest level of the subject assessment zone;
- (b) it is of a width of not less than 15m;

/(c) ...

¹ Open space outside the site boundary is not accountable for (P). However, where an area is zoned as open space on the Outline Zoning Plan / Development Permission Area Plan and provided such area is designated as promenade or non-building area on the relevant town plan, such area may be treated as a lane for the purpose of assessing (S) and (P).

- (c) it is continuous across the site in one direction or it may change in direction by not more than 15 degrees provided its direction after the change of course is always within 15 degrees from its original path²;
- (d) where it meets the site boundaries, there is a street or lane with a mean width of not less than 7.5m.

4.7 After subdividing the site, the (P) may be assessed separately for each subdivided site using the same or a different pair of orthogonal projection planes. (see Figures 19 & 20)

4.8 A sample case on assessment of building separation provisions is given in Appendix C.

5. Performance-based Design Alternative on the Provision of (P)

5.1 Subject to compliance with the minimum permeability (P) of buildings as specified in Table 1 and paragraph 7 of this PNAP and satisfactory demonstration by applying air ventilation assessment (AVA) that the buildings' potential impact on the local wind environment has been duly considered and that by comparing with a baseline case which complies with the above Design Requirements, the proposed design is equivalent or better in external air ventilation terms, the BA is prepared to accept alternative designs that do not comply with the prescriptive requirements specified in Design Requirement (1) and paragraphs 4.2 and 4.3 of Design Requirement (2) above.

5.2 The air ventilation assessment shall be properly done by referring to the latest methodology and requirements of Technical Circular No. 1/06 on Air Ventilation Assessments³ using wind tunnel modelling or digital representation of the physical and wind environment using CFD simulations.

5.3 For projects adopting a performance-based design alternative, the following information with full justifications for deviation from the prescribed requirements shall be submitted in two stages:

Stage 1 Submission

- (a) An expert evaluation on whether the tools and methodologies for AVA employed are fit for the purpose and are suitably verified and scientifically validated with practical merits shall be carried out. In this connection, submission for prior acceptance of all information listed below covering factors like site configuration, local topography, wind characteristic and sensitive receivers in the surrounding areas, relevant urban climatic considerations, etc. is required:

/(i) ...

² The wind path should preferably align with the summer prevailing wind direction or existing street pattern.

³ The Technical Circular No 1/06 issued by the Housing, Planning and Lands Bureau is available from the website at http://www.devb.gov.hk/filemanager/en/content_679/hplb-etwb-tc-01-06.pdf

- (i) a baseline case that fully complies with all the prescriptive Design Requirements (1) and (2);
- (ii) details of scientific bases to assess performance;
- (iii) analysis tools and/or design procedures;
- (iv) modeling input, settings and parameters for the analysis and/or design;
- (v) limitation and applicability of the proposal in context;
- (vi) interpretation of results;
- (vii) method of verification;
- (viii) similar established standard and implementation in other places; and
- (ix) documented references of the scientific bases.

Stage 2 Submission

- (b) A study report on whether the proposed scheme will be in line with urban climatic considerations and such similar requirements as imposed through the town planning approval process or in Government lease; and
- (c) An AVA report on whether the proposed scheme will perform better in external air ventilation terms, demonstrated by the simulation results of the proposed scheme as compared to the simulation results of the baseline case.

5.4 Upon approval of the proposal, additional three hard copies and an electronic copy in Acrobat format for each AVA report shall be submitted together with a copy of the completed AVA register (Appendix G) for uploading to the AVA register as detailed in paragraph 26 of the PNAP.

Site Topography & Sunken Buildings

Appendix B
(PNAP APP-152)

- Site "Level Zero" is the mean level of the lower or lowest street(s)
- The height of a building shall be measured to the mean height of the roof over the highest usable floor space
- Disregard any building below Level Zero or any sunken part of a building
- Disregard the effect on air ventilation around buildings due to topographical features of the site

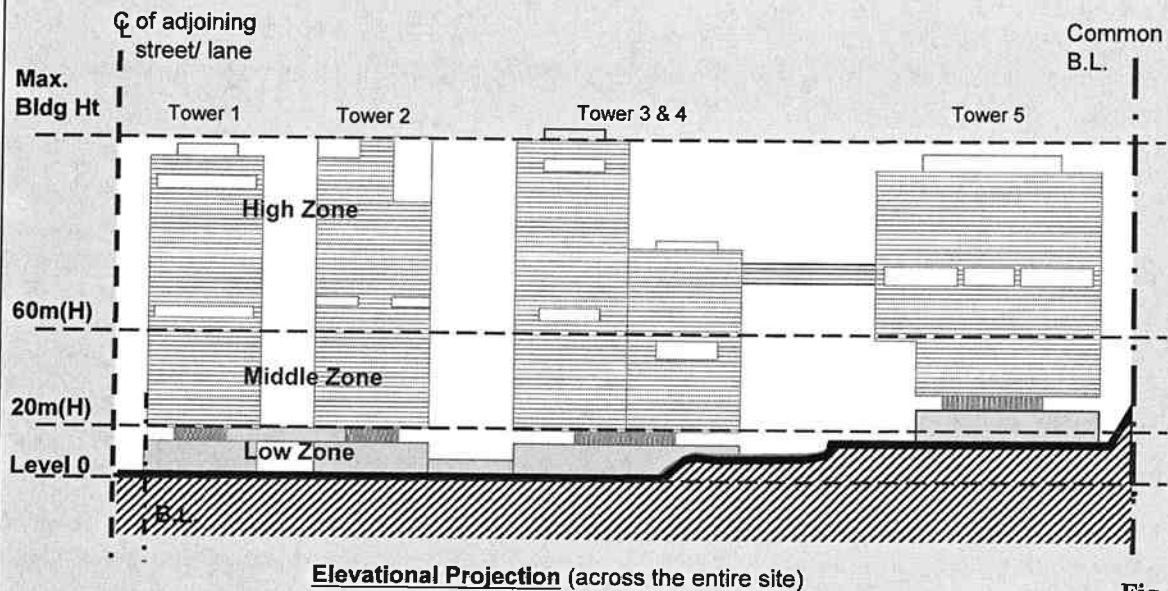
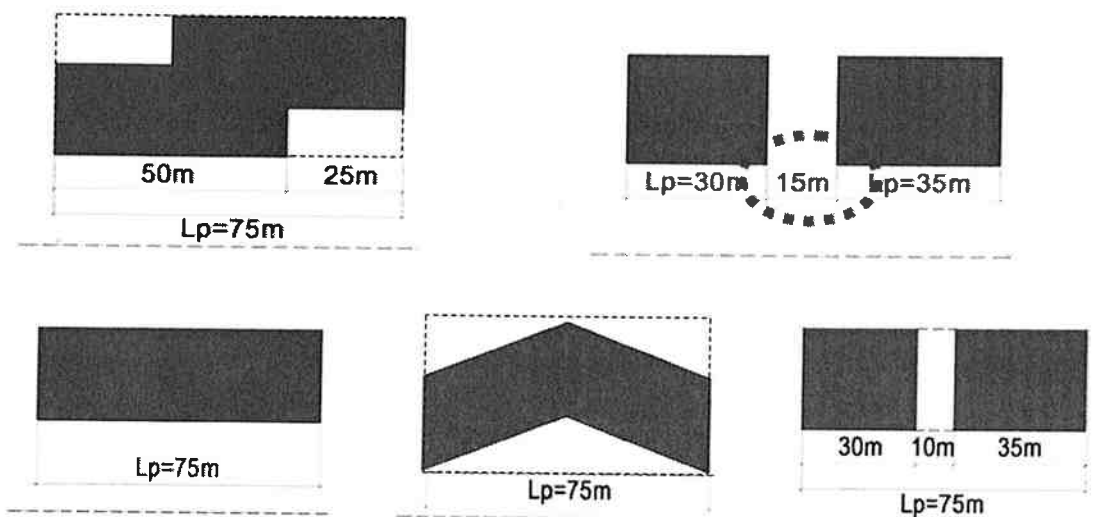


Fig. 1

Individual "Continuous Projected Façade Length (Lp)"

The total projected length of façade of a building or a group of buildings if any separation in-between is $< 15\text{m}$ (as projected to the long side of a notional rectangle for measurement)

