

Circular Letter No.: 2024.215

Issue Date: 1 August 2024

Application: BEAM Plus NB Version 2.0

Effective Date: 1 November 2024

HWB P1 Minimum Ventilation Performance and HWB 4 Enhanced Ventilation

- 1. The Technical Circular Letter hereby announces an update to the credit content for **HWB P1 Minimum Ventilation Performance and HWB 4 Enhanced Ventilation** under BEAM Plus NB v2.0.
- 2. The aim of the update is to clarify the following:
 - Update of assessment criteria for the naturally ventilated normally occupied spaces installed with acoustic windows for residential buildings under prescriptive path of HWB P1 and HWB 4a;
 - Clarification on assessment criteria for the naturally ventilated normally occupied spaces for non-residential buildings under prescriptive path of HWB P1 and HWB 4a;
 - Clarification on acceptable references of ventilation criteria under HWB 4b; and
 - Refinement on the submittal requirements for HWB P1 and HWB 4.
- 3. The requirements given in Sections 7.P and 7.3 of the BEAM Plus NB v2.0 Manual (2023 Edition) are hereby updated with the enclosures in Annex A and Annex B of this Technical Circular Letter:
 - Pages Annex A-1 to A-7 shall replace all contents in Section 7.P on HWB P1 specified in Pages 333 to 339 of the Manual; and
 - Pages Annex B-1 to B-9 shall replace all contents in Section 7.3 on HWB 4 specified in Pages 350 to 356 of the Manual.
- 4. <u>Approved PA projects</u>: For projects that have already completed PA and have certain assessment approach approved, the Applicant may opt to adopt the same assessment criteria for FA or voluntarily comply with this Technical Circular Letter. For the avoidance of doubt, the Applicant shall provide PA evidence (e.g., extract of the PA report, documents submitted for assessment in PA, etc.) in subsequent assessments to support the intention of using the same assessment methodology as in PA.
- 5. For the ease of reading, the credit content in Pages Annex A-1 to A-7 and Annex B-1 to B-9 of this Technical Circular Letter has incorporated the previously published FAQ #202 for HWB P1 and Technical Circular Letter #2023.191 for HWB 4b respectively. The Applicant shall observe the respective Technical Circular Letter and FAQ for their issue dates and effective dates.



Ir Victor Cheung Chairperson of Standards Sub-committee Annex A:

Updated Credit Content for Section 7.P under BEAM Plus NB v2.0

7	Health and Wellbeing	7.P		Prerequisite
		HWB	P1	Minimum Ventilation Performance
	Extent of Application	All bu	uilding	5
	Objective	Asse quant in ord	ss the tity of ler to s	e quality of on-site outdoor air and demonstrate that a minimum outdoor air is supplied to all normally occupied spaces in the project safeguard the health and comfort of building users.
	Credits Attainable	Prere	quisite	2
	Credit Requirement	(a) M נ	vleasu unders	re outdoor air pollutants on-site prior to building design to tand the site conditions.
		(b) [c	Demor quantit	nstrate the project is in compliance with the minimum ventilation y with respective to its designed ventilation mode.
	Assessment	(a) (On-sit	e Outdoor Air Quality
		E	Engag outdoo oolluta	e an IAQ Certificate Issuing Body (CIB) [1] to measure the quality of r air. Measurements should be taken for the following outdoor air nts:
		1	I. Ca	rbon monoxide (CO)
		2	2. Nit	rogen dioxide (NO2)
		3	3. Oz	cone (O ₃); and
		4	4. Re	spirable suspended particulates (PM ₁₀)
		F	Provide nclude	e a CIB endorsed outdoor air quality measurement report which shall ::
		-	La me	yout plan showing the location(s) of the outdoor air quality easurement point(s);
		-	De	scription of the measuring equipment used;
		-	Da	te, time and duration of measurements;
		-	Me	easurement results;
		-	Ca	libration certificate of the measuring equipment; and
		-	Ph po	otos taken during measurements (at least one photo per sampling int).
		<u>(</u> v F s	<u>One sa</u> vhich presen sample emissio	ample should be taken at the centre of the site. If emission sources, are under operation by the time the measurement is taken, are t in the immediate surroundings of the project site, additional es should be taking at locations facing the sources. The examples of con sources can be found in the EPD's website [2].

