BEAM Plus
New Buildings
Version 2.0 (09.2019)

HKGBC
香港綠色建築議會

BEAM
建築環保評估協會

Table of Contents

Note:

The proponent is cautioned that the supporting information for credit claim has to be taken at the material time, which needs to be captured during the process and cannot be done retrospectively.

1. Introduction

1.1 Overview

BEAM

Building Environmental Assessment Method (BEAM) Plus is a comprehensive environmental assessment tool for buildings which is carried out on a voluntary basis. It defines the best practice criteria for a range of sustainability issues across the whole life-cycle of buildings and projects, such as how buildings should be designed, constructed and operated, etc. Recognised as one of the world's leading green building assessment tools, it provides a comprehensive set of performance standards that can be pursued by developers and owners.

Owned and operated by the BEAM Society Limited (BSL), BEAM Plus New Buildings is one of the BEAM Plus rating tools that cover the design and construction of new buildings.

Based on the credit achievement where the standard or defined performance criteria are satisfied, the project will be graded Platinum, Gold, Silver or Bronze, to reflect the overall performance.

BEAM Plus New Buildings Version 2.0 (NB v2.0)

The upgraded BEAM Plus New Buildings Version 2.0 (NB v2.0) aims to be practical, clear and standardised in defining the key elements of green buildings including health and wellbeing, hygiene, site impacts, use of materials, water quality, energy efficiency, indoor environmental quality, etc. During the upgrade process, the following fundamentals were established:

Above Statutory Requirements – Requirements for prerequisites and credits should be set above the statutory requirements.

Adaptability – Routes for standard and bespoke building types should be established. Requirements for standard building types should be better defined with more assurance of the applicability of the criteria.

Certainty – Requirements should be clearly defined to reduce ambiguity and promote better certainty in the assessment process. Submittal requirements should be standardised as far as practicable.

Practicality – Standards should be achievable with respect to state-of-the-art of the building industry to promote wider adoption of green building practices yet pose reasonable challenges for better quality, performance and cost-effectiveness. Submittal requirements at Provisional Assessment Stage should be practicable with respect to normally available design information at the design stage in a typical project timeframe.

It is envisaged that these fundamentals form the basis of the holistic green building performance indicators which suitably integrate different green features into a user-friendly assessment tool.

BEAM Society Limited (BSL)

BEAM is owned and operated by BSL, an independent non-profit public body whose membership is drawn from many professional and interest groups in Hong Kong's building construction and real estate sectors. BSL is committed to developing and implementing the BEAM assessment tools, assessing green buildings and training professionals.

Hong Kong Green Building Council (HKGBC)

HKGBC was established in 2009 as Hong Kong's industry body that coordinates efforts towards green building. HKGBC certifies BEAM Plus projects, accredits BEAM Professional (BEAM Pro), BEAM Affiliate (BA) and BEAM Assessors (BAS).

Development of BEAM Plus NB Version 2.0

The development of BEAM Plus NB v2.0 was led by a BSL Steering Committee comprising industry practitioners and experts. Industry stakeholders have been consulted via engagement workshops for feedback and opinion on areas including but not limited to the overall framework, performance categories and their relative emphasis, assessment criteria, submission requirement and grading methodology. The Steering Committee comprises:

Convener – Sr Kenneth Chan

Members – Prof CS Poon; Ir CS Wong; Mr John Herbert; Mr KM So; Ms Susan Leung; Dr TT Chow; Mr Benny Au; Mr Alex Leung; Mr Justin Li; Mr Joel Chan Cho-sing; Ir Kim Tang Cheuk; Sr Kenneth Yun Ying Kit; Mr Tak Yip Wong; Dr Ivan Fung; Prof Jack Cheng; Dr Ren Chao; Ir Clarence Tze Ka-yan; Mr Dominic Lam; Mr Keith YUE; Mr Kevin Ng; Ir CF Leung; Prof Daniel WT Chan; Ir Dr Raymond Yau; Mr Ryan Lee; Dr Benny Chow; Mr Martin Wan; Ir Victor Cheung

Advisors – Ms Alice LF Yeung; Ms Karen Cheung; Mr Patrick Chan; Mr K.C. Lo; Dr Lau Kwok Keung; Mr Stephen Yim Yu-chau; Ms Irene Tong

Disclaimer

BEAM Plus has been prepared with the assistance and participation of many individuals and representatives from various organisations. The outcome represents a general consensus, but unanimous support from each and every organisation and individual consulted is not implied. The BEAM Plus documentation shall be revised on a regular basis and as frequently as necessary. BSL reserves the right to amend, update and change this Manual from time to time without prior notice. Where changes in regulations necessitate changes to the assessment criteria, they will be issued to all parties involved in an assessment and will be announced in the BSL's website. An appropriate transitional period shall be allowed for projects undergoing assessment process.

It should be noted that none of the parties involved in the funding of BEAM, including BSL and its members, provide any warranties or assume any liability or responsibility to the users of BEAM, or any third parties for the accuracy, completeness or use of, or reliance on, any information contained in BEAM, or from any injuries, losses, or damages arising out of such use or reliance.

As a condition of use, users covenant not to sue, and agree to waive and release BSL and its members from any and all claims, demands and causes of actions for any injuries, losses and damages that users may now or hereafter have a right to assert against such parties as a result of the use of, or reliance of BEAM.

Limitations

BSL does not endorse any self-assessed grading awarded by the use of BEAM Plus for New Buildings.

HKGBC offers a formal certification process of grading, this service provides independent third-party review of credits claimed to ensure all credits can be demonstrated to be achieved by the provision of the necessary documentary evidence. The use of BEAM Plus for New Buildings without formal certification does not entitle the user or any other party to promote any grading awarded.

Application and Eligibility

BEAM Plus NB v2.0 covers the design, construction and associated testing and commissioning of all types of new buildings, from small single building to large buildings, including but not limited to commercial, educational,

government, industrial, office and residential buildings, hotels and shopping centres, etc.

The assessment needs to cover various types of premises contained within the development and may involve premises that are only a 'shell' or are fitted-out. Whatever the circumstances, assessment focuses on what the designer, builder and commissioning agent achieve. Assessment of some aspects of performance may be type dependent, or not feasible for various reasons, so the number of applicable credits and their aggregation will vary.

BEAM Plus does not assess any unauthorised or any unauthorised portions of any buildings, i.e. any buildings or building works not complying with the Buildings Ordinance. In case any non-compliance works or unauthorised portions in a building are reported, both HKGBC and BSL reserve the right to deprive the awarded rating from the Applicant.

Assessment Boundaries

The Applicant shall define the project boundary to undergo the BEAM Plus assessment. The project boundary needs not necessarily follow the site boundary of the development, which however, should be consistent throughout the project assessment.

