

|   |                           |   |
|---|---------------------------|---|
| 2 | <b>SITE ASPECTS</b>       | <b>2.2 SITE PLANNING AND DESIGN</b>   |
|   |                           | <b>SA 8 MICROCLIMATE AROUND BUILDINGS</b>   |
|   | <b>EXCLUSIONS</b>         | <b>SA 8a – Sites which are located in urban zones with existing stagnant air</b>  |
|   | <b>OBJECTIVE</b>          | Ensure the microclimate around and adjacent to buildings has been adequately considered, and where appropriate, suitable mitigation measures are provided.  |
|   | <b>CREDITS ATTAINABLE</b> | 4   |
|   | <b>PREREQUISITES</b>      | For Air Ventilation Assessment (AVA), those project belonging to the categories requiring AVA as specified in the Housing, Planning and Lands Bureau (HPLB) Technical Circular No. 1/06 – Air Ventilation Assessment.   |
|   | <b>CREDIT REQUIREMENT</b> | <p>a) Wind amplification</p> <p>1 credit for demonstrating that no pedestrian areas will be subject to excessive wind velocities caused by amplification due to the site layout design and/or building design.</p> <p>b) Elevated temperatures</p> <p>1 credit for providing shade on at least 50% of non-roof impervious surfaces on the site (parking, walkways, plazas) using light coloured high-albedo materials (albedo of at least 0.4).</p> <p>1 credit for providing roof material that meets the Solar Reflectance Index (SRI) of 78 or vegetation roof covering at least 50% of the total roof area.</p> <p>c) Air Ventilation Assessment</p> <p>1 credit for conducting an AVA by wind tunnel or Computer Fluid Dynamics (CFD) according to the prevailing AVA methodology introduced by the Government demonstrating the optimal option is selected in comparing with different options.</p>   |
|   | <b>ASSESSMENT</b>         | <p>The microclimate around buildings includes commonly and frequently accessible areas, such as entrances and exits to buildings, pedestrian routes, opening spaces, streets, podium gardens, walkways, sitting-out areas, playground areas, etc.</p> <p>a) Wind amplification</p> <p><b>The Client shall submit a report prepared by a suitably qualified person, using either wind tunnel tests or CFD studies, demonstrating compliance.</b></p> <p>The assessment should be based on the following key approaches:</p> <ul style="list-style-type: none"> <li>Assessment area where test points are positioned is within 1H (H being the height of the tallest building on the project site) from the site boundary;</li> <li>Relative wind speeds around buildings shall be assessed by placing a suitable scale model of the building and surrounding large structures within radius of 2H (building height) of the tallest building from the development site in a boundary layer wind tunnel, if there are prominent features (e.g. tall buildings or large and bulky obstructions) immediately outside the 2H zone, the assessment boundary should be extended to include these prominent structures;</li> </ul> |

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- Appropriately numbered and suitably located test points should be positioned in and outside the project site within the assessment area. Particular attention should be paid to building corners, gaps between buildings and building voids;
- The annual wind rose (wind probability table) of the site should be used;
- At least 8 of the prevailing wind directions (out of 16) should be tested;
- The average “hourly mean wind speed” of the test points to be reported;
- No test point reported should exceed an average “hourly mean wind speed” of 4 m/s.

b) Elevated temperatures

The Client shall submit a report detailing strategies and design solutions to mitigate elevated temperatures in exposed public areas. This should demonstrate the effectiveness of reducing temperatures by:

- i) providing shade on at least 50% of non-roof impervious surfaces on the site (parking, walkways, plazas) using light coloured high-albedo materials (albedo of at least 0.4); or B1
- ii) providing roof material with the Solar Reflectance Index (SRI) higher than 78 covering at least 50% of the total roof area; or provide vegetation covering at least 50% of the total roof area. B2

Area of exemption for the roof with material of high SRI or vegetation would include areas occupied by mechanical systems.

c) Air ventilation assessment

The HPLB and ETWB have formulated the methodology for Air Ventilation Assessment. The Client shall follow the prevailing technical circular as described and demonstrate the effects and impacts on the pedestrian wind environment.