¹ IAQ Certificate Issuing Body Accreditation [ONLINE]. Available at: https://www.iaq.gov.hk/en/iaq-certification-scheme/certificate-issuingbody-accreditation.aspx. [Accessed April 2021].

² Environmental Protection Department – Hong Kong Air Pollutant Emission Inventory [ONLINE]. Available at: http://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission_inve.html. [Accessed April 2021].

Representative locations are acceptable if there is accessibility issue. If the Applicant encounters difficulties in taking air quality measurement at the centre of the site, at least one sampling of air quality measurement taken at the potential future fresh air intake point can be accepted as an alternative. In such cases, there is not necessary to provide MVAC drawings to justify the fresh air intake position. The samples should be taken when no construction activities were on-going on the day of measurement. All parameters at one sampling location should be taken on the same day.

Prepare a narrative to benchmark the measurement results against the below acceptance limits. Note that the measurement results are not required to comply with the limits and should be served as design information only. A rectifying plan describing the design of air purification strategies is required if air quality is not achieved.

Parameter	8-hour average acceptance limit [3]
Carbon monoxide (CO)	<7,000 µg/m³ or <6.1 ppmv
Nitrogen dioxide (NO2)	<150 µg/m³ or <80 ppbv Plus [1-hour] <200 µg/m³ or <106 ppbv
Ozone (O ₃)	<120 µg/m³ or <61 ppbv
Respirable suspended particulate (PM ₁₀)	<100 µg/m³

Due to site constraints, it may not be practicable to take 8-hour continuous measurement. In these circumstances, surrogate measurement (i.e. an intermittent measurement strategy based on the average of half-an-hour measurements conducted at four timeslots) is also accepted.

(b) Minimum Ventilation

Identify and categorise the spaces in the building into normally occupied and not normally occupied according to the space type matrix in Appendix 9.4 of this Manual.

Specify the system (mechanical or natural) used to ventilate the spaces.

Spaces with significant indoor air pollution sources such as toilets, car park, refuse room and plant room are excluded from the assessment. Staircases are also excluded.

Demonstrate compliance with the below criteria.

1. <u>Mechanically Ventilated Spaces</u>

Provide a fresh air calculation report with the provision of fresh air equipment demonstrating compliance with the minimum ventilation rate stipulated in ASHRAE Standard 62.1-2016 [4] in all mechanically ventilated normally occupied spaces.

Projects with Bare Shell Provision

It is observed that more developers have opted for the option in developing new buildings with bare shell spaces (i.e. the responsibility of providing the fresh air equipment to supply fresh air into indoor space will rest on the future users/ tenants).

³ Environmental Protection Department – IAQ Certification Scheme [ONLINE]. Available at: http://www.iaq.gov.hk/en/iaq-certification-scheme.aspx. [Accessed April 2021].

⁴ American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) – ANSI/ASHRAE Standard 62.1-2016 – Ventilation for Acceptable Indoor Air Quality

To ensure projects with bare shell space meet the objective of the credit, the project proponent shall ensure that there will be adequate fresh air louvre(s) to draw outdoor air into the project's indoor space. The project proponent shall make reference to an authoritative source, such as the criteria for louvre sizing specified under ASHRAE Handbook—Fundamentals, when determining the actual number and size of louvre(s) to be provided at the façade of the development.

2. Naturally Ventilated Spaces

Select one of the following paths. The Applicant is not limited to adopt only one path for all the spaces.

- 2.1. Prescriptive Path
 - 2.1.1. For Residential Buildings/ Portions:

For naturally ventilated normally occupied spaces, the total area of the windows/ primary openings provided in each space should not be less than 7% of the floor area of the space. The requirements for windows should refer to Cap. 123F Building (Planning) Regulations [5] and the definition of primary openings should make reference to PNAP APP-130 [6]. The space with notional partition(s) should be considered in the assessment, the ratio of windows/ primary openings provided in each individual habitable room should be demonstrated.

If cross ventilation is provided as per PNAP APP-130, the aggregated size of the primary openings should not be less than 2.2% of the floor area of the room; the aggregated size of the secondary openings should not be less than 2.2% of the floor area of the room.

For those naturally ventilated normally occupied spaces installed with acoustic windows, the openable window areas shall comply with the local statutory requirements which strive for the balance between sufficient ventilation and mitigation of noise. No detailed demonstrations are required and not assessed under the above criteria.