Certification Framework

Assessment under BEAM Plus for New Buildings covers the demolition, planning, design, construction and commissioning of a building and should be initiated in the early stages of project development. BEAM Plus for New Buildings aims to reduce the environmental impacts of new buildings while improving the quality and user satisfaction, by the adoption of the best techniques available within reasonable cost.

A notable attribute of BEAM Plus for New Buildings, as compared with other mostly used schemes elsewhere, is that an assessment for new buildings is not finalised until a building is completed, ensuring that 'green' and 'sustainable' design features are actually implemented, and construction practice meets the required performance standards. Besides being in the interests of the Client and tenant in certifying the actual performance of the finished product, this approach also serves to 'dovetail' assessment with BEAM Plus Existing Buildings and Interiors. It would be expected that a building graded under BEAM Plus for New Buildings and suitably operated, maintained and renovated would achieve a similar grade under other BEAM Plus certification schemes.

Certification Process

Independent BEAM Assessors (BAS) or BSL inhouse BAS would be assigned to each project to undertake the assessment works. The Technical Review Committee (TRC) of BSL will review the assessment reports done by the BAS and endorse the assessment results, followed by the issuance of certification by the HKGBC. Detail assessment procedures can be found in the BEAM Plus Project Assessment Procedures Manual which is available in HKGBC and BSL websites.

BEAM Professional/ Affiliate

BEAM Professional (BEAM Pro)/ Affiliate mentioned in this manual should process the valid credential for BEAM Plus New Buildings version 2.0 for facilitating the certification process and to ensure the compliance of relevant credit requirements.

Site Audit

BSL shall, in due course after consultation with stakeholders, institute a random site audit mechanism as part of the verification processes. Details will be given in an Audit Manual yet to be issued. Audit will be conducted only after the official publication of the Audit Manual and formal implementation of the audit mechanism.

Documentation	The Applicant has the obligation to provide evidence to demonstrate credit compliance. In NB v2.0, only sufficient amount of material (by way of example) is required to be submitted. However, the Applicant must make sure all supporting information is timely collected and properly documented. Just in case when the BEAM assessor considers it necessary to demand additional material of the same sort for clarification, the Applicant is obligated to produce such material upon request.
Certification Fee	BEAM Plus certification fee comprises 2 parts, namely Registration Fee and Assessment Fee which are payable to HKGBC and BSL respectively. Details on the fee structure can be found in the HKGBC and BSL websites.
Credit Interpretation Request (CIR)	CIR is designed to allow project teams to obtain specific guidance on whether certain BEAM Plus credits can be fulfilled pertaining to the special design of a project. Details on CIR can be found in HKGBC and BSL websites
Appeal	The Applicants may submit an appeal on an individual credit if they disagree to and/ or do not accept the decision made by the BSL. More details can be found in the HKGBC and BSL websites.

1.2 Framework

Credit Performance Categories

Different assessment methods assign their credits under different categories according to the preferences of the tool developer. In BEAM Plus NB v2.0, credits are grouped into the following categories:

i. Integrated Design and Construction Management (IDCM);
ii. Sustainable Sites (SS);
iii. Materials and Waste (MW);
iv. Energy Use (EU);
v. Water Use (WU);
vi. Health and Wellbeing (HWB); and
vii. Innovations and Additions (IA).

While BEAM Plus NB v2.0 adopts similar categories in other BEAM Plus tools, the number and nature of credits within each category are specific to the context of Hong Kong and new building projects.

Integrated Design and Construction Management (IDCM)

IDCM focuses on the integration between design and operation, integrated design between design team members and client, and integration throughout the development process from design to construction. The core objectives of IDCM are as follows:

i. Integrated Design Process;
ii. Green Construction Practices; and
iii. Smart Design and Technologies.
iv. Design for Engagement and Education on Green Buildings

Sustainable Sites (SS)

SS focuses on the design and planning issues, and the integration of neighbourhood and site location. The core objectives of SS are as follows:

i. Neighbourhood Integration;
ii. Biodiversity Enhancement;
iii. Bioclimatic Design; and
iv. Climate Resilience and Adaptability.

Materials and Waste (MW)

MW focuses on the minimisation of operational materials and waste. The core objectives of MW are as follows:

i. Efficient Use of Materials;
ii. Selection of Materials; and
iii. Waste Reduction.

Energy Use (EU)

EU focuses on the reduction of building operation energy consumption. It is energy performance based and seeks to encourage quality passive design. The core objectives of EU are as follows:

i. Energy Use Reduction and Control;
ii. Renewable and Alternative Energy Systems; and
iii. Energy Efficient Equipment.

Water Use (WU)

WU focuses on the reduction of water consumption. The core objectives of WU are as follows:

i. Water Conservation;
ii. Effluent; and
iii. Water Harvesting and Recycling.

Health and Wellbeing (HWB)

HWB focuses on the human environmental quality. It is designed to expand the scope of previous indoor environmental quality (IEQ) category and absorb human centric design elements. The core objectives of HWB are as follows:

i. Design for Green Living;
ii. Inclusive Design; and
iii. Indoor Environmental Quality.

Innovations and Additions (IA)

IA focuses on promoting and rewarding true innovations. The core objectives of IA are as follows:

i. Innovation Techniques; and
ii. Innovation Challenges.

Credit Allocation

Credits have been broadly allocated to each assessment criterion by taking into account the other internationally recognised green building assessment tools as well as the sensitivity analysis and the comments received during the stakeholder engagement workshops.

Category Weighting

Having reviewed the local and international assessment schemes and other relevant information, a percentage of weighting for each environmental performance category has been assigned to reflect its importance and the global trends as follows:

Category	Weighting
IDCM	18%
SS	15%
MW	9%
EU	29%
WU	7%
HWB	22%

Prerequisites

The Applicant must demonstrate that all the pre-requisites are achieved. Otherwise, the project will be graded as “Prerequisite(s) Not Achieved”.

Bonus Credit & Additional Bonus Credit

The bonus credits and additional bonus credits in NB v2.0 are counted under the corresponding categories. A factor of 1.2 is applied in score calculation for the attainment of bonus credits and additional bonus credits.

Bonus credits are independent from the normal credit(s) under the same credit item. They can be achieved regardless of the success or failure in attaining the normal credit(s). Whereas the additional bonus credits are dependent on the normal credit(s) under the same credit item. The award of normal credit(s) is the prerequisite for attaining the additional bonus credits.

The maximum possible score under each category is 100%.

IA Credit

The IA credits in NB v2.0 are counted towards the total number of credits qualifying for an award classification. A maximum of 10 IA credits could be submitted for achieving a higher score in the assessment.

Determination of Overall Grade

The final certificate grading for projects certified under BEAM Plus NB v2.0 is subject to the following conditions:

i. Satisfying all pre-requisites;

ii. Achieving overall score required; and

iii. Obtaining minimum percentage (%) for each category listed below.