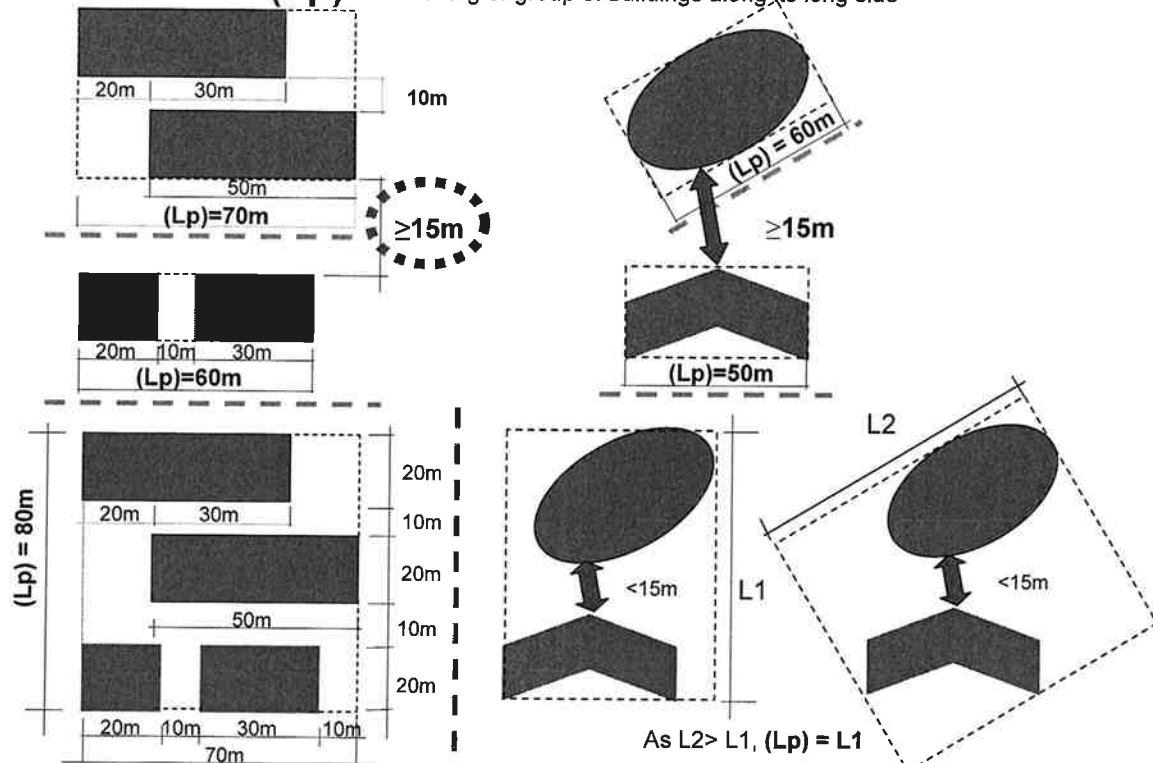
- Building portions at low zone of height $\leq 6.67\text{m}$ ($1/3\text{H}$ of low zone) may be disregarded in (L_p) measurement (see Fig.11)



A notional rectangle for measuring (L_p) of a building or a group of buildings along its long side

Fig. 2

Individual (L_p) of a building or group of buildings along its long side



- A notional rectangle for measuring (L_p) of a building or a group of buildings along its long side.
- Where the building or group of buildings is irregular in shape, the notional rectangle may be the smallest rectangle that contains the building or group of buildings

Fig. 3

Width of Adjoining Street Canyon (U)

Distance from the external wall of a proposed building to the B.L. of the opposite site(s) across the street

- street canyon shall be vertically unobstructed. Signboards, minor projecting features, open sided features e.g. balconies, utility platforms, covered walkways and trellises may be disregarded.

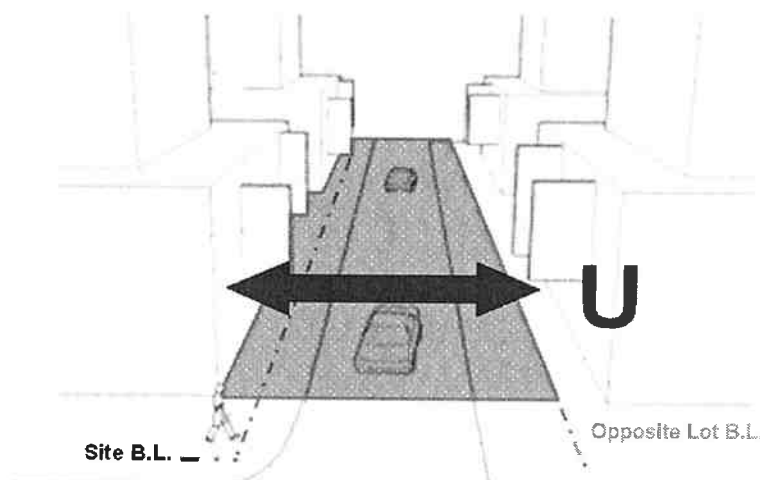
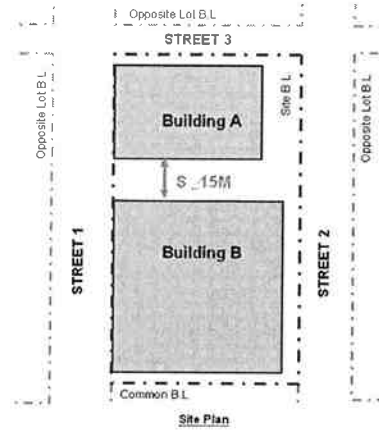
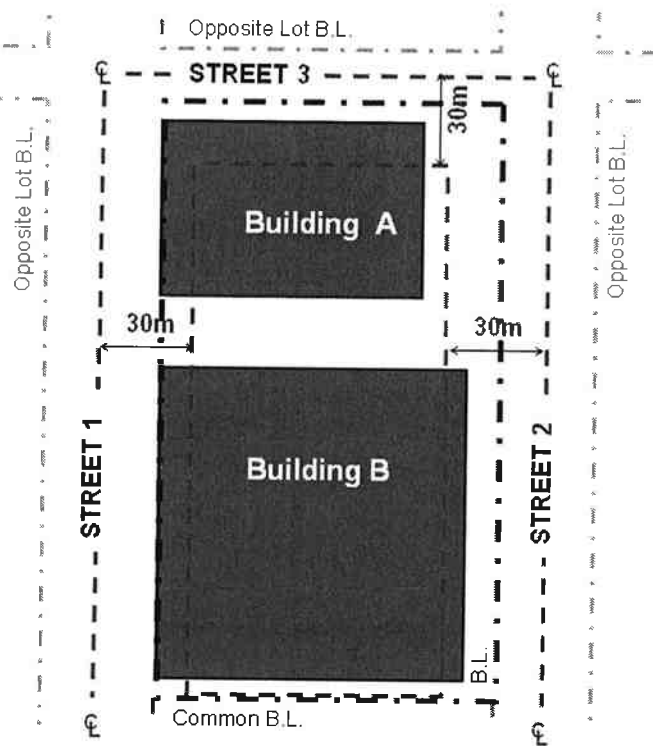


Fig. 4

Adjoining Street Canyon

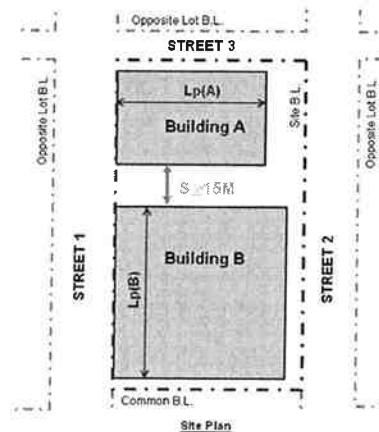
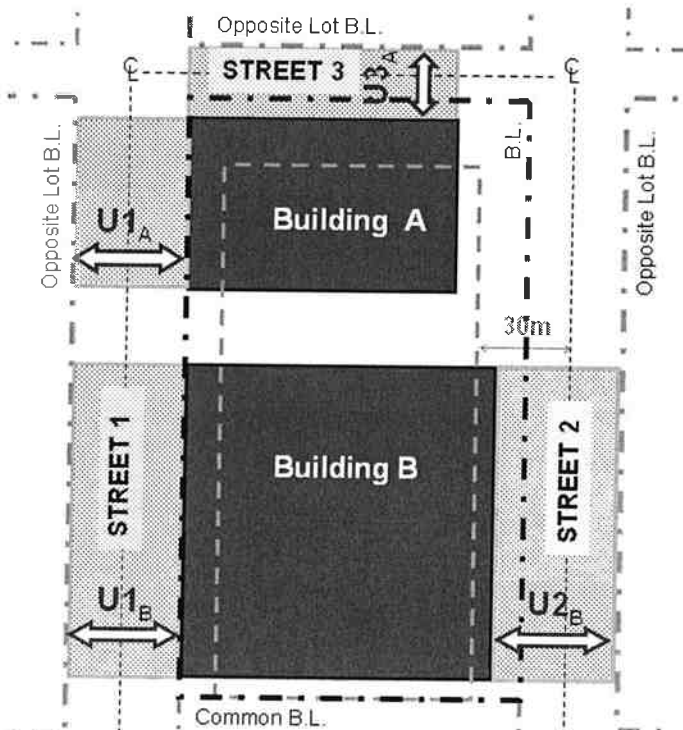


Buildings subject to control on Individual (Lp)

- buildings/groups of buildings wholly or partly within 30m from the centreline of an adjoining street.