2.1.2. For Non-residential Buildings/ Portions:

Provide a report demonstrating compliance with Section 6.4.2 Location and Size of Openings stipulated in ASHRAE Standard 62.1-2016 in all naturally ventilated normally occupied spaces.

For normally occupied spaces that utilise natural ventilation with direct openings to the outdoors, the net free unobstructed area of the opening should be not less than 4% of the net occupied floor area.

For normally occupied spaces that utilise natural ventilation without direct openings to the outdoors and are ventilated through adjoining rooms, the opening between rooms shall be permanently unobstructed (Door between rooms is deemed as permanently unobstructed opening). The net free unobstructed area of the opening should be not less than 8% of the net occupied floor area of the normally occupied space or not less than 2.3m².

⁵ Building (Planning) Regulations Cap. 123, Hong Kong e-Legislation [ONLINE]. Available at: https://www.elegislation.gov.hk/hk/cap123F. [Accessed April 2021].

⁶ Buildings Department – APP-130 – Lighting and Ventilation Requirements – Performance-based Approach [ONLINE]. Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/APP/APP130.pdf. [Accessed April 2021].

2.2. <u>Performance Path (For projects with spaces cannot achieve</u> <u>through Prescriptive Path)</u>

For naturally ventilated normally occupied spaces, the ventilation rate meets 1.7 ACH under one annual prevailing wind direction with the highest wind frequency. The annual wind rose (wind probability table) at 400 – 600m of the site should be used.

Wind data, such as wind frequency, wind rose, wind profile should be adopted from the appropriate and reliable sources, such as simulated site wind data based on appropriate mathematical models, such as RAMS from PlanD [7] or experimental site wind data from wind tunnel test.

Ventilation performance should be demonstrated using wind tunnel tests, computational fluid dynamics or approaches that range from simple single zone models to elaborate multi-zone models [8].

The below requirements should be fulfilled in the CFD simulation:

- i. Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department, the Government of HKSAR [9];
- The surrounding area shall be at least, 2H (H being the building height (m) of the tallest building on the project site) or 200m away from the project site boundary, whichever is larger. The buildings within the surrounding area can be simplified to block;
- The terrain area shall be in a size of at least, 10H (H being the building height (m) of the tallest building on the project site) or 1000m × 1000m, whichever is larger, with the project placed in the centre; and
- iv. Buoyancy and turbulence driven flows need not be considered.

Prepare a Natural Ventilation Report including the following contents:

- a. Summary of naturally ventilated spaces highlighting compliance;
- b. All assumptions made;
- c. Methodology; and
- d. Results.

⁷ Site Wind Availability System [ONLINE]. Available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html. [Accessed April 2021].

⁸ American Society for Testing Materials. ASTM E 2267-03. Specifying and Evaluating Performances of Single Family Attached and Detached Dwellings – Indoor Air Quality 2003.

⁹ Lands Department – Survey and Mapping Office [ONLINE]. Available at: https://www.landsd.gov.hk/en/survey-mapping.html. [Accessed April 2021].

Submittals

The Natural Ventilation Report should be endorsed by a locally qualified professional who has at least 3 years of relevant experience in natural ventilation design and CFD modelling. The Locally Qualified Professional shall attain at least one of the following local professional qualifications:

- Member of The Hong Kong Institution of Engineers (MHKIE);
- Member of Hong Kong Institute of Qualified Environmental Professionals Limited (MHKIQEP);
- Registered Energy Assessor (REA), under the Buildings Energy Efficiency Ordinance (Cap. 610); and
- Registered Professional Engineer (R.P.E.), under the Engineers Registration Ordinance (Cap. 409).

The accepted disciplines of the above local professional qualifications include Building Services, Mechanical, Electrical, Energy and Environmental.

CV of the Locally Qualified Professional shall be provided to demonstrate that the Locally Qualified Professional holds the required local professional qualification(s) and with the relevant experience.