Grade	Minimum Percentage for Each Category	Total Score
Platinum	20%	≥ 75%
Gold	20%	≥ 65%
Silver	20%	≥ 55%
Bronze	20%	≥ 40%

If a project can comply with all the applicable pre-requisites but cannot reach the threshold of Bronze rating, it will be graded as “Pre-requisites Achieved”. In case the project fails to demonstrate compliance with any one of the applicable pre-requisites, it will be graded as “Pre-requisite(s) Not Achieved”.

1.3 Summary of Credits

	Section	Credit Requirement	Extent of Application	Credit
2	**Integrated Design and Construction Management (IDCM)**			**25 + 14 BONUS**
IDCM P1	Sustainability Champions - Project	Prerequisite achieved for demonstrating that an accredited BEAM Professional (BEAM Pro) with a valid credential for BEAM Plus New Buildings v2.0 is engaged as the project BEAM Pro of the consultant team. The project BEAM Pro shall: 1) Act as the point of contact with the Hong Kong Green Building Council and the BEAM Society Limited for administrative matters relating to BEAM Plus certification; 2) Participate as one of the key project team members in the design and construction stages, with assistance of the Construction BEAM Pro (and Affiliates, if any) defined under IDCM 6 if any, to oversee the submission materials are in the compliance with relevant requirements of the BEAM Plus Manual. The project BEAM Pro may also assume other roles in the consultant team of the project; 3) Create a BEAM Plus NB Certification Checklist including project goals, performance and BEAM Plus target rating; 4) Provide guidance to the project and construction teams regarding BEAM Plus principles, structure, timing, certification process and requirements of credits; and 5) Advise the Client on relevant professionals or parties on respective tasks to address relevant BEAM Plus certification requirements.	All buildings	Required
IDCM P2	Environmental Management Plan	Prerequisite achieved for demonstrating that an Environmental Management Plan has been properly prepared.	All buildings	Required

	Section	Credit Requirement	Extent of Application	Credit
IDCM P3	Timber Used for Temporary Works	Prerequisite achieved for demonstrating that no virgin forest products are used for temporary works.	All buildings	Required
IDCM 1	Sustainability Champions - Design	1 credit for at least two (2) members from at least two (2) applicable core design disciplines shall be accredited BEAM Professionals with valid credentials for BEAM Plus NB v2.0 for Projects intending to achieve a Bronze rating or above. 1 additional BONUS credit for at least one (1) additional member, from an applicable core design discipline different from the disciplines counted in the above credit, shall be an accredited BEAM Professional with valid credentials for BEAM Plus NB v2.0; **Alternatively,** At least two (2) additional members, of an applicable core design discipline different from the disciplines counted in the above credit, shall be accredited BEAM Affiliates with valid credentials for BEAM Plus NB v2.0.	All buildings	1 + 1 additional BONUS
IDCM 2	Complimentary Certification	(a) BEAM Plus Neighbourhood (ND) 1 BONUS credit where the project is certified by BEAM Plus Neighbourhood (ND) certification. (b) BEAM Plus Interiors (BI) 1 BONUS credit for preparing the Project for BEAM Plus Interiors (BI) certification. (c) BEAM Plus Existing Buildings (EB) 1 BONUS credit for preparing the project for BEAM Plus Existing Buildings (EB) certification (comprehensive scheme).	All buildings that are applicable for respective BEAM Plus certification tools.	3 BONUS
IDCM 3	Integrated Design Process	(a) Early Consideration(s) of Integrated Building Design Process 1 credit for consideration of the integrated design process regarding whole-system thinking to explore the interrelationships among green building design strategies and systems in the conceptual design stage. 1 additional credit for organising at least one multi-disciplinary design charrette to formulate passive and active design	All buildings	4

	Section	Credit Requirement	Extent of Application	Credit
		strategies in the conceptual/ schematic design stages. (b) Early Design Consideration of Buildability/ Constructability 1 credit for early design consideration of buildability to ease construction and save on-site materials/ labour before completion of the design development stage. (c) Design Consideration of Operation and Maintenance 1 credit for design consideration of the long-term operation and maintenance needs of the building and its engineering services.		
IDCM 4	Life Cycle Costing	1 credit for conducting life cycle costing for active systems.	All buildings	1
IDCM 5	Commissioning	2 credits for demonstrating (a) the appointment of commissioning authority (CxA) before tender stage and (b) providing a commissioning plan. 1 credit for providing a commissioning review report before construction as described in part (c). 1 credit for providing commissioning reports as described in part (d).	All buildings	4
IDCM 6	Sustainability Champions - Construction	1 credit for at least two (2) accredited BEAM Professionals with valid credentials for BEAM Plus New Buildings v2.0 are engaged by the main/ lead contractor for the project intending to achieve a Bronze rating or above. Alternatively, 1 credit for at least one (1) accredited BEAM Professional and two (2) accredited BEAM Affiliates, with valid credentials for BEAM Plus New Buildings v2.0 are engaged by the main/ lead contractor of the project intending to achieve a Bronze rating or above.	All buildings	1

	Section	Credit Requirement	Extent of Application	Credit
IDCM 7	Measures to Reduce Site Emissions	(a) Minimisation of Air Pollution 1 credit for providing adequate monitoring and mitigation measures to minimize air pollution during construction (demolition and foundation are included, if any). (b) Minimisation of Noise Pollution 1 credit for providing adequate monitoring and mitigation measures to minimize noise pollution during construction (demolition and foundation are included, if any). (c) Minimisation of Water Pollution 1 credit for providing adequate monitoring and mitigation measures to minimize water pollution during construction (demolition and foundation are included, if any). (d) Minimisation of Light Pollution 1 credit for providing adequate mitigation measures to minimize light pollution during construction (demolition and foundation are included, if any).	All buildings	4
IDCM 8	Construction and Demolition Waste Recycling	(a) Demolition Waste Recycling 1 credit for demonstrating compliance with the Waste Management Plan and the application of proactive waste management provisions during demolition; and recycling at least 15% of demolition waste. 1 additional BONUS credit for demonstration of recycling at least 30% of demolition waste. For exemplary performance, 1 additional BONUS credit for demonstration of recycling at least 60% of demolition waste. (b) Construction Waste Recycling 1 credit for demonstrating compliance with the Waste Management Plan and the application of proactive waste management provisions during construction (foundation to be included, if any); and recycling of at least 15% of construction waste (foundation waste to be included, if any). 1 additional BONUS credit for demonstration of recycling at least 30% of construction waste (foundation waste to be included, if any).	IDCM 8a All buildings requiring demolition which are under the Client's control IDCM 8b All buildings	2 + 4 additional BONUS