Fig. 5

Mean Width of Adjoining Street Canyon (U) & Max. Individual (Lp)



Max. (Lp) = 5 x (U)

- If the building abuts two or more streets, the lesser or least (U)
- Building A**
 $U_{3A} < U_{1A}$; max. (Lp)_A = 5 x U_{3A}
- Building B**
 $U_{1B} < U_{2B}$; max (Lp)_B = 5 x U_{1B}

Fig. 6

Mean Width of Street Canyon (U)

Building A

When width of the adjoining street canyon varies, the mean width of (U) shall be determined as:

$$U_{A1} = \frac{\text{Street Canyon Area (A1)}}{\text{Length (A1)}}$$

- When $U_{A1} < U_{A2}$, max. $(Lp)_A = 5 \times U_{A1}$

Building B

No part of the building is closer than 30m to the street centrelines. Building B is not subject to the Design Requirement on (Lp) .

Building C

(Lp) is determined by the width of (U) at Street 2:

- $(Lp)_C = 5 \times U_{C2}$

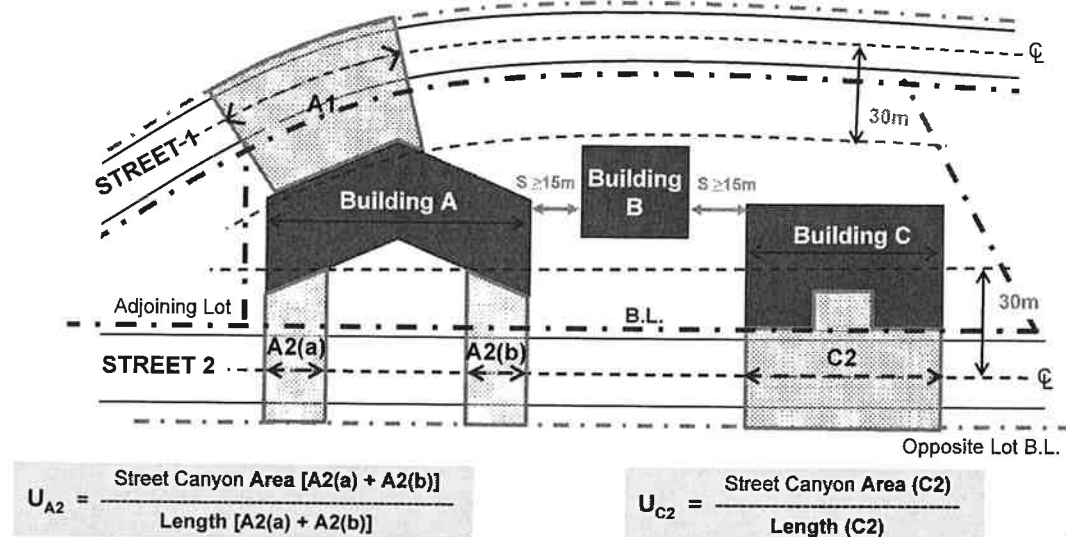
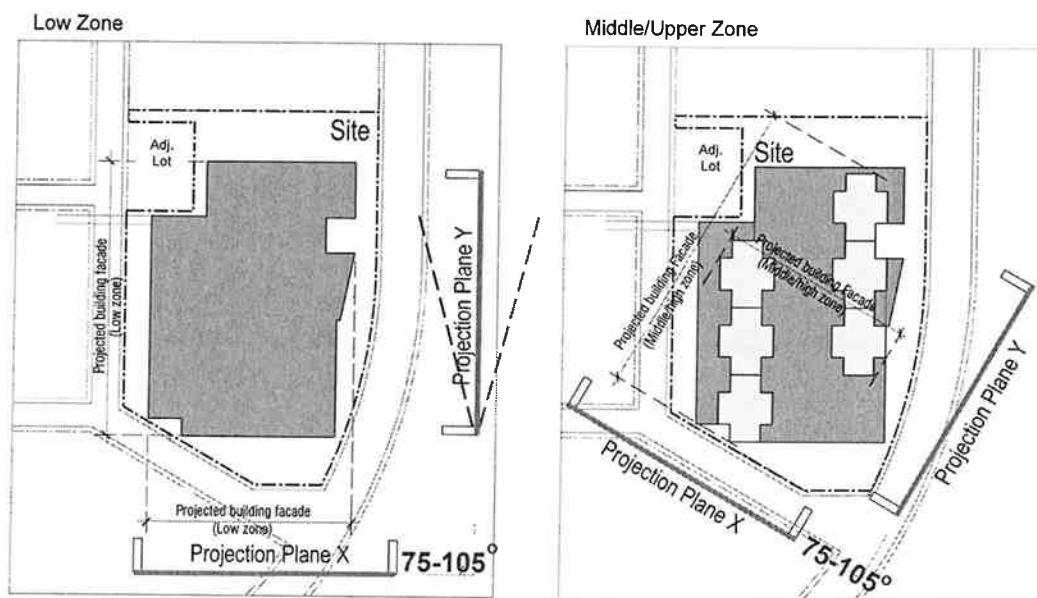


Fig. 7

A pair of Projection Planes for (P) assessment



- **Low Zone**
 - one of the planes parallel to an adjoining street
- **Middle/High Zone**
 - any pair chosen to suit the building disposition or environmental context e.g. prevailing wind direction
- **(P) assessment on one plane only if:**
 - (a) site < 2ha, and
 - (b) the total width of all projected building facades as projected onto the other plane < 60m

Fig. 8

Permeability (P) of Buildings

(P) is the percentage area ratio of the sum of projected intervening spaces & permeable elements over individual assessment zone on a projection plane

$$(P) = \frac{\text{Sum of areas of intervening spaces \& permeable elements}}{\text{Area of the assessment zone}} \times 100\%$$

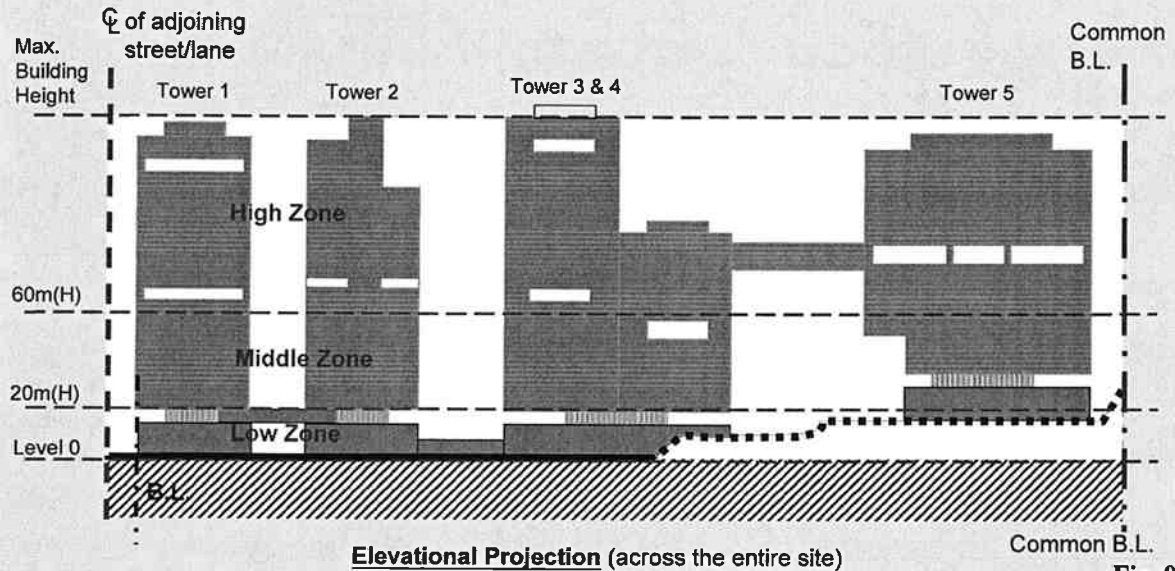


Fig. 9

Permeability (P) of Buildings – Intervening Spaces

Intervening spaces shall account for min. 2/3 of the required (P)

$$\frac{\text{Sum of areas of intervening spaces}}{\text{Area of the assessment zone}} \times 100\% \geq \frac{2}{3} \times (P)$$