(a) On-site Outdoor Air Quality

Supporting Documents <i>Please provide softcopies with filename prefix as</i> <i>indicated on the leftmost column below.</i>			CA	FA/ RFA
HWB_P1a_00	BEAM Plus NB submission template for HWB P1a	~	~	~
HWB_P1a_01	Rectifying plan describing the design of air purification strategies if air quality is not achieved	~	~	~
HWB_P1a_02	CIB endorsed outdoor air quality measurement report of all required outdoor air pollutants	~	~	~

(b) Minimum Ventilation

Supporting Do	ΡΑ	СА	FA/	
Please provide indicated on the			RFA	
HWB_P1b_00	BEAM Plus NB submission template for HWB P1b	~	~	~
HWB_P1b_01	/	/	/	/
HWB_P1b_02	/	/	/	/

For Machanically Martilated Marmally Occurring DA CA FAL						
Spaces, please i	ing ventilated Normally Occupied include the following:	PA	CA	FA/ RFA		
HWB_P1b_03	Fresh Air Calculation Report with the provision of fresh air equipment demonstrating compliance with the minimum ventilation rate stipulated in ASHRAE Standard 62.1-2016 [HWB_P1&04a_Appendix A]	~	~	*		
HWB_P1b_04	MVAC fresh air equipment schedule and MVAC air-side schematics	~	~	~		
HWB_P1b_05	MVAC layout plan	-	~	✓		
HWB_P1b_06	Technical Data (e.g. catalogues) showing the offered fresh air flow rate of the fresh air equipment	-	~	~		
For Projects wi equipment is NC for normally occ following:	th Bare Shell Provision (fresh air T provided by the project proponent cupied spaces), please include the	ΡΑ	CA	FA/ RFA		
HWB_P1b_07	Layout Drawing showing the location and size of the fresh air louvre(s); and Fresh Air Calculation showing the requirement on fresh air louvres [HWB_P1_Appendix B]	~	~	~		
HWB_P1b_08	Declaration Letter endorsed by the project proponent declaring that the project will NOT be provided with fresh air equipment and only louvre(s) for fresh air intake will be provided OR Tenant Guideline highlighting the recommended amount of fresh air to be provided into the indoor space	-	~	~		
For Naturally Ve by Prescriptive F	PA	CA	FA/ RFA			
HWB_P1b_09	Floor plan highlighting locations of primary openings, secondary openings (for spaces with cross ventilation) and/ or openings between rooms (for spaces in non- residential buildings without direct openings to the outdoors and are ventilated through adjoining rooms) that provided in all naturally ventilated normally occupied rooms	~	~	~		

HWB_P1b_10	Window and Opening Schedules showing the areas of the primary openings, secondary openings (for spaces with cross ventilation) and/ or openings between rooms (for spaces in non-residential buildings without direct openings to the outdoors and are ventilated through adjoining rooms) that provided in all naturally ventilated normally occupied rooms	V	~	*
HWB_P1b_11	Calculation of ratio of the total area of the openings provided in each space to the floor area of the space [HWB_P1&04a_Appendix C]	~	✓	✓
For Naturally Ve by Performance	PA	CA	FA/ RFA	
HWB_P1b_12	Endorsed Natural ventilation report	~	~	~
HWB_P1b_13	CV of the professional as per requirements in the assessment	~	~	~
HWB_P1b_14	/	/	/	/

Remarks

(a) Additional Information

Site Wind Availability System. 2017. [ONLINE]. Available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.ht ml. [Accessed April 2021].

(b) Related Credit

HWB 4 Enhanced Ventilation

The related credit awards project demonstrating enhanced ventilation performance in normally occupied spaces and not normally occupied spaces.

HWB 8 Indoor Air Quality

Carrying out on-site outdoor analysis provides useful information for the selection of ventilation means and ventilation system design in order to achieve satisfactory indoor air quality. From the measurement result, a proper design to ensure a good air quality provision could help gaining credit points in HWB 8.