	Section	Credit Requirement	Extent of Application	Credit
		For exemplary performance, 1 additional BONUS credit for demonstration of recycling at least 60% of construction waste (foundation waste to be included, if any).		
IDCM 9	Construction IAQ Management	1 credit for implementing a Construction IAQ Management Plan, undertaking a building 'flush out' or 'bake out', and replacement of all filters prior to occupancy.	All areas to implementing a Construction IAQ Management Plan. All areas with central air-conditioning and ventilation systems for undertaking a building 'flush out' or 'bake out' and replacement of all filters prior to occupancy.	1
IDCM 10	Considerate Construction	1 credit for demonstrating considerate measures to the neighbourhood, passers-by and workers. Good tree protection practices where tree preservation within the project site is required, should also be carried out.	All buildings	1
IDCM 11	Building Management Manuals	1 credit for providing a fully documented Operations and Maintenance Manual and Energy Management Manual.	All buildings	1
IDCM 12	Operator Training plus Chemical Storage Room	1 credit for providing training for operations and maintenance staff to the minimum specified; and demonstrating that adequate maintenance facilities are provided for operations and maintenance work.	All buildings	1
IDCM 13	Digital Facility Management Interface	1 BONUS for providing a digital interface in addition to the project design metering provision for future facility management team to review the building operation performance.	All non-residential building and common areas of residential buildings	1 BONUS
IDCM 14	Occupant Engagement Platform	1 BONUS for providing a digital platform to engage building occupants.	All non-residential buildings.	1 BONUS
IDCM 15	Document Management System	(a) Project Team Document Management 1 credit for demonstrating the use of document management systems within the design team.	All buildings	2

	Section	Credit Requirement	Extent of Application	Credit
		(b) Facility Management Team Document Management 1 credit for demonstrating the use of document management platform by the building owner or building management company.		
IDCM 16	BIM Integration	(a) Coordinated Use of BIM within Design Teams 1 credit for the coordinated use of BIM among the design team. (b) Coordinated Use of BIM within Design and Construction teams 1 additional BONUS for coordinated use of BIM among the design team and the contractors. (c) BIM for time 1 BONUS for using the BIM model for scheduling, cost and quantity, schedules preparation and tracking the project budget. (d) BIM for Facility Management Use 1 BONUS for updating the BIM model to as-built condition.	All buildings	1 + 1 additional BONUS + 2 BONUS
IDCM 17	Design for Engagement and Education on Green Buildings	1 credit for providing any two (2) education elements from the following list of green building design measures and provisions accredited by BEAM Plus and implemented in the project. The Project must achieve a rating of Bronze or above. 1) Provide users with manuals for all green building design measures and provisions. 2) Provide educational signage system that is integrated with the major communal areas of the project to educate users and visitors about the benefits of the green building design measures and provisions. 3) Provide users a platform for sustainable living showcase demonstration, experience or sharing that are relevant to the enabling design measures and provisions in the project. e.g. websites, regular publications available to the public, newspapers or other means proposed by the Applicant.	All buildings	1 + 1 additional BONUS

	Section	Credit Requirement	Extent of Application	Credit
		4) Additional or alternative education element(s) proposed by the Applicant with substantiation demonstrating strategies compatible with the listed strategies for achieving the credit objective. 1 additional BONUS credit for providing four (4) education elements mentioned above on green buildings.		
3	**Sustainable Sites (SS)**			**20 + 19 BONUS**
SS P1	Minimum Landscaping Requirements	Prerequisite achieved for demonstrating compliance with minimum planting provisions in terms of viability and site coverage of greenery of at least 20% of the site.	All sites with a site area of 1,000 m^2 or more.	Required
SS 1	Pedestrian-oriented and Low Carbon Transport	(a) Accessibility to Public Transport 1 credit for achieving Accessibility Index of 15 or more for all buildings of a development. (b) Pedestrian-oriented Access 1 credit for achieving 50% or more of the applicable pedestrian-oriented transport planning measures. 1 additional BONUS credit for achieving 100% of the applicable pedestrian-oriented transport planning measures. (c) Cycling Facilities and Network Integration 1 BONUS credit for providing cycling facilities within the Site and integrating with the public cycling network if a public cycling network exists or has been planned nearby. (d) Charging Facilities for Electric Vehicle (EV) 1 BONUS credit for providing EV medium chargers for at least 50% of all parking spaces and EV charging-enabling for all parking spaces (including visitor car parks).	All buildings	2 + 1 additional BONUS + 2 BONUS

	Section	Credit Requirement	Extent of Application	Credit
SS 2	Neighbourhood Amenities	(a) Amenities for Building Users 1 credit where adequate amenities for building users are located within the site or 500m walking distance/ an equivalent horizontal commuting time from the site entrance(s). (b) Shared Amenities for Neighbourhood 1 credit where adequate shared amenities for the neighbourhood are provided within the site and are made available for public use.	All buildings	2
SS 3	Building Design for Sustainable Urbanism	(a) Sustainable Urban Design 1 credit for preparing a site design appraisal report demonstrating a proactive approach in achieving a people-oriented and place-making approach for sustainable site planning, and at least 30% of applicable sustainable urbanism measures are achieved. 2 credits for achieving at least 60% of applicable sustainable urbanism measures. 1 additional BONUS credit for achieving at least 90% of applicable sustainable urbanism measures. (b) Conservation of Cultural Heritage 1 BONUS credit for demonstrating that a proper heritage impact assessment mechanism and its recommendations have been implemented.	All buildings	2 + 1 additional BONUS + 1 BONUS
SS 4	Neighbourhood Daylight Access	1 credit for the designs which the access to daylight of neighbouring sensitive buildings is maintained to the prescribed levels.	All buildings	1
SS 5	Noise Control for Building Equipment	1 credit for demonstrating that the level of the intruding noise at the facade of potential noise sensitive receivers is in compliance with the criteria recommended in the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites.	All buildings	1

	Section	Credit Requirement	Extent of Application	Credit
SS 6	Light Pollution Control	(a) Control of Obtrusive Artificial Light 1 credit for demonstrating that the obtrusive light from exterior lighting meets the specified performance for the environmental zone in which the building development is located. (b) Control of External Light Reflection from Building 1 credit for demonstrating that sunlight reflection from external surfaces of the buildings is controlled by using materials with acceptable external light reflectance.	All buildings	2
SS 7	Biodiversity	(a) Reduction of Ecological Impact 1 credit for demonstrating that all identified habitat types on Site are of low or negligible indicative ecological values **Alternatively,** Demonstrate that all identified habitat types on Site of medium to high indicative ecological value are preserved intact and are either unaffected by the planned development 1 additional BONUS credit for demonstrating that existing trees are retained in situ such that the combined girth of the retained trees, with individual girth of at least 150mm for below requirement. At least 20% of the total girth of all existing trees on site. 1 additional BONUS for demonstrating that existing trees are retained in situ such that the combined girth of the retained trees, with individual girth of at least 150mm for below requirement. At least 40% or more of the total girth of all existing trees on site. (b) Enhancement of Biodiversity Prepare a manual on biodiversity-friendly landscape maintenance, **PLUS** each of the following measures for enhancing the biodiversity of the Site: 1 BONUS plus Physical connectivity between areas with ecological values 1 BONUS plus Increase diversity and complexity of planting 1 BONUS plus Wildlife-friendly building features (e.g. windows and lighting)	SS 7a All site with existing tree except brownfield sites or sites on reclaimed land. SS 7b Sites with adjacent areas of medium or high ecological value.	1 + 2 additional BONUS + 3 BONUS