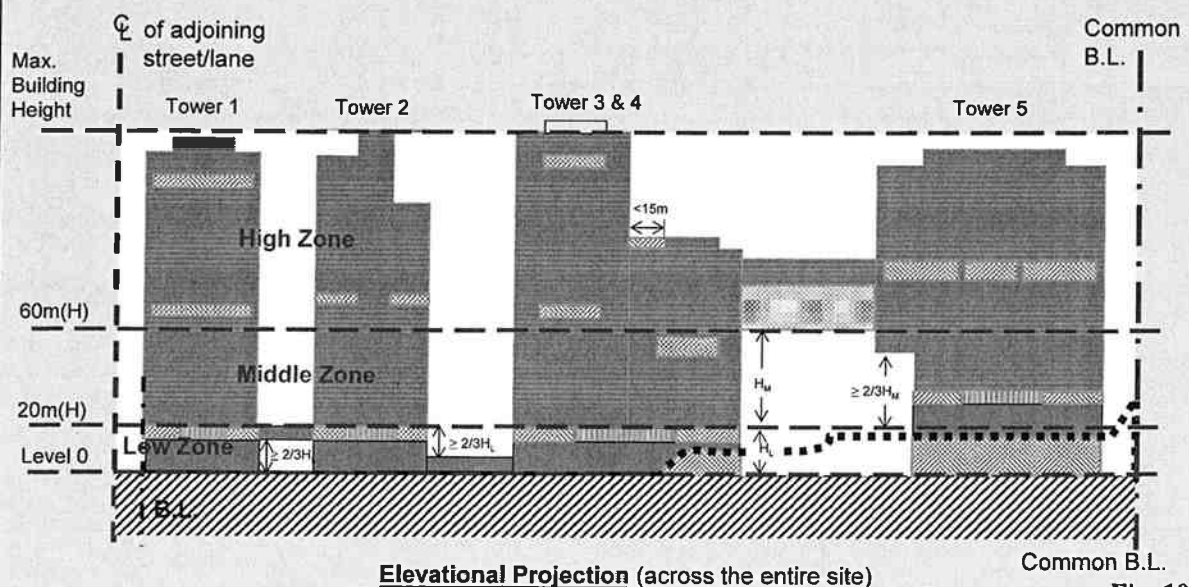


Fig. 10

Intervening Space

- Provision of intervening spaces with separating distance (S) between projected façades $\geq 15\text{m}$, and between end of a projected façade and adjacent common B.L. or centreline of adj. street/lane $\geq 7.5\text{m}$
- Height of such intervening space $\geq 2/3H$ of the Assessment Zone, or
 - It is open to above

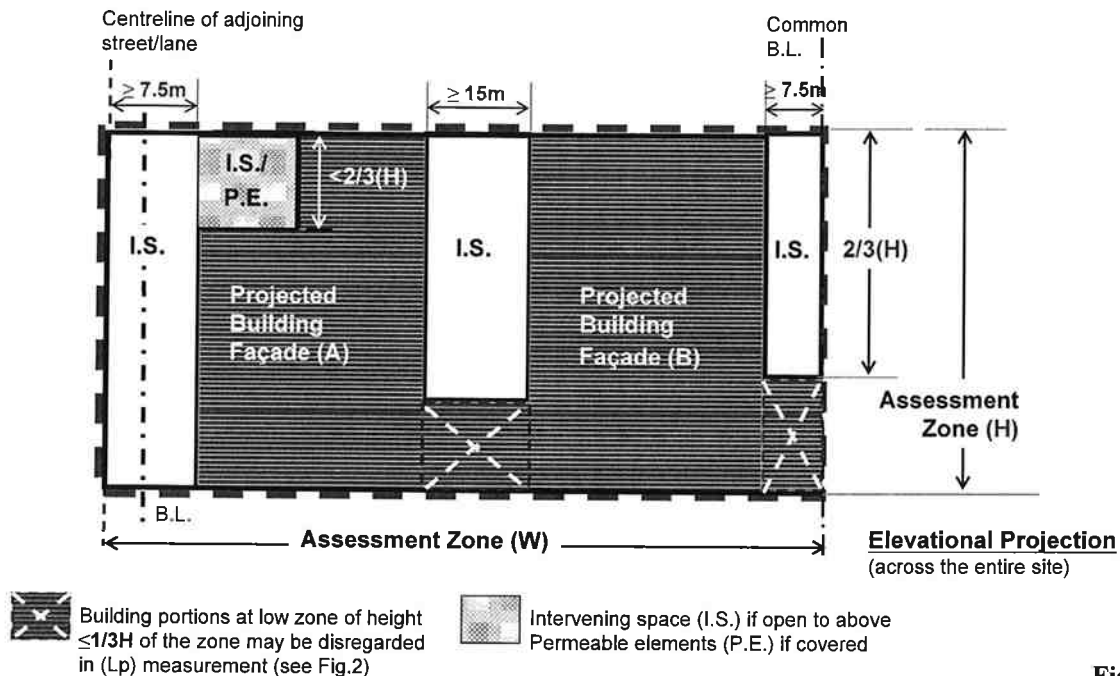


Fig. 11

Mean Width of Separating Distance

Mean width between projection line at building ends to common B.L. or centreline of street/lane

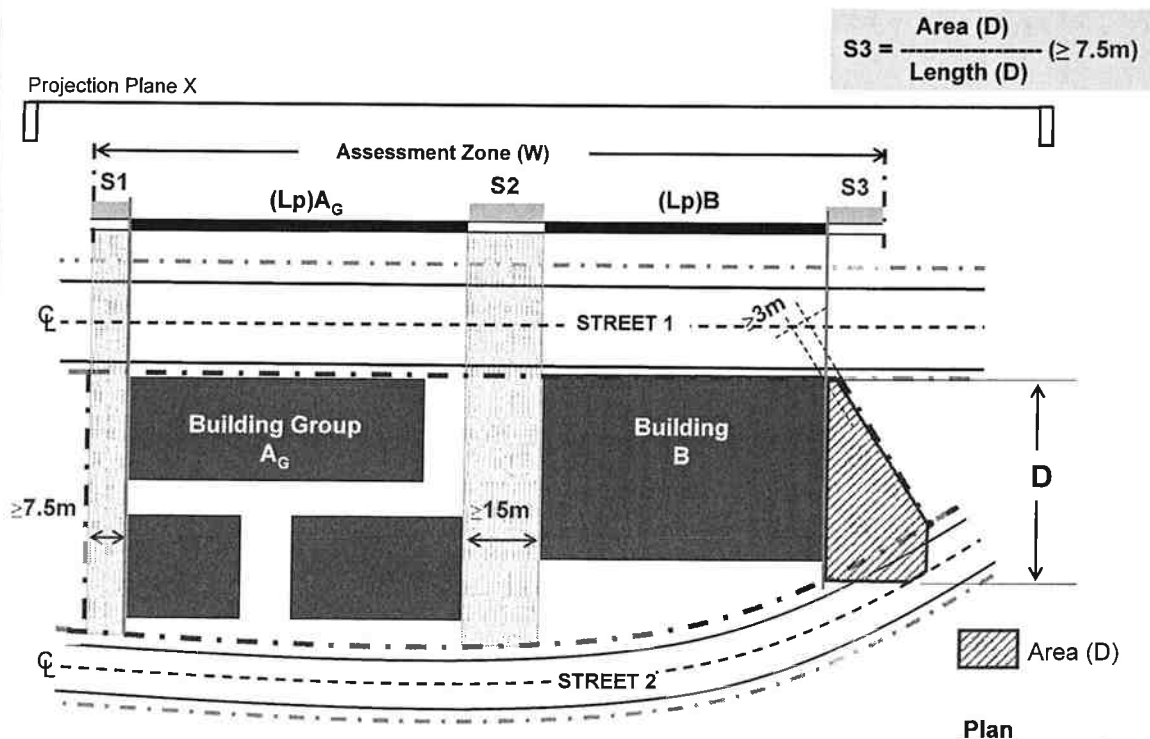


Fig. 12

Permeability (P) of Buildings – Permeable Elements

□ Permeable elements may contribute to maximum 1/3 of the required (P)

$$\frac{\text{Sum of areas of permeable elements}}{\text{Area of the assessment zone}} \times 100\% \leq \frac{1}{3} \times (P)$$