Annex B: Updated Credit Content for Section 7.3 under BEAM Plus NB v2.0

7 Health and Wellbeing 7.3 Indoor Environmental Quality

	HWB 4	Enhanced Ventilation					
Extent of Application	All building	All buildings					
Objective	Maintain e pollutant s	Maintain effective ventilation and prevent exposure to concentrated indoor pollutant sources to support occupants' health and wellbeing.					
Credits Attainable	3 + 1 additional BONUS						
Credit Requirement	(a) Fresh	Air Provision					
	1.1.	Fresh Air Provision in Normally Occupied Spaces					
	1 crec are pr	1 credit for demonstrating that all normally occupied spaces in the buildir are provided with increased ventilation.					
	1.2.	Fresh Air Provision in Not Normally Occupied Spaces					
	1 crea buildir	dit for demonstrating that all not normally occupied spaces in the ng are provided with adequate ventilation.					
	1.3. <u>1</u> add the ve	<u>On-site Measurements</u> itional BONUS credit for conducting on-site measurements to verify intilation performance for normally occupied spaces.					
	(b) Exhai	ust Air					
	1 cred signifi	it for the provision of an effective ventilation system for spaces where cant indoor pollution sources are consistently generated.					
Assessment	(a) Fresh	Air Provision					
	Identif and n 9.4 of	y and categorise the spaces in the building into normally occupied ot normally occupied according to the space type matrix in Appendix this Manual.					
	Speci	fy the system (mechanical or natural) used to ventilate the spaces.					
	Space refuse are al	es with significant indoor air pollution sources such as toilets, car park, e room and plant room are excluded from the assessment. Staircases so excluded.					
	The p appro ventila provis ventila	rovision of fresh air louvre for bare shell spaces is not accepted as an ach to achieve the ventilation requirement of the credits. The ation requirement of the credits can only be achieved through ion of fresh air equipment (such as PAU, AHU, FAF etc.) or by natural ation as stated below.					

1.1. Fresh Air Provision in Normally Occupied Spaces

Demonstrate compliance with the below criteria.

1.1.1. Mechanically Ventilated Spaces

Provide a fresh air calculation report with the provision of fresh air equipment demonstrating that the minimum ventilation rates stipulated in ASHRAE Standard 62.1-2016 [1] in all mechanically ventilated normally occupied spaces are exceeded by at least 30%.

1.1.2. Naturally Ventilated Spaces

Select one of the following paths. The Applicant is not limited to adopt only one path for all the spaces.

- 1.1.2.1. Prescriptive Path
 - i. For Residential Buildings/ Portions:

For naturally ventilated normally occupied spaces, the total area of the windows/ primary openings provided in each space is not less than 9% of the floor area of the space. The requirements for windows should refer to Cap. 123F Building (Planning) Regulations [2] and the definition of primary openings should make reference to PNAP APP-130 [3]. The space with notional partition(s) should be considered in the assessment, the ratio of windows/ primary openings provided in each individual habitable room should be demonstrated.

If cross ventilation is provided as per PNAP APP-130, the aggregate size of the primary openings should not be less than 2.5% of the floor area of the room; the aggregate size of the secondary openings should not be less than 2.5% of the floor area of the room.

For those naturally ventilated normally occupied spaces installed with acoustic windows, the detailed demonstrations are required and should be assessed under the above criteria. If acoustic window is installed, the window area should only refer to the openable window area. The requirements for acoustic windows and the definition of openable window area should make reference to PNAP APP-130 Appendix A – Section 6 Acoustic Window.

ii. For Non-residential Buildings/ Portions:

For normally occupied spaces that utilise natural ventilation with direct openings to the outdoors, the net free unobstructed area of the opening should be not less than 5.2% (exceed 4%, as stipulated in Section 6.4.2 Location and Size of Openings of ASHRAE Standard 62.1-2016, by 30%) of the net occupied floor area.

¹ American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) – ANSI/ASHRAE Standard 62.1-2016 Ventilation for Acceptable Indoor Air Quality.

² Building (Planning) Regulations Cap. 123, Hong Kong e-Legislation. [ONLINE]. Available at: https://www.elegislation.gov.hk/hk/cap123F. [Accessed April 2021].

³ Buildings Department – APP-130 Lighting and Ventilation Requirements – Performance-based Approach. [ONLINE]. Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/APP/APP130.pdf. [Accessed April 2021].

For normally occupied spaces that utilise natural ventilation without direct openings to the outdoors and are ventilated through adjoining rooms, the opening between rooms shall be permanently unobstructed (Door between rooms is deemed as permanently unobstructed opening). The net free unobstructed area of the opening should be not less than 8% of the net occupied floor area of the normally occupied space or not less than 2.3m².

1.1.2.2. Performance Path

For naturally ventilated normally occupied spaces, the ventilation rate meets 2.2 ACH under one annual prevailing wind direction with the highest wind frequency. The annual wind rose (wind probability table) at 400 – 600m of the site should be used.