	Section	Credit Requirement	Extent of Application	Credit
SS 8	Urban Heat Island Mitigation	For Site area <1000m^2 (a) Urban Design Guidelines Chapter 11 1 credit for implementing at least 2 site level strategies under Section 11 of Hong Kong Planning Standards and Guidelines Chapter 11 Urban Design Guidelines. For Site area ≥ 1000m^2 (a) Sustainable Building Design Measures 1 credit for providing shade on at least 5% of the site area and 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). 1 credit for demonstrating compliance with prescribed requirements of the SBD Guidelines as promulgated in the PNAP APP-152. 1 additional BONUS credit for demonstrating compliance with prescribed requirements and relevant prescriptive requirements of the SBD Guidelines as promulgated in the PNAP APP-152 with enhanced performances. (b) Tree Coverage 2 BONUS credit for demonstrating that at least 10% of the total Site Area is provided with tree coverage. For exemplary performance, 1 additional BONUS credit where 20% or more of the site is provided with tree coverage. (c) Air Ventilation Assessment (AVA) For conducting an AVA by wind tunnel or Computer Fluid Dynamics (CFD) according to the prevailing AVA methodology introduced by the Government demonstrating that better or equivalent ventilation performances than a baseline case: 1 credit for demonstrating annual wind condition. 1 credit for demonstrating summer wind condition. (d) Intra Urban Heat Island Study 2 BONUS credit for conducting an Intra Urban Heat Island Study demonstrating that a maximum Intra-Urban Heat Index (difference between T_{urban} and T_{met}) in summer is less than 0.8 °C.	All buildings	For Site area < 1000m^2: 1 For Site area ≥ 1000m^2: 4 + 2 additional BONUS + 4 BONUS

	Section	Credit Requirement	Extent of Application	Credit
SS 9	Immediate Neighbourhood Wind Environment	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.	All buildings	1
SS 10	Outdoor Thermal Comfort	(a) Shaded or Covered Routes 1 credit where at least one shaded or covered route, connects the site with nearby amenities/site main entrance/transport hub. (b) Passive Open Spaces with Thermal Comfort 1 credit where 50% or more of the passive open spaces and pedestrian zones achieve thermal comfort. This is demonstrated on a typical summer day at 3:00 pm in Hong Kong.	All sites with site area of 1,000m^2 or more.	2
SS 11	Stormwater Management	2 credit for demonstrating that adequate stormwater management design measures have been provided to cater the total volume of runoff for one hour corresponding to a design rainfall of at least 30mm/event for the site in its post-developed conditions. 1 additional BONUS credit for demonstrating that adequate stormwater management measures have been provided to cater the total volume of runoff corresponding to a design rainfall of at least 40mm/event for the site in its post-developed conditions.	All sites with site area of 1,000m^2 or more.	2 + 1 additional BONUS
SS 12	Design for Climate Change Adaptation	1 BONUS for studying the projected variation in temperature and rainfall and water level rise/storm surge of adjacent water bodies due to climate change and its impact on the development and prepare mitigation proposal to improve the climate resilience of the building. 1 additional BONUS for including quantitative calculation to support the resilience design which is technically eligible and cost effective.	All buildings	1 BONUS + 1 additional BONUS

	Section	Credit Requirement	Extent of Application	Credit
4	**Materials and Waste (MW)**			**14 + 21 BONUS**
MW P1	Minimum Waste Handling Facilities	Prerequisite achieved for meeting the minimum provisions of waste recycle facilities for the collection, sorting, storage, recycling (recovered material) and disposal (waste).	All buildings except one-single family domestic building with not more than 3 floors, or domestic part of a composite building for one single family with not more than 3 floors, or a building not normally occupied or for transient stay (e.g. pump house, sewage treatment plant, carpark building).	Required
MW 1	Building Re-use	Compliance Method 1 1 BONUS credit for the reuse of 20% or more (by mass or volume) of existing structures (sub-structure and superstructure). 2 BONUS credits for the reuse of 40% or more (by mass or volume) of existing structures (sub-structure and superstructure). For exemplary performance, 1 additional BONUS credit for the reuse of 90% or more (by mass or volume) of existing structures (sub-structure and superstructure). **Alternatively,** Compliance Method 2 1 BONUS credit for the reuse of 25% or more (by surface area) of superstructure elements (including at least floor, roof decking) & enclosure materials (including at least skin, framing). 2 BONUS credits for the reuse of 50% or more (by surface area) of superstructure elements (including at least floor, roof decking) & enclosure materials (including at least skin, framing). For exemplary performance, 1 additional BONUS credit for the reuse of 90% or more (by surface area) of superstructure elements (including at least floor, roof decking) & enclosure materials (including at least skin, framing).	All buildings	2 BONUS + 1 additional BONUS

	Section	Credit Requirement	Extent of Application	Credit
MW 2	Modular and Standardised Design	1 credit for designing modular elements which contributed at least 50% (by mass, volume, dollar value or surface area) of the major elements and modules in the project. For exemplary performance, 1 additional BONUS credit for designing modular elements which contributed 90% or more (by mass, volume, dollar value or surface area) of the major elements and modules in the project.	All buildings except for a single one-storey building with total floor areas not exceeding 230m^2	1 + 1 additional BONUS
MW 3	Prefabrication	(a) Structural Elements 1 credit when 10% of the prefabricated structural elements has been manufactured off-site. 1 additional BONUS credit when 20% of the prefabricated structural elements has been manufactured off-site. **Alternatively,** (b) Façade Elements 1 credit when 10% of prefabricated facade elements has been manufactured off-site. 1 additional BONUS credit when 20% of prefabricated facade elements has been manufactured off-site. **Alternatively,** (c) Architectural/ Internal Building Elements 1 credit when 10% of prefabricated architectural/ internal building elements has been manufactured off-site. 1 additional BONUS credit when 20% of prefabricated architectural/ internal building elements has been manufactured off-site. 1 additional BONUS credit for compliance with the requirements listed in above sub-item (a), (b) and (c). For exemplary performance, 1 additional BONUS credit when 50% or more of the prefabricated elements in sub-item (a) or (b) or (c) has been manufactured off-site.	All buildings	1+3 additional BONUS