The Client shall submit evidence in the form of a report prepared by a suitably qualified person which follows the reporting requirement listed in the prevailing technical circular. C1

## BACKGROUND

The microclimate around buildings can suffer as a result of the restricted natural ventilation from winds and breezes, leading to stagnant areas of pollution and elevated temperatures. Conversely, the topology can lead to significant amplification of wind at pedestrian level, leading to discomfort and fatigue for pedestrians, damage to plant life, accumulation of debris, and in more extreme cases, danger from impeded walking and flying objects.

Wind flow around a site can be accelerated or decelerated due to the building form, typically 2 to 3 times greater than for open ground. Localised areas of accelerated wind around corners and between narrow channels are of particular concern.

The following table [1] indicates that mechanical discomfort sets in at wind speeds of about 5 ms<sup>-1</sup>, with speeds above 8 ms<sup>-1</sup> being very uncomfortable and speeds above 20 ms<sup>-1</sup> being dangerous. Conversely, some areas may receive relatively low wind flow with free airflow being obstructed by buildings.

1 British Building Research Station, Wind Environment Around Tall Buildings. Digest 141, May 1972.

| Beaufort Number | Wind speed ms <sup>-1</sup> | Effect  |
|-----------------|-----------------------------|---|
| 0,1             | 0-1.5                       | No noticeable wind                                  |
| 2               | 1.6-3.3                     | Wind felt on face                                   |
| 3               | 3.4-5.4                     | Hair disturbed, clothing flaps                      |
| 4               | 5.5-7.9                     | Raises dust, dry soil and loose paper, hair blown   |
| 5               | 8.0-10.7                    | Force felt on body, limit of agreeable wind         |
| 6               | 10.8-13.8                   | Umbrellas use difficult, difficult to walk steadily |
| 7               | 13.9-17.1                   | Inconvenience felt when walking                     |
| 8               | 17.2-20.7                   | Generally impedes progress                          |
| 9               | 20.8-24.4                   | People blown over by gusts                          |

For wind amplification, the value of 4m/s is based on Frank H. Durgin's research [2]. This research shows that with 4m/s (actually 3.7 to 4.8m/s) and k, the exponent from the Weibull distribution = 2, the probability of the exceedance of a dangerous level will be within a reasonable range.

The use of non-reflective external surfaces contributes to localised elevated temperatures created when solar heat gains are absorbed and then radiated back to the surroundings. The effect may be local to pedestrian and recreational areas, and contribute to urban heat islands. As a result, local ambient and effective temperatures can rise by several degrees or more when compared with more open and better ventilated areas. Penalties include local discomfort, detrimental effects on site vegetation and wildlife, etc. Elevated temperatures can be mitigated through the choice of finishes on buildings and horizontal hard surfaces that reflect heat, the application of shading or planting vegetation.

Microclimatic conditions of the site should be designed with a thorough and balanced consideration of the wind, sunlight, temperature and air quality.

To promote the awareness of project proponents in order to ensure that air ventilation impacts are duly considered as one of the main criteria in the planning and design process, HPLB has encouraged Air Ventilation Assessment (AVA) to be included in the planning and design of the projects. A framework for applying AVA is developed on the basis of the 'Feasibility Study on Establishment of Air Ventilation Assessment' [3] completed and endorsed by the Committee on Planning and Land Development in 2005. HPLB promulgated the Technical Circular (TC) No. 1/06 on AVA in 2006.

AVA targets the projects that may have major impacts on the macro wind environment. The Government will take the lead to apply AVA for all major Government projects including public housing projects and comprehensive redevelopment areas, while quasi-government organisations and the private sector are encouraged to apply AVA to their projects on a voluntary and need basis. The framework of AVA would enable comparison of design options in external air ventilation terms and identification of potential problem areas for design improvements.