Wind data, such as wind frequency, wind rose, wind profile should be adopted from the appropriate and reliable sources, such as simulated site wind data based on appropriate mathematical models, such as RAMS from PlanD [4] or experimental site wind data from wind tunnel test.

Ventilation performance should be demonstrated using wind tunnel tests, computational fluid dynamics or approaches that range from simple single zone models to elaborate multi-zone models [5].

The below requirements should be fulfilled in the CFD simulation:

- i. Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department, the Government of HKSAR;
- The surrounding area shall be at least, 2H (H being the building height (m) of the tallest building on the project site) or 200m away from the project site boundary, whichever is larger. The buildings within the surrounding area can be simplified to block;
- iii. The terrain area shall be in a size of at least, 10H
 (H being the building height (m) of the tallest building on the project site) or 1000m × 1000m, whichever is larger, with the project placed in the centre; and
- iv. Buoyancy and turbulence driven flows need not be considered.

Prepare a Natural Ventilation Report including the following contents:

- a. Summary of naturally ventilated spaces highlighting compliance;
- b. All assumptions made;

⁴ Site Wind Availability System [ONLINE]. Available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html. [Accessed April 2021].

⁵ American Society for Testing Materials. ASTM E 2267-03. Specifying and Evaluating Performances of Single Family Attached and Detached Dwellings – Indoor Air Quality 2003.

- c. Methodology; and
- d. Results.

The Natural Ventilation Report should be endorsed by a locally qualified professional who has at least 3 years of relevant experience in natural ventilation design and CFD modelling. The Locally Qualified Professional shall attain at least one of the following local professional qualifications:

- Member of The Hong Kong Institution of Engineers (MHKIE);
- Member of Hong Kong Institute of Qualified Environmental Professionals Limited (MHKIQEP);
- Registered Energy Assessor (REA), under the Buildings Energy Efficiency Ordinance (Cap. 610); and
- Registered Professional Engineer (R.P.E.), under the Engineers Registration Ordinance (Cap. 409).

The accepted disciplines of the above local professional qualifications include Building Services, Mechanical, Electrical, Energy and Environmental.

CV of the Locally Qualified Professional shall be provided to demonstrate that the Locally Qualified Professional holds the required local professional qualification(s) and with the relevant experience.

1.2. Fresh Air Provision in Not Normally Occupied Spaces

The assessment for the Not Normally Occupied Spaces should only include lobbies and corridors. Other not normally occupied spaces such as toilets, staircases, pantries etc. can be excluded.

Demonstrate compliance with the below criteria.

1.2.1. Mechanically Ventilated Spaces

Provide a fresh air calculation report with the provision of fresh air equipment demonstrating compliance with the minimum ventilation rates stipulated in ASHRAE Standard 62.1-2016 in all mechanically ventilated not normally occupied spaces.

1.2.2. Naturally Ventilated Spaces

Demonstrate the ventilation rates in all naturally ventilated not normally occupied spaces meets 1.7 ACH. Methodology should follow the performance path as specified under Section 1.1.2.2. above.

1.3. On-site Measurements

Additional BONUS credit will be granted only if the credit in Part (a) (1.1) Fresh Air Provision in Normally Occupied Spaces has been achieved.

Prepare a measurement methodology which includes the proposed measurement locations and methodology. In order to ensure a comprehensive coverage of measurement, if there is more than one building within the development, the sampling points should be distributed across each building. The measurement methodology and on-site measurement report should be endorsed by contractor's representative.

1.3.1. Mechanically Ventilated Normally Occupied Spaces

Demonstrate, by measurement, the required amount of outdoor air corresponding to the design outdoor air flow rate is provided. Accepted measurement methods include the following:

- i. ASHRAE Standard 111 [6]; OR
- ii. Tracer gas techniques in accordance with ASTM E741 [7]

At least one sampling point should be present in each mechanically ventilated normally occupied space type.

If the measurement results demonstrate unmet requirement in Part (a) Section 1.1.1 (i.e. measurement results showing ventilation rate of any mechanically ventilated normally occupied space not exceeding 30% of the minimum ventilation rate), the credit in both Part (a) (1.1) and Part (a) (1.3) will not be awarded.

1.3.2. Naturally Ventilated Normally Occupied Spaces

Demonstrate, by measurement, the required amount of design ACH is provided. Tracer gas decay test in accordance with ASTM E 741 or equivalent is an accepted measurement method.