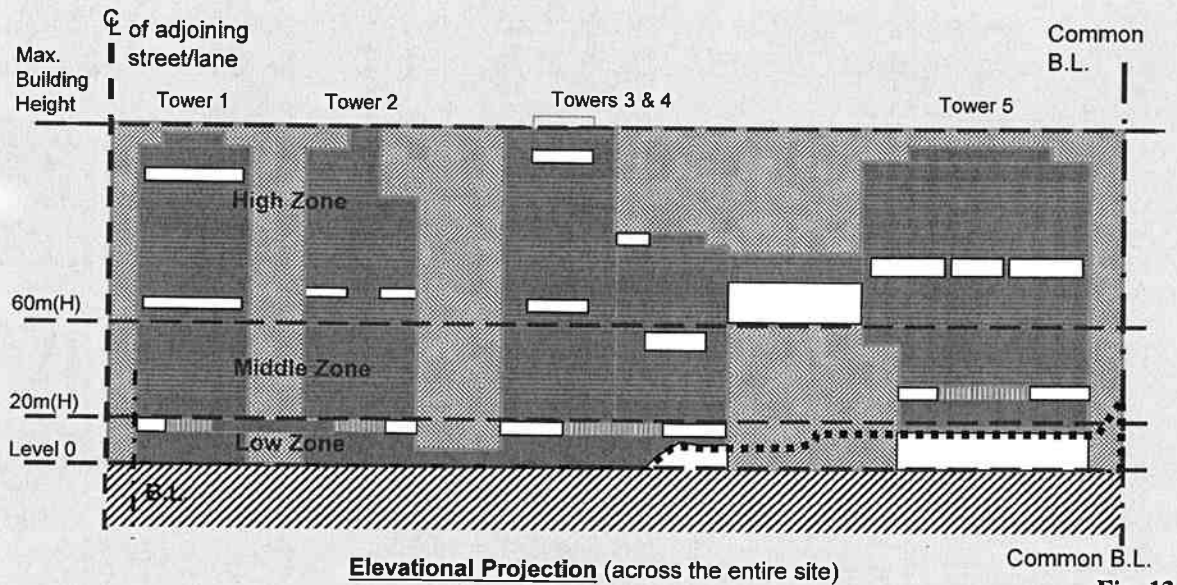
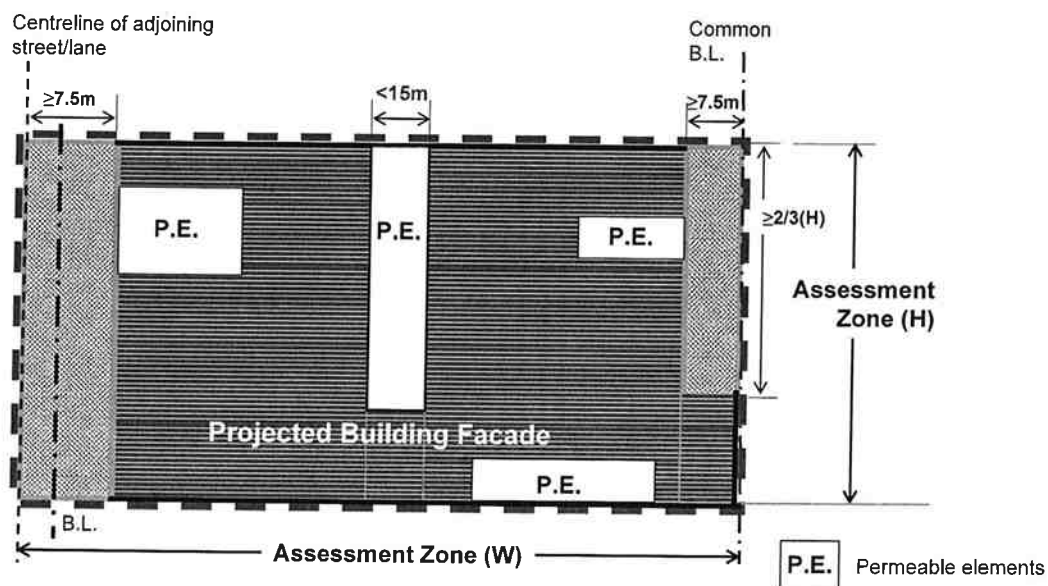


Fig. 13

Permeable Elements

Provision of permeable elements within, above, below or between buildings

- clear opening size of such a permeable element is not less than 3m



Elevational Projection (across the entire site)

Fig. 14

Design Flexibility notional air corridor / wind path

- Change in direction $\leq 15^\circ$ when it meets the boundary line or anywhere within the site
- Direction deviate $\leq 15^\circ$ from the original path
- Width of the intervening space / notional air corridor / wind path remains unchanged after such change in directions

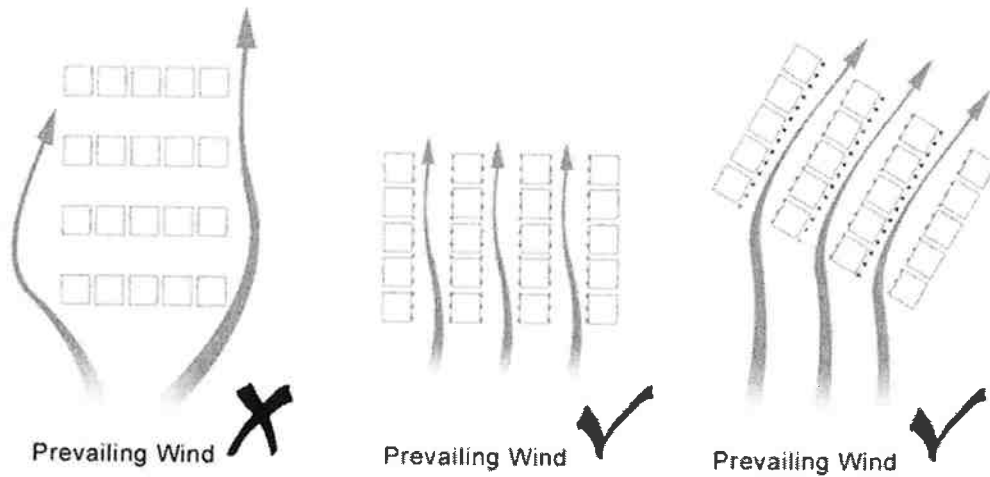


Fig. 15

Notional Air Corridor Separating distance (S) between buildings & at façade ends

- When projection plane X is placed on either side of the site, length of a building façade so projected on the planes may vary.
- (P) assessment may be based on the projection on either one of the planes X(1) or X(2) as chosen.
- separating distance (S) between buildings $\geq 15\text{m}$.
- mean separating distance between the façade end and adjacent common B.L. or centreline of adj. street/lane $\geq 7.5\text{m}$ subject to the condition that no part of the building be closer than 3m from the common B.L. with adjoining lot.

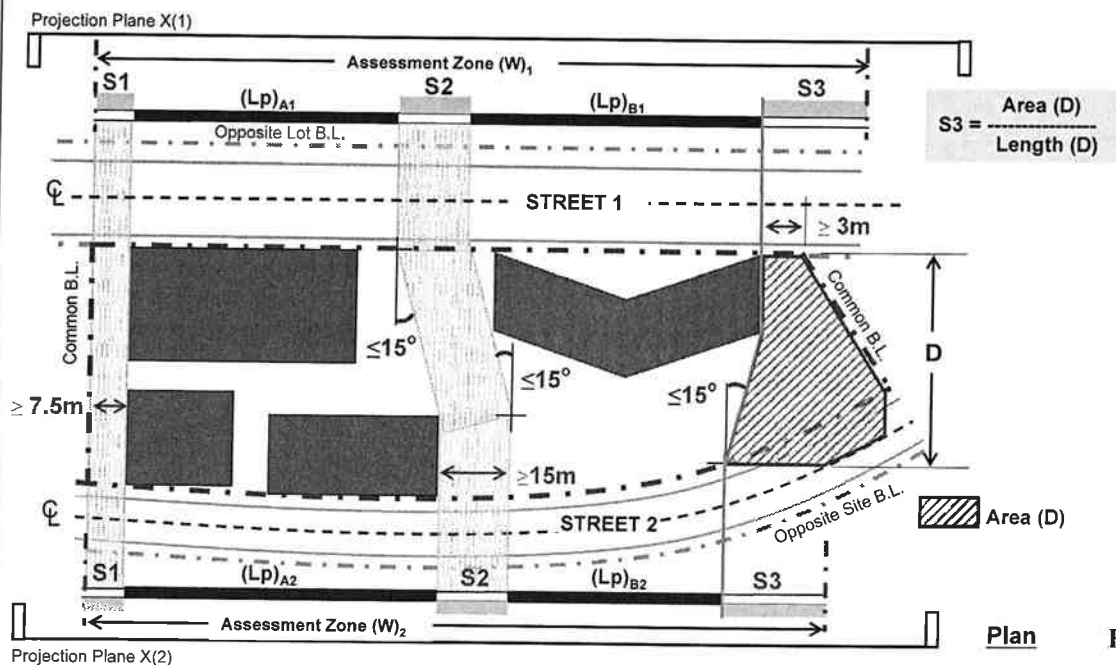
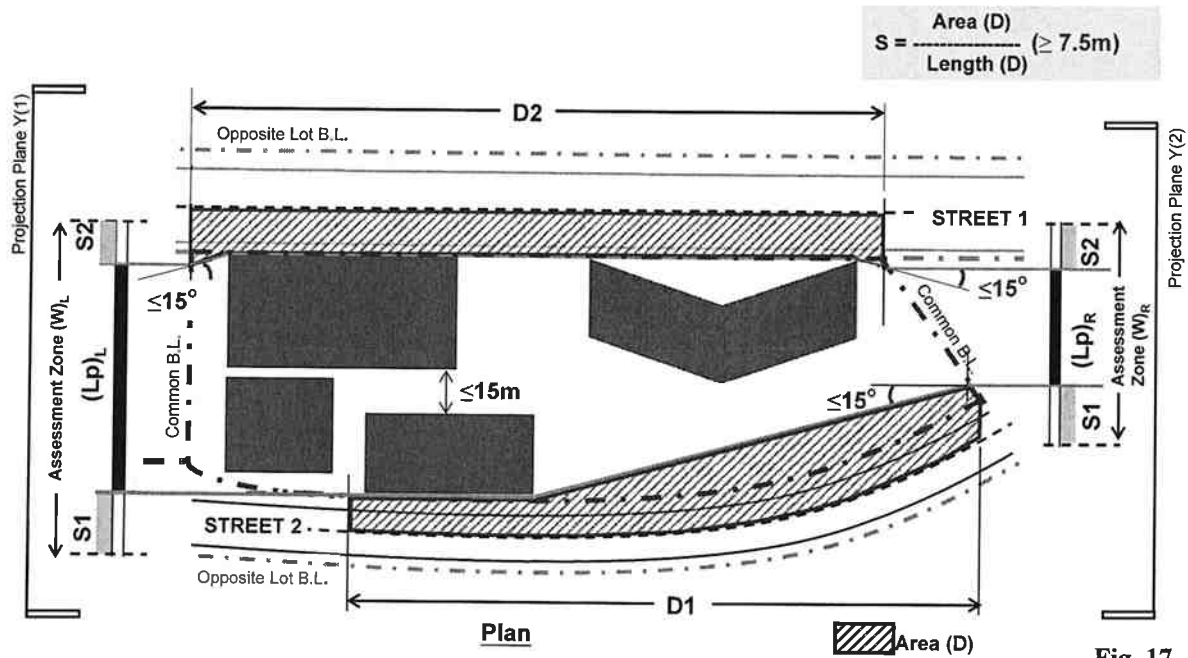