	Section	Credit Requirement	Extent of Application	Credit
MW 4	Design for Durability and Resilience	(a) Building Material Selection Appraisal 1 credit for appraisal report demonstrating a proactive approach to evaluate the durability of the building materials with at least 3 of the relevant listed items. (b) Protecting Vulnerable Parts of the Building from Damage 1 BONUS credit for providing suitable protective measures, or designed features or solutions to prevent damage to vulnerable parts. (c) Protecting Exposed Parts of the Building from Material Degradation 1 BONUS credit for incorporating appropriate design and specification measures to limit material degradation due to environmental factors.	All buildings	1+2 BONUS
MW 5	Sustainable Forest Products	1 credit for demonstrating at least 30% (for residential development) and 50% (for non-residential development) of all timber and composite timber products used in the project are from sustainable sources/ recycled timber. For exemplary performance, 1 additional BONUS for demonstrating 90% or more of all timber and composite timber products used in the project are from sustainable sources/ recycled timber.	All buildings	1+1 additional BONUS
MW 6	Recycled Materials	(a) Outside Surface Works and Structures 1 credit where at least 10% of all materials used for site exterior surface works, structures and features with recycled content. **Alternatively,** (b) Building Façade and Structural Components 1 credit where at least 10% of all materials used for facade and structural components are materials with recycled content; **OR** the use of Pulverised Fuel Ash (PFA) as a partial cement replacement in concrete that the PFA content is not less than 25%; **OR**	All buildings	1+2 additional BONUS

	Section	Credit Requirement	Extent of Application	Credit
		the use of Ground Granulated Blast furnace Slag (GGBS) as a partial cement replacement in concrete that the GGBS content is not less than 40%. **Alternatively,** (c) Interior Non-structural Components 1 credit where at least 10% of all materials used for interior non-structural components are materials with recycled content. 1 additional BONUS credit for compliance with requirements listed in sub-item (a), (b) and (c). For exemplary performance, 1 additional BONUS credit where 50% or more of all materials used for sub-item (a) or (b) or (c) are materials with recycled content.		
MW 7	Ozone Depleting Substances	(a) Refrigerants 1 credit for the use of refrigerants with a value less than or equal to the threshold of the combined contribution to ozone depletion and global warming potentials using the specified equation. (b) Ozone depleting materials 1 credit for the use of products in the building fabric and services that avoid using ozone depleting substances in their manufacture, composition or use.	All buildings	2
MW 8	Regional Materials	1 credit for the use of regional materials meeting prescribed requirement, which contribute at least 10% of all building materials used in the project. 1 additional BONUS credit for the use of regional materials meeting prescribed requirement, which contribute at least 20% of all building materials used in the project. For exemplary performance, 1 additional BONUS credit for the use of regional materials meeting prescribed requirement, which contribute 50% or above of all building materials used in the project.	All buildings	1+2 additional BONUS
MW 9	Use of Certified Green Products	(a) Certified Green Products 1 credit for having at least 5% certified green products in one (1) of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components).	All buildings	2+3 additional BONUS + 1 BONUS

	Section	Credit Requirement	Extent of Application	Credit
		2 credit for having at least 5% certified green products in two (2) of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components). 1 additional BONUS credit for having at least 5% of certified green products under Construction Industry Council (CIC) Green Product Certification, Carbon Labelling Scheme/ HKGBC Green Product Accreditation and Standard (HK G-Pass) in one (1) of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components). For exemplary performance, 1 additional BONUS credit for having at least 25% of certified green products under CIC Green Product Certification, CIC Carbon Labelling Scheme/ HK G-PASS in one (1) of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components). (b) Rapidly renewable materials 1 BONUS credit for demonstrating 5% of all building materials/ products of interior non-structural components in the project is rapidly renewable materials. For exemplary performance, 1 additional BONUS credit for demonstrating 25% of all building materials/ products of interior non-structural components in the project is rapidly renewable materials.		
MW 10	Life Cycle Assessment	1 credit for demonstrating the embodied energy in the major elements of the building structure of the building has been studied and optimised through a Life Cycle Assessment (LCA).	All buildings	1

	Section	Credit Requirement	Extent of Application	Credit
MW 11	Adaptability and Deconstruction	(a) Spatial Adaptability 1 credit for designs providing spatial flexibility that can adapt spaces for different uses and allows for expansion to permit additional spatial requirements to be accommodated. **Alternatively,** (b) Flexible Engineering Services 1 credit for flexible design of services that can adapt to changes of layout and use. **Alternatively,** (c) Structural Adaptability 1 credit for designs providing flexibility through the use of building structural systems which allow for change in future use, and which is coordinated with interior planning modules. 1 additional BONUS credit for compliance with requirements listed in sub-item (a), (b) and (c).	All buildings	1 + 1 additional BONUS
MW 12	Enhanced Waste Handling Facilities	(a) Additional Recyclables Collection 1 credit for the provision of facilities for collection, sorting, storage and disposal of 2 other recyclable streams in addition to those described in MW P1. (b) Additional Facility Provisions to Enable enhanced Municipal Solid Waste (MSW) Charing **Scheme** 1 credit for additional facilities for collection, sorting, storage and disposal of recyclables in addition to those described in MW P1 and MW12 part (a). (c) Waste Treatment Equipment 1 BONUS credit for providing at least one set of waste treatment equipment. (d) Alternatives to Recycling Facilities 1 BONUS credit for providing alternative means of waste collection systems.	All buildings except one single family domestic building with not more than 3 floors, or domestic part of a composite building for one single family with not more than 3 floors, or a building not normally occupied or for transient stay (e.g. pump house, sewage treatment plant, carpark building).	2 + 2 BONUS

	Section	Credit Requirement	Extent of Application	Credit
5	**Energy Use (EU)**			**31 + 13 BONUS**
EU P1	Minimum Energy Performance	Demonstrate performance improvement against the latest edition of Building Energy Code (BEC). <u>For BEC Governing Building Types:</u> Refer to the latest edition of BEC to demonstrate that performance improvement is achieved in both of the following building services systems provided by the project owner: 1. Improve 2% of code specified minimum coefficient of performance (COP) for Air-conditioning equipment unit; and 2. Reduce 3% of code specified maximum allowable lighting power density for lighting installation. <u>For Non-BEC Governing Building Types:</u> All Non-BEC governing building types and spaces are required to demonstrate their compliance with the latest BEC on: 1. Air-conditioning equipment efficiency (full load COP); and 2. Lighting power density for listed space type in the code. <u>For buildings consist of BEC and non-BEC Governing Building or Space type:</u> All requirements of compliance listed in this credit are required.	All buildings	Required
EU 1	Low Carbon Passive Design	Passive designs that can reduce building HVAC load, facilitate natural ventilation and maximise daylight will be rewarded in this credit under either prescriptive path or performance path. **Option 1: Prescriptive Path** 4 Credits for incorporating any 4 of the passive design strategies listed below: 1) Optimum Spatial Planning 2) External Overhang (fix/ movable) 3) Vegetated Building Envelope 4) Cross Ventilation Provision (normally occupied space) 5) Cross Ventilation Provision (not normally occupied space) 6) Daylight Provision	All buildings	6