2 Pedestrian level wind criteria using the equivalent average - Frank H. Durgin 1997.

3 Advisory Council on the Environment- Feasibility Study for Establishment of Air Ventilation Assessment  
[http://www.epd.gov.hk/epd/english/boards/advisory\\_council/files/ace102005.pdf](http://www.epd.gov.hk/epd/english/boards/advisory_council/files/ace102005.pdf)

**BEAM Plus Assessment for  
Conversion of Industrial Building and  
Heritage Building Revitalisation Projects**

Major conversion of industrial and heritage buildings will be assessed under BEAM Plus for New Buildings. This circular letter provides clarification of the assessment of these project types:

**Adoption of Non-Applicable credits**

The following four credits are recommended as “Non-applicable” due to the limitation of preserving the existing building structure:

- SA8a Wind Amplification
- SA8c Air Ventilation Assessment
- SA9 Neighbourhood Daylight Factor
- MA4c Structural Adaptability

However, if the building can achieve the above credits in its existing conditions, the applicants can still attempt to score the credits accordingly.

In addition, other credits can also be considered as “non-applicable” if it is demonstrated that the corresponding alteration works are restricted by local regulations or government policies. Compensatory measures could be considered as alternative.

**Expanding the credits in Section 7 Innovations and Additions (IA)**

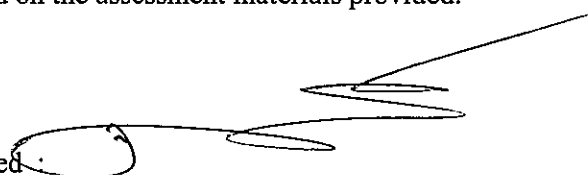
Under Section 7 Innovations and Additions, the maximum number of IA credits will be increased to 10 Bonus credits plus 1 credit for BEAM Professional in order to encourage advanced practices and new technologies. The following provisions could be considered as a Bonus credit.

- Sustainability consideration on enhancing social value;
- Community engagement throughout the design and construction period

Applicant shall submit relevant information to BEAM Society Limited such as meeting records, the value of collective memory, etc. for consideration.

In implementing the above terms and conditions, the final decision on the proposed “Non-applicable” credits and “IA” credits will be subject to the discretion of BEAM Society Limited based on the assessment materials provided.

Signed



Prof. John Ng  
Chair of Technical Review Committee

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Circular Letter No.: 2015.127

Issue Date: 1 June 2015

Application: BEAM Plus NB Version 1.1  
BEAM Plus NB Version 1.2

Effective Date: 1 June 2015

### **SA 8a Wind Amplification**

This circular letter announces that, for demonstrating that no pedestrian areas will be subject to excessive wind velocities caused by amplification due to the site layout and/or building design, the following requirements shall be complied with:

- A minimum percentage occurrence of prevailing winds of 75 % annual is required.
- At least 8 of the prevailing wind directions (out of 16) should be tested. If 2 of the 8 directions to be tested are next to each other, it is acceptable to group them together to reduce the number of tests.

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Signed :   
Dr. Raymond Yau  
Chairperson of Technical Review Committee



Circular Letter No.: 2015.128

Issue Date: 1 June 2015

Application: BEAM Plus NB Version 1.1  
BEAM Plus NB Version 1.2


Effective Date: 1 June 2015

**SA 8c Air Ventilation Assessment**

This circular letter announces that if a project has carried out Initial Study of Air Ventilation Assessment (AVA) using Computational Fluid Dynamics (CFD) or wind tunnel in the Provisional Assessment Stage and compliance of credit requirements has been demonstrated, no further study would be required in the Final Assessment Stage if the scheme has no major design change. The Applicant shall follow the reporting requirements listed in the Technical Circular No. 1/06 of Housing, Planning and Lands Bureau (HPLB) and Environment, Transport and Works Bureau (ETWB).

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If there are major design changes that may affect the pedestrian wind environment, Initial Study shall be carried out again to demonstrate compliance of credit requirements. Detailed Study shall be carried out if it is required under the said prevailing technical circular of HPLB and ETWB.