Fig. 16

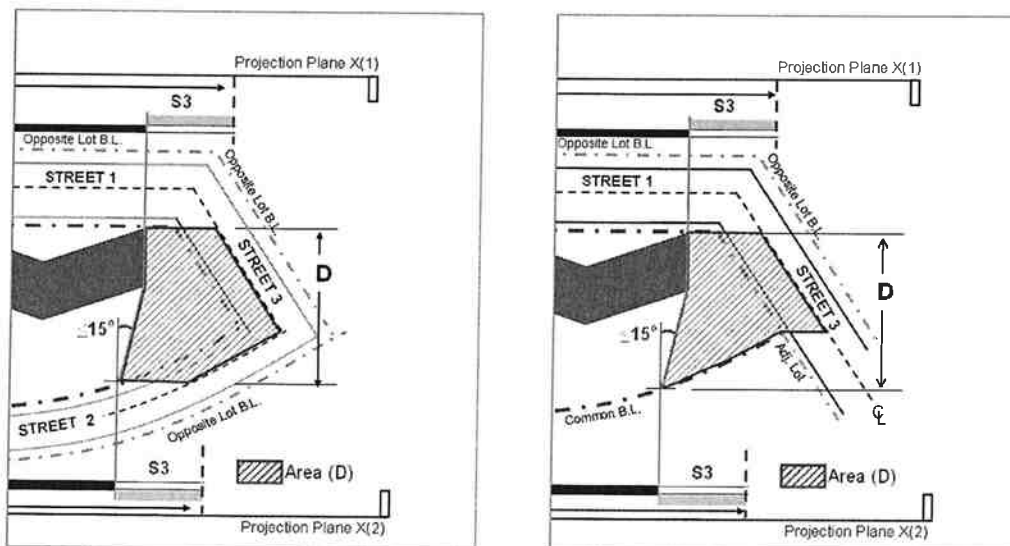
Notional Air Corridor Separating distance at façade ends

- When projection plane Y is placed on either side of the site, length of a building façade so projected on the planes may vary.
- (P) assessment may be based on the projection on either one of the planes Y(1) or Y(2) as chosen.
- mean separating distance between the facade end and centreline of the adjoining street/lane $\geq 7.5\text{m}$ subject to the condition that no part of the building be closer than 3m from the common B.L. with adjoining lot.



Notional Air Corridor Separating distance at façade ends

- Mean separating distance (S) between the facade end and common B.L. or centreline of the adjoining street/lane $\geq 7.5\text{m}$ subject to the condition that no part of the building shall be closer than 3m from the common B.L. with adjoining lot.



- When the site abuts two adjoining streets
- When the site abuts a street and an adjoining lot

Fig. 18

Wind Path passing through the site

Dividing the site into TWO or more notional sites for (P) assessment

- vertically uncovered and unobstructed above the lowest level of the assessment zone
- width $\geq 15\text{m}$
- leading to a street or to a lane of mean width $\geq 7.5\text{m}$ at either ends

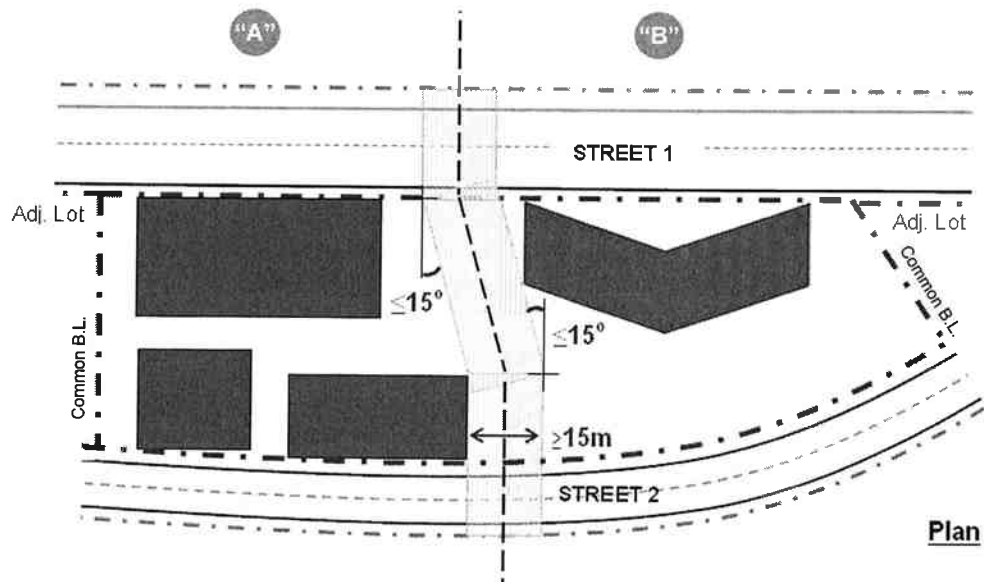


Fig. 19

Sub-divided Notional Sites for (P) Assessment

- Separating distance (S) at the projected facade end shall be measured to the notional B.L. at centreline of the wind path.
- Individual pair of projection planes may be chosen for each of the TWO sub-divided sites for (P) assessment.
- Site "Level Zero" of the original undivided site shall be used for all notional sites.

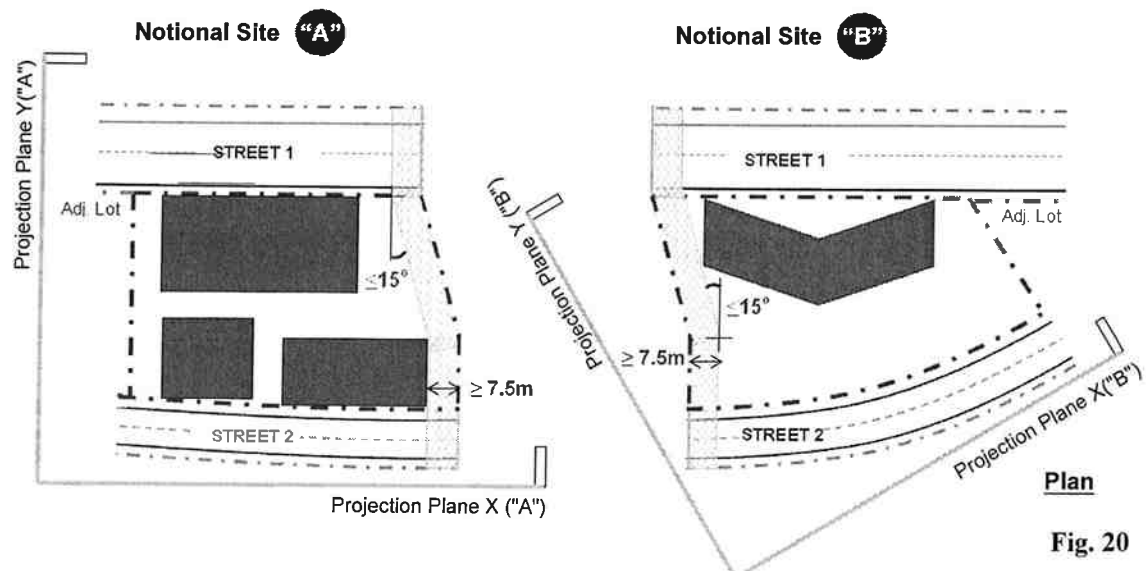
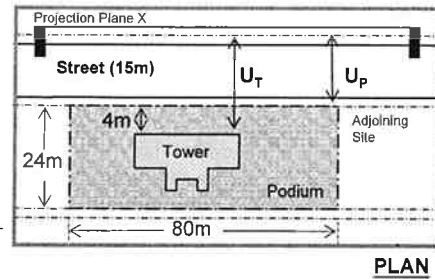
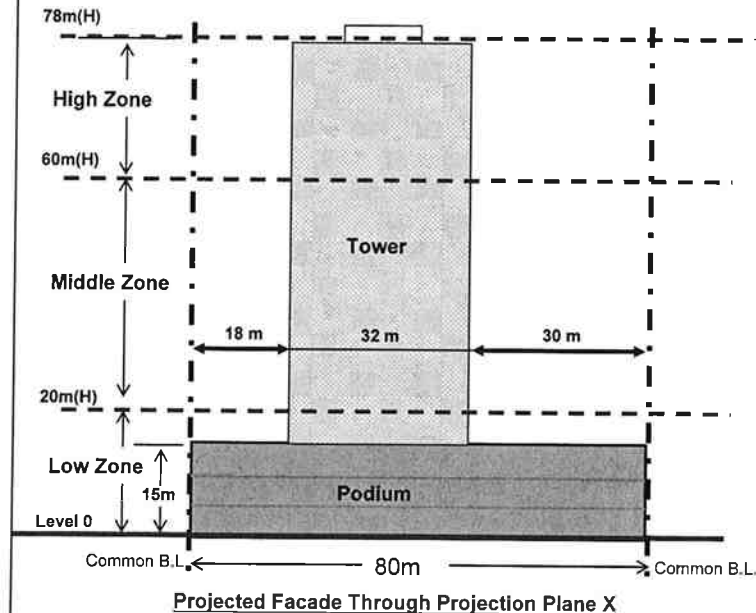