Section		Credit Requirement	Extent of Application	Credit
		Option 2: Performance Path **<u>HVAC Load Reduction</u>** 1) Built Form and Orientation 1 credit for reducing building envelope load from a hypothetic case with at least 22.5° difference in orientation with justification by simulation. 2) Optimum Spatial Planning 1 credit for demonstrating consideration of optimum spatial planning to enhance energy conservation with justification by simulation. 3) External Shading Devices 1 credit for the provision of fixed or movable external shading devices, in the form of vertical or horizontal sun shading feature with justification by simulation. 4) Vegetated building envelope 1 credit for the provision of vegetated building envelope with justification by calculation. **<u>Natural Ventilation</u>** 5) Space Layout for Natural Ventilation 1 credit for demonstrating that project space (both normally occupied space and not normally occupied space) is designed to facilitate the utilisation of natural ventilation with justification by simulation. **<u>Daylight</u>** 6) Space Layout for Daylight Penetration 1 credit for demonstrating that the space is well-lit by daylight and reduce occupants' dependency on artificial lighting with justification by simulation method.		
EU 2	Reduction of CO_2 Emissions	Select one of the 2 compliance path options described below. **Option 1 – Performance Path (1-10 Credits + 5 Bonus)** Demonstrate a percentage of reduction on annual CO_2 emission of the proposed building performance compared with the baseline performance. 1 to 10 credits for annual CO_2 emission reduction from 1% to 19%.	All buildings	10 + 5 BONUS

	Section	Credit Requirement	Extent of Application	Credit
		Additional 1 to 5 BONUS for annual CO_2 emission reduction from 21% to 29%. **Option 2 – Prescriptive Path (1-7 Credits)** Demonstrate a prescriptive compliance in below listed item. Residential buildings and non-residential buildings should follow different path. For building consist of both residential and non-residential parts, demonstrate the compliance for all requirements as listed below. (a) Passive Building Design Enhancement (0.5 to 3 credits) • Building Envelope • Natural Ventilation (b) Active Building Design Improvement (1 to 4 credits) • Each air-conditioning equipment • Lighting System • Lift and escalator installation (N/A for building with No Lift & Escalators)		
EU 3	Peak Electricity Demand Reduction	**Option 1 - Based on EU 2 Performance Path** 1 to 3 credits for reducing the peak electricity demand by the following saving percentages from 5% to 15%. **Option 2 - Based on EU 2 Prescriptive Path** 1 credit for EU3 when 4 credit points in EU2 (prescriptive path) is achieved. 2 credits for EU3 when 7 credit points in EU2 (prescriptive path) is achieved.	All Buildings	3
EU 4	Metering and Monitoring	(a) Fundamental Metering and Monitoring 1 credit for providing **energy** monitoring system for equipment and systems in spaces. 1 BONUS credit for providing **performance auditing** monitoring system for equipment and systems in spaces (b) Metering for Tenanted Area 1 BONUS credit for allowing monitoring provision of tenants' energy consumption.	All Non-residential buildings and common area of residential buildings	1 + 2 BONUS

	Section	Credit Requirement	Extent of Application	Credit
EU 5	Renewable and Alternative Energy Systems	(a) Solar Energy Feasibility Study 1 credit for evaluating the building roof's potential in harnessing solar energy. (b) On-site Renewable Energy Application 1 to 5 credits plus 5 additional BOUNS for using on-site renewable energy systems to offset annual building energy consumption for controlled area to offset 0.2% to 2% energy consumption.	All buildings	6 + 5 additional BONUS
EU 6	Air-Conditioning Units	(a) Compliance with Manufacturer's Recommendation. 1 credit for complying with manufacturer's recommended installation positions for optimal heat rejection. (b) Performance Verification 1 credit for demonstrating the operating temperatures of all window type, split-type or packaged type air-conditioning units do not exceed manufacturer's recommendation for the specified COP in the manufacturer's technical specifications via computational simulation techniques.	All buildings using window or split-type air conditioners.	2
EU 7	Clothes Drying Facilities	(a) Provision of Clothes Drying Facilities 1 credit for providing permanent clothes drying facilities provision for all residential units under suitable location conditions. (b) Demonstration of Effectiveness 1 BONUS credit for demonstrating the effectiveness of permanent clothes drying facilities via computational analysis.	Residential buildings	1 + 1 BONUS
EU 8	Energy Efficient Appliances	1 credit when 60% of total rated power of appliances are certified energy efficient products. 2 credits when 80% of total rated power of appliances are certified energy efficient products.	Residential buildings and hotel	2

	Section	Credit Requirement	Extent of Application	Credit
6	**Water Use (WU)**			**12 + 3 BONUS**
WU P1	Minimum Water Saving Performance	Demonstrate that the use of water efficient flow devices leads to an estimated annual saving of 10%.	All buildings	Required
WU 1	Annual Water Use	(a) Further Potable Water Saving 1o 3 credits for demonstrating that the use of water efficient flow devices leads to an estimated annual saving from 20% to 30%. (b) Exemplary Potable Water Saving. 1 additional BONUS credit for demonstrating that the use of water efficient flow devices leads to an estimated annual saving of 40%.	All buildings	3 + 1 additional BONUS
WU 2	Water Efficient Irrigation	1 to 2 credits for reducing potable water consumption for irrigation from 25% to 50% in comparison with the baseline. 1 additional BONUS credit for reducing potable water consumption for irrigation by 100% in comparison with the baseline.	All Buildings with permanent greenery and permanent irrigation system.	2 + 1 additional BONUS
WU 3	Water Efficient Appliances	1 credit for installing water efficient appliances that achieve Grade 1 under the WSD's Water Efficiency Labelling Scheme.	*Residential Buildings*.	1
WU 4	Water Leakage Detection	1 credit for installing water leakage detection systems in all municipal potable water tank rooms.	All buildings	1
WU 5	Twin Tank System	1 credit for providing twin tank for potable water supply system and flushing water supply system.	All buildings	1
WU 6	Cooling Tower Water	1 credit for achieving 7 or more cycles of concentration with acceptable water quality.	All buildings equipped with cooling tower using potable water as makeup water.	1
WU 7	Effluent Discharge to Foul Sewers	1 credit for demonstrating a reduction in annual sewage volumes by 20% or more.	All buildings	1
WU 8	Water Harvesting and Recycling	(a) Harvested Rainwater 1 credit for harvesting of rainwater that achieve a reduction of 5% or more in the consumption of potable water.	All buildings	2 + 1 BONUS