At least one sampling point should be present in each naturally ventilated normally occupied space type. For each naturally ventilated normally occupied space usage, the sampling locations should cover all orientations and high, middle and low-level zones of the buildings.

If the measurement results demonstrate unmet requirement in Part (a) Section 1.1.2 (i.e. measurement results showing ventilation rate of any naturally ventilated normally occupied space not exceeding 30% of the minimum ventilation rate), the credit in both Part (a) (1.1) and Part (a) (1.3) will not be awarded.

(b) Exhaust Air

The coverage applies to spaces that consistently produce pollutants. Examples of such areas include <u>toilets</u>, <u>car parks</u>, <u>and refuse rooms</u>, where indoor pollutants may accumulate. There have been concerns regarding the applicability to all plant rooms, which are primarily designed to house HVAC equipment, electrical distribution panels, water pumps and other machinery necessary to maintain the building's functionality.

Most of these rooms are equipped with exhaust air systems, which not only contribute to the smooth operation of the equipment but also play a pivotal role in promoting the safety, health, and well-being of personnel occupying the building.

For instance, ventilation in boiler rooms ensures the supply of fresh air for combustion and prevents overheating, while exhaust systems in battery rooms may be designed to disperse potential gaseous mixtures to nonhazardous levels.

A pollutant refers to any substance introduced into the environment, either intentionally or unintentionally, that has harmful or toxic effects on living organisms or the natural environment.

⁶ American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) – ANSI/ASHRAE Standard 111-2008 Measurement, Testing, Adjusting and Balancing of Building HVAC Systems

⁷ ASTM International – ASTM E471-11 Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution

It is worth emphasizing that the primary objective of the credit is to address the effective elimination of indoor pollutants. Consequently, plant rooms that do not generate pollutants during normal operating conditions are exempt from the assessment process. For instance, plant rooms housing ELV equipment, lift machines, water pumps, or server appliances fall into this exemption category.

Although ventilation systems are typically incorporated into electrical plant rooms such as transformer rooms, switch-rooms, and UPS rooms, their primary function revolves around preventing heat buildup rather than removing pollutants. Hence, these rooms are excluded from the assessment.

Plant rooms housing HVAC equipment are provided with ventilation systems to ensure acceptable ambient temperature, safety and comfort of personnel. The exhaust systems also serve as a means of dispersion in the event of a major leak. However, since no pollutants are produced during normal operation, these rooms are likewise exempt from the assessment.

It is important to note that only those <u>plant rooms that consistently</u> <u>generate pollutants</u> will be included in the assessment. Examples include <u>battery rooms</u>, <u>plant rooms with grease interceptor/ grease traps and plant</u> rooms where activities like chemical mixing, filtration, and sewage treatment etc. are carried out on an ongoing basis, leading to the continuous release of pollutants into the environment.

Provide design criteria that have been adopted and the details of the ventilation system designs providing local exhaust where concentrated pollutant sources are likely to be present. ASHRAE Standard 62.1-2016, CIBSE Guide A 2021 [8], CIBSE Guide B 2005/ 2016 [9], PNAP ADM-2, PNAP APP-98 and PNAP APP-130 are accepted references for this credit. The ventilation requirements from statutory regulations, e.g. Cap. 123H, are not regarded as the accepted reference to demonstrate compliance with this credit. Justification is needed for other references.

Alternatively, project-specific ventilation design criteria outlined in the design documents and/ or contract specifications may be used if the ventilation criteria cannot be referenced from the aforementioned standards.

Submit an exhaust air calculation report with the provision of exhaust air equipment demonstrating compliance with the ventilation design criteria and equipment specifications.