Fig. 20

Building Separation Assessment

Sample Case

- Site area = 1,920m² (< 20,000 m²)
- Proposed building: one tower above a podium of 15m(H)
- Max. building height = 78m (> 60m)
- The site abuts a street of 15m wide
- (Lp) of a podium with full site coverage = 80m (≥ 60m, *assessment required*)



Design Requirement (1)

Max. (Lp) = 5 x U

Building at Low Zone

- $U_p = 15m$, max. $(Lp)_p = U_p \times 5 = 75m$
- (Lp) of proposed podium = 80m (> 75m)
(i.e. NOT OK)

Building at Middle/High Zone

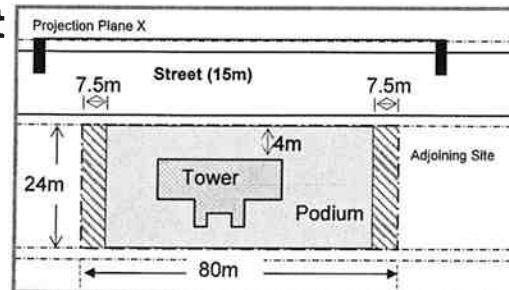
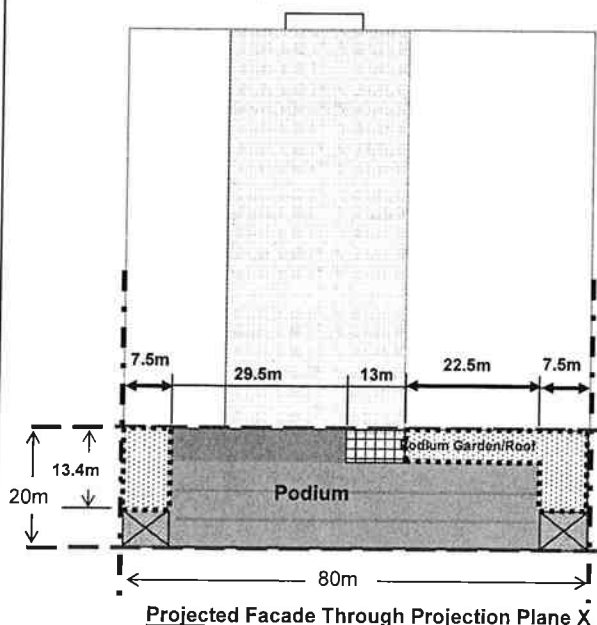
- $U_t = 19m$, max. $(Lp)_t = U_t \times 5 = 95m$
- (Lp) of proposed tower = 32m (< 95m)
(i.e. OK)

Fig. 1

Building Separation Assessment

Design Requirement (2) - Low Zone

- Minimum (P) = 20% (from Table 1)
- Set Projection Plane X parallel to the Street



Intervening Space & Separating Distance

- min. 7.5m to common B.L.
- open to above, or of height $\geq 2/3$ of the Assessment Zone
- $(Lp)_p = 80m - (7.5m \times 2) = 65m$ (< 75m, i.e. OK)

Total facade area of the intervening spaces

$$= (7.5 \times 13.4)m^2 + (7.5 \times 13.4 + 22.5 \times 5)m^2 = 313.5m^2$$

(P) achieved by the intervening spaces

$$= 313.5m^2 / (20 \times 80)m^2 \times 100\% = 19\% (< 20\%, \text{ but not less than } (2/3) \times 20\% = 13.33\%)$$

Facade area of the permeable element

$$= 13m \times 5m = 65m^2$$

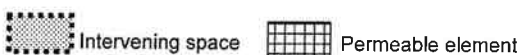
(P) achieved by the permeable element

$$= 65m^2 / (20 \times 80)m^2 \times 100\% = 4\% (< (1/3) \times 20\% = 6.66\%, \text{ i.e. all accountable})$$

Overall (P) achieved at low zone

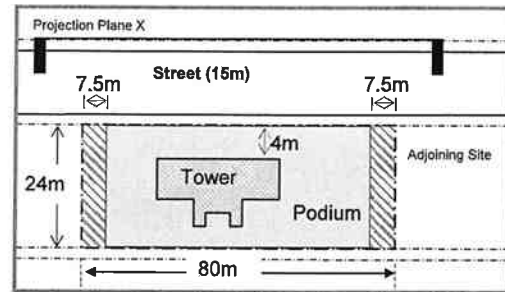
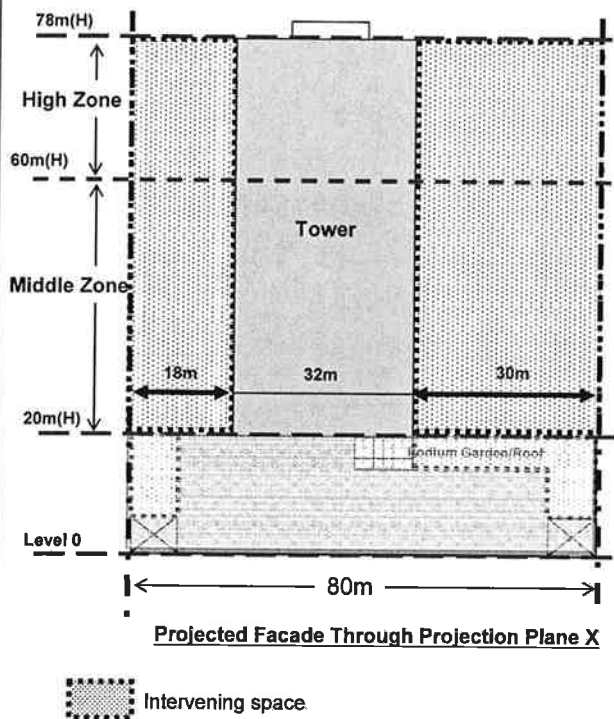
$$= 19\% + 4\% = 23\% (> 20\%, \text{ i.e. OK})$$

Fig. 2



Building Separation Assessment

Design Requirement (2) - Middle/High Zone



Intervening Space & Separating Distance

- min. 7.5m to common B.L.
- open to above or of height $\geq 2/3$ of the Assessment Zone
- $(L_p)_T = 32m (< 95m, \text{i.e. OK})$

Total facade area of the intervening spaces

$$= (18 \times 58)m^2 + (30 \times 58)m^2 = 2784m^2$$

Overall (P) achieved

$$= 2784m^2 / (80 \times 58)m^2 \times 100\%$$

$$= 60\% (> 20\%, \text{i.e. OK})$$

Fig. 3

Measures for Compliance with the Building Set Back Requirement (contd.)

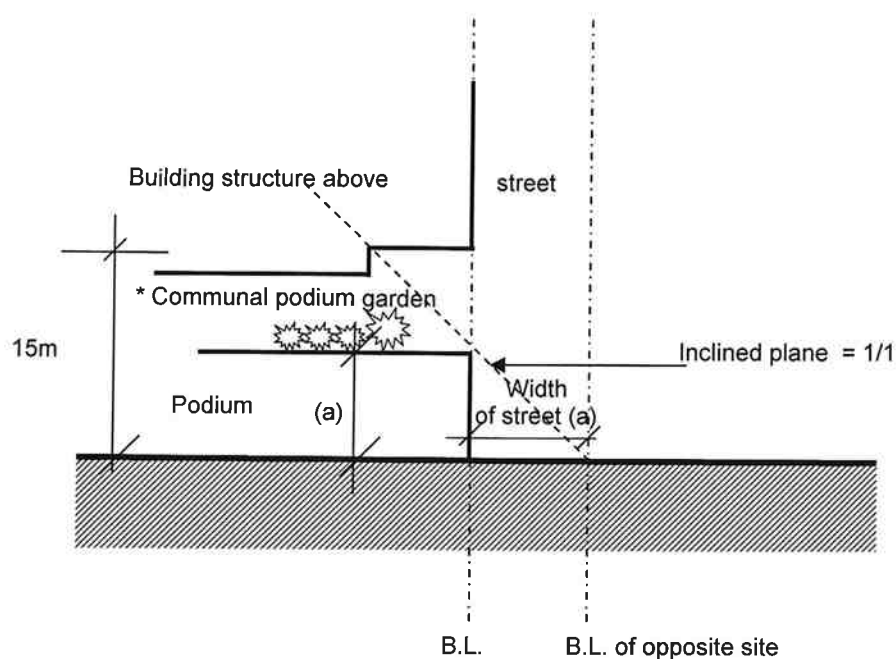


Fig. 3 Stepped building profile with communal podium garden as detailed in paragraph 13(b)