Signed :   
Dr. Raymond Yau  
Chairperson of Technical Review Committee



Circular Letter No.: 2017.138

Issue Date: 29 May 2017

Application: BEAM Plus NB Version 1.1 & 1.2

Effective Date: 29 May 2017

**SA 8b Elevated Temperatures**

Original tiled roof of historical buildings with cultural heritage value of a development shall be excluded from the total roof area calculation. A development that has no roof other than original tiled roof of historical buildings with cultural heritage value shall be excluded from the second credit of SA 8b.

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A handwritten signature in blue ink, consisting of a large, stylized 'S' followed by a smaller, more complex mark.

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Mr KM So  
Chairperson of Standards Sub-committee

**Q15. SA 8, What will be the assessment if the given site is located in a wind stagnant area and has a wind speed of less than 1.5 m/s even without any development?**

This credit shall be N/A, if the applicant can demonstrate that the site is in a stagnant area and that an optimal design option has been selected.

**Q17. SA 8, Is building shading considered as shade of pedestrian impervious surfaces?**

No. Sun shading is affected by diurnal and seasonal variations.

**Q19. SA 8a, What is the reference value to evaluate the amplification factor?**

International literature and standards, e.g. AWES-QAM-1-2001 or ASCE-EP-67 will serve as the reference value for detail guidelines on wind amplification assessment.

**Q20. SA 8a, Are there any criteria on selecting representative locations and quantity of testing points?**

Yes. For the Test point location, it should be selected to represent frequent pedestrian. While for the criteria on selecting quantity of testing points, please refer to Air Ventilation Assessment Technical Circular No. 1/06.

**Q22. SA 8a, Is the compliance of the credit requirements necessary for every test point for BEAM Plus New Buildings Version 1.1 and 1.2?**

Yes, it is. The weighted average wind speed and velocity ratio at each test point, taking into account the frequency occurrence of each wind direction in the computation of the average value, shall meet the requirements for BEAM Plus New Buildings Version 1.1 and 1.2 respectively.

(Released on 23 June 2014)

**Q24. SA 8a, Is any supporting document required to justify that a site is located in an urban zone with existing stagnant air for exclusion of the credit in BEAM Plus New Buildings Version 1.2?**

Yes, the Client shall submit a report prepared by a suitably qualified person, using either wind tunnel tests or CFD studies to demonstrate that the project site is located in an urban area with existing stagnant air for exclusion of the credit.

(Released on 23 June 2014)



**Q25. SA 8a & 8c, For BEAM Plus New Buildings Version 1.1 and 1.2, What sort of wind data should the project proponent adopts for the various wind studies?**

Generally, the Applicant can refer to the Regional Atmospheric Modelling System (RAMS) from Planning Department as the wind data for the various wind studies.

Yet, if the Applicant is able to obtain (i) project specific or site relevant measurement data, or (ii) relevant experimental site wind availability data either from Planning Department or other sources using wind tunneling method, then the Applicant should make use of these data in conducting the wind studies.

(Released on 21 January 2019)

**Q27. SA 8b(ii), For BEAM Plus New Buildings Version 1.1 and 1.2, regarding roof system calculation:**

Question:

Can roof area occupied by installation of PV, solar thermal panels, MEP equipment, skylights and any other built-in, nonstructural portion of a roof system be excluded from the calculation of roof area under this credit?

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Answer:

1. The area occupied by installation of PV, solar thermal panels, MEP equipment, skylights and any other built-in, nonstructural portion of a roof system in general can be excluded from the calculation of the roof area under this credit.
2. The surrounding uncovered maintenance access, however, are not classified as nonstructural portion of a roof system and shall be included into the calculation of roof area under this credit.
3. If the installation of PV, solar thermal panels, MEP equipment, skylights and any other built-in, nonstructural portion of a roof system occupies for more than 50% of the roof area, then the credit is N/A.

(Released on 21 January 2019)

**Q29. SA 8c, Must the design option with the best air ventilation performances be adopted in order to obtain the credit?**

The intent of the credit is to select the optimal design option that has adequately considered and has provided suitable mitigation measures for the pedestrian wind environment. The selected design option may not be the option with the best air ventilation performances, as long as the above is demonstrated.

(Released on 23 June 2014)