Submittals

(a) Fresh Air Provision

Supporting Do Please provide indicated on the	ΡΑ	CA	FA/ RFA	
HWB_04a_00	BEAM Plus NB submission template for HWB 4a	~	~	~
HWB_04a_01	/	/	/	/
HWB_04a_02	/	/	/	/
HWB_04a_03	/	/	/	/

⁸ Chartered Institute of Building Services Engineers (CIBSE) – CIBSE Guide A Environmental Design 2021

⁹ Chartered Institute of Building Services Engineers (CIBSE) – CIBSE Guide B Heating, Ventilating, Air Conditioning and Refrigeration 2005/ 2016

HWB_04a_04	/	/	/	/
For Mechanicall Not Normally Sections 1.1.1. a following:	y Ventilated Normally Occupied and Occupied Spaces (applicable to and Section 1.2.1.), please include the	ΡΑ	CA	FA/ RFA
HWB_04a_05	Fresh Air Calculation Report with the provision of fresh air equipment demonstrating compliance with the ventilation rate stipulated in ASHRAE Standard 62.1-2016 as per requirements in the assessment [HWB_P1&04a_Appendix A]	V	~	~
HWB_04a_08	MVAC fresh air equipment schedule and MVAC air-side schematics [and]	~	✓	✓
	Technical Data (e.g. catalogues) showing the offered fresh air flow rate of the fresh air equipment	-	~	~
HWB_04a_09	MVAC layout plan	-	\checkmark	~
For Naturally Ve Normally Occup (applicable to S please include th	ΡΑ	CA	FA/ RFA	
HWB_04a_06	Endorsed Natural Ventilation Report	~	✓	~
HWB_04a_07	CV of the professional as per requirements in the assessment	~	~	~
For Naturally Ve by Prescriptive I please include th	entilated Normally Occupied Spaces Path (applicable to Section 1.1.2.1.), ne following:	PA	CA	FA/ RFA
HWB_04a_10	Floor Plan highlighting locations of primary openings, secondary openings (for spaces with cross ventilation) and/ or openings between rooms (for spaces in non- residential buildings without direct openings to the outdoors and are ventilated through adjoining rooms) that provided in all naturally ventilated normally occupied rooms	~	~	~
HWB_04a_11	Window and Opening Schedules showing the areas of the primary openings, secondary openings (for spaces with cross ventilation) and/ or openings between rooms (for spaces in non-residential buildings without direct openings to the outdoors and are ventilated through adjoining rooms) that provided in all naturally ventilated normally occupied rooms	~	✓	✓

HWB_04a_12	Calculation of the ratio of the total area of the openings provided in each space to the floor area of the space [HWB_P1&04a_Appendix C]	~	~	~
For On-Site Me 1.3), please inclu	ΡΑ	СА	FA/ RFA	
HWB_04a_13	Specification on provision of on-site measurement, measurement methodology and report	~	-	-
HWB_04a_14	Endorsed Measurement Methodology	-	-	~
HWB_04a_15	Endorsed Measurement Report	-	-	~

(b) Exhaust Air

Supporting Do	ocuments	ΡΑ	СА	FA/
Please provide indicated on the			KFA	
HWB_04b_00	BEAM Plus NB submission template for HWB 4b	~	~	~
HWB_04b_01	/	/	/	/
HWB_04b_02	/	/	/	/
HWB_04b_03	/	/	/	/
HWB_04b_04	Exhaust Air Calculation Report with the provision of exhaust air equipment demonstrating compliance with the ventilation design criteria [HWB_04b_Appendix A]	~	~	~
HWB_04b_05	MVAC exhaust air fan schedule and MVAC air-side schematics; [and]	✓	~	~
	Technical Data (e.g. catalogues) showing the offered exhaust air flow rate of the exhaust air equipment	-	✓	✓
HWB_04b_06	MVAC layout plan	-	~	~

Remarks

(a) Additional Information

World Health Organization – Health and sustainable development – Natural Ventilation. [ONLINE]. Available at:

https://www.who.int/teams/environment-climate-change-and-health/airquality-and-health/sectoral-interventions/housing/strategies. [Accessed April 2021].

Whole Building Design Guide, National Institute of Building Sciences. Natural Ventilation. [ONLINE]. Available at:

https://www.wbdg.org/resources/natural-ventilation. [Accessed April 2021].

(b) Related Credit

EU 2 Reduction CO₂ Emissions

Although enhanced ventilation rate may increase building energy consumption, the Applicant is encouraged to adopt additional energy saving strategies, for instance demand control ventilation to overcome the compromise between indoor environmental quality and energy consumption.

HWB 5 Waste Odour Control

While HWB 4 governs the exhaust rate of enclose waste and recycling facilities, HWB 5 stipulates requirements to reduce risk of odour nuisance.

HWB 8 Indoor Air Quality

Indoor air quality can be improved via dilution resulted by maintaining suitable ventilation rate.