Note: * Communal podium garden shall comply with height, openness, size and greenery area requirements stipulated in paragraph 1(d) of Appendix A of JPN1

Greenery Area at Pedestrian Zone

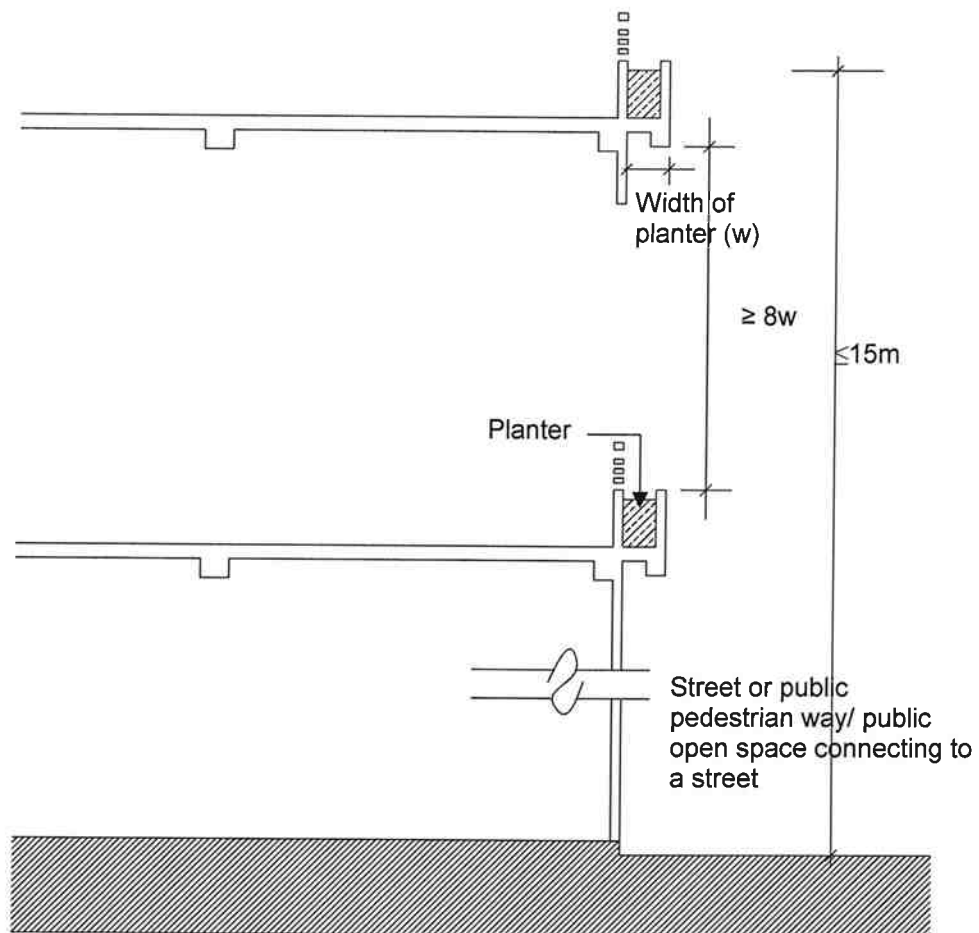


Fig. 1 Greenery at pedestrian zone may be covered as detailed in paragraph 19(a)

Method of Measurement for Compliance with Site Coverage of Greenery

- 1.1 All greenery areas shall be measured horizontally based on the soil¹ areas as shown on the plan, except as described in paragraph 1.2 below.
- 1.2 Other greening features may be accepted to contribute not more than 30% of the total required greenery areas, subject to its location and application of a reduction factor where applicable, as detailed below: -

Greening Features	Location	Reduction Factor in Computing the Greenery Areas	Site coverage of greenery
² Water features	Pedestrian zone; uncovered communal podium roof	50%	Not more than 30% of the total greenery areas specified in Table 2
Grass paver	No restriction	50%	
³ Vertical greening	Pedestrian zone	Not applicable	
⁴ Landscape-treated slopes/retaining structures with gradient steeper than 45°	No restriction	Not applicable	

- 1.3 Greenery in removable pots/planters that are not permanently fixed or built into the development is not accountable.

Notes

1. For reference, the recommended minimum soil depths for trees, shrubs, grass/ground covers are 1.2m, 0.6m and 0.3m respectively.
2. Water features shall be measured by the horizontal water surface area. Swimming pool and jacuzzi are not considered as water features.
3. Vertical greening shall be measured by the elevational area of the vertical frame (for climbing and/or weeping plants) or the elevational area of the modular planter or panel where the greenery will grow. For the avoidance of doubt, the horizontal area of soil in planters under the vertical frame/modular planter/panel already counted for vertical greening as aforesaid shall be excluded from the greenery area calculation. Self-clinging climbing plants on hard surfaced walls shall be measured horizontally based on the soil areas as shown on the plan (not counted as vertical greening and therefore not subject to the restriction in paragraph 1.2 above).
4. Landscape-treated slopes/retaining structures shall be measured by the elevational area of the soil where the greenery will grow, and where the gradient of the slope varies, an averaged gradient may be accepted. For the avoidance of doubt, landscape-treated slopes/retaining structures with gradient equal or less than 45 degrees is not subject to the above restriction and will be measured horizontally based on the soil area as shown on the plan.

Information and Documents to be Submitted

To demonstrate compliance with the building separation, building set back and site coverage of greenery requirements, the following information shall be provided for consideration: -

Building Separation

- (a) 1:1000 layout plans each showing the site in relation to its adjoining streets and surrounding buildings and features. The footprint (external walls) of the proposed buildings within the site, the provided intervening spaces, permeable elements, the selected orthogonal projection planes, air corridors and air paths are to be clearly shown to demonstrate compliance with the building separation requirements for each low, middle and high zones.
- (b) 1:500 plans, elevations, sections and calculations showing the street canyon(s) (U), the maximum continuous projected façade length (L_p) of building(s) and group(s) of buildings in comparison to the permissible L_p; the separating distance (S) provided in comparison to the required S; and the permeability (P) of buildings achieved at each low, middle and high zone, in comparison to the minimum P.

Building Set Back

- (c) A block plan showing the location of the subject site and the width of all adjoining streets;
- (d) Where the width of any street is less than 15m, further details such as level(s) of the street for computing the amount of required set back.
- (e) 1:200 plan(s) and section(s) with calculations demonstrating compliance with the building set back requirements.
- (f) Information showing the compliance of greenery areas requirement under paragraph 15(b) of this PNAP is detailed in items (g) to (i) below.

Site Coverage of Greenery

- (g) 1:500 plan(s) showing the locations of the proposed greenery areas, the common access thereto and details of relevant street, public pedestrian way, public open space for compliance with the requirement of greenery areas at pedestrian zone(s).
- (h) A schedule with calculations and illustrated diagrams showing the area of proposed greenery at each location for compliance with the requirements in Table 2.
- (i) Location of irrigation point(s) and drainage provision.

Format of the AVA Register for Private/Quasi-Government Projects

(Extracted from Annex C of HPLB Technical Circular No. 1/06, Air Ventilation Assessment)

**AVA Register for
Private/Quasi-Government Projects**

Project Description

1. Project Title	
2. Project Reference	
3. Project Proponent	
4. Outline of Project Details <i>(attach location plan)</i>	

5. Select the following category(ries) which would be applicable to the project :

- ☐ Comprehensive land use restructuring schemes, including schemes that involve agglomeration of sites together with closure and building over of existing streets.
 - ☐ Area-wide plot ratio and height control reviews.
 - ☐ Developments on sites over 2 hectares and with an overall plot ratio of 5 or above.
 - ☐ Development proposals with total Gross Floor Area exceeding 100,000 square metres.
 - ☐ Developments with podium coverage extending over one hectare.
 - ☐ Development above public transport terminus.
 - ☐ Buildings with height exceeding 15 metres within a public space or breezeway designated on layout plans / outline zoning plans or proposed by planning studies.
 - ☐ Undeveloped waterfront sites with lot frontage exceeding 100 metres in length.
 - ☐ Extensive elevated structures of at least 3.5 metres wide, which abut or partially cover a pedestrian corridor along the entire length of a street block that has / allows development at plot ratio 5 or above on both sides; or which covers 30% of a public open space.
 - ☐ Others, please specify
-

6. Details of the AVA conducted for the project <i>(The AVA report, 3 hard copies and an electronic copy in Acrobat format, is to be attached for record)</i>	
(a) AVA Consultants (if any) (b) Time (start / finish) (c) Assessment tool used (CFD or wind tunnel) (d) What were the major changes to the design of the project resulting from the AVA?	
7. Disclosure of information to the public	
Does the project proponent consent to release the AVA report for public inspection?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Does the project proponent consent to release information in this AVA proforma for public inspection?	<input type="checkbox"/> Yes <input type="checkbox"/> No
8. Contact	
(a) Name (b) Designation (c) Tel. (d) E-mail	