	Section	Credit Requirement	Extent of Application	Credit
		(b) Recycled Grey Water 1 credit for recycled grey water that achieve a reduction of 5% or more in the consumption of potable water. (c) Exemplary Water Recycling 1 BONUS credit where harvested rainwater, recycled grey water or a combination of both leads to a reduction of 10% or more in the consumption of potable water.		
7	**Health and Wellbeing (HWB)**			**19 + 10 BONUS**
HWB P1	Minimum Ventilation Performance	(a) Measure outdoor air pollutants on-site prior to building design to understand the site conditions. (b) Demonstrate the project is in compliance with the minimum ventilation quantity with respective to its designed ventilation mode.	All buildings	Required
HWB 1	Healthy and Active Living	1 BONUS credit for scoring at least 3 items of all applicable design measures for healthy and active living.	Indoor / semi-outdoor communal areas of building development.	1 BONUS
HWB 2	Biophilic Design	1 BONUS credit for demonstrating visual connection with nature and/ or biophilic design features at an assessment space with Visual Quality Score of 2 or above. 1 additional BONUS credit for demonstrating visual connection with nature and/ or biophilic design features at an assessment space with Visual Quality Score of 3 or above.	All Buildings	1 BONUS + 1 additional BONUS
HWB 3	Inclusive Design	(a) Universal Accessibility 1 credit for providing at least ten (10) applicable enhanced provisions as stipulated in the “Recommended Design Requirements” of BFA 2008. (b) Weather protection and family friendly features 1 BONUS credit for providing prescribed weather protection and at least two (2) family friendly facilities features.	All buildings	1 + 1 BONUS

	Section	Credit Requirement	Extent of Application	Credit
HWB 4	Enhanced Ventilation	(a) Fresh Air Provision **1) Fresh air provision in normally occupied spaces** 1 credit for demonstrating that all normally occupied spaces in the building are provided with increased ventilation. **2) Fresh air provision in not normally occupied spaces** 1 credit for demonstrating that all not normally occupied spaces in the building are provided with adequate ventilation. **3) On-site measurements** 1 additional BONUS credit for conducting on-site measurements to verify the ventilation performance for all normally occupied spaces. (b) Exhaust air 1 credit for the provision of an effective ventilation system for spaces where significant indoor pollution sources are generated.	All buildings	3 + 1 additional BONUS
HWB 5	Waste Odour Control	1 credit for installing odour sensor at all discharge points from enclosed waste disposal and recycling spaces.	All buildings	1
HWB 6	Acoustics and Noise	(a) Room Acoustics 1) 1 credit for demonstrating that mid-frequency reverberation time in applicable spaces of landlord's-controlled area meets the prescribed criteria of different types of premises. 2) 1 credit for demonstrating that mid-frequency reverberation time in applicable rooms of non-landlord meets the prescribed criteria of different types of premises. (b) Noise Isolation 1) 1 credit for demonstrating airborne noise isolation between, spaces fulfils the prescribed criteria. 2) 1 BONUS for demonstrating impact noise isolation between floors fulfills the prescribed criteria. (c) Background Noise 1 credit for demonstrating background noise levels within the prescribed criteria	All buildings for parts (a) (1), (b) (1) and (c) All buildings with tenanted spaces for parts (a) (2) Residential buildings for part (b) (2)	4 + 1 BONUS

	Section	Credit Requirement	Extent of Application	Credit
		(including traffic noise and external building services equipment that are within the project boundary).		
HWB 7	Indoor Vibration	1 credit for demonstrating vibration levels not exceeding the prescribed criteria.	All buildings	1
HWB 8	Indoor Air Quality	(a) Indoor air quality in occupied spaces **1.1 Path 1** 2 credits for demonstrating compliance with the prescribed limits for Carbon monoxide (CO), Nitrogen dioxide (NO_2), Ozone (O_3), Carbon dioxide (CO_2), Respirable suspended particulates (PM_{10}), Total volatile organic compounds (TVOCs), Formaldehyde (HCHO) and Radon (Rn) in the sampled occupied spaces. 1 credit for demonstrating compliance with the prescribed limits for Airborne bacteria and conduct the Mould assessment in the sampled occupied spaces. **1.2 Path 2** 3 credits for submitting a valid IAQ Certification Scheme (Good Class) certificate issued by the Environmental Protection Department (EPD) covering the whole building. **1.3 Path 3** 3 credits and 1 BONUS credit for submitting a valid IAQ Certification Scheme (Excellent Class) certificate issued by the Environmental Protection Department (EPD) covering the whole building. (b) Air Quality in Car Park 1 credit for demonstrating compliance with the pollutant concentration limits specified in ProPECC PN 2/96.	All buildings for parts (a) and (b) All buildings with enclosed and/ or semi-enclosed car park of areas more than 10% of Construction Floor Area for part (b). All buildings with enclosed and/ or semi-enclosed parking for part (b)	4 + 1 additional BONUS

	Section	Credit Requirement	Extent of Application	Credit
HWB 9	Thermal Comfort	(a) Thermal Comfort Analysis 2 credits for conducting thermal comfort analysis and demonstrate that normally occupied spaces can fulfil the thermal comfort requirements. (b) Thermal Comfort Measurement 1 additional BONUS credit for conducting on-site measurements to verify the thermal comfort performance.	All buildings	2 + 1 additional BONUS
HWB 10	Artificial Lighting	(a) Artificial lighting in normally occupied spaces 1 credit for achieving the prescribed lighting performance in normally occupied spaces. (b) Artificial lighting in not normally occupied spaces and unoccupied spaces 1 credit for achieving the prescribed lighting performance in not normally occupied spaces and unoccupied spaces.	All buildings	2
HWB 11	Daylight	2 BONUS credits for demonstrating at least 55% of the total area of the studied normally occupied spaces achieves spatial Daylight Autonomy$_{300/50\%}$ ($sDA_{300/50\%}$) and no more than 10% of the same area receives Annual Sunlight Exposure$_{100,250}$ ($ASE_{1000,\ 250}$).	Residential, office and education buildings	2 BONUS
HWB 12	Biological Contaminations	1 credit for complying with the recommendations given in the Code of Practice for Prevention of Legionnaires' Disease 2016 Edition in respect of Water Supply Systems, HVAC Systems and other Water Features.	All buildings	1
8	**Innovations and Additions (IA)**			**Maximum 10 BONUS**
IA 1	Innovations and Additions	Present evidence of the application of new practices, technologies and/ or techniques that are (1) not described in this manual; or (2) not market mainstream implementation; or (3) multiple aspect achievement; and the associated benefits in addressing sustainability objectives for new buildings.	All buildings, for innovations that have not been addressed in respective categories of the NB certification.	Maximum 10 BONUS for IA

2	**Integrated Design and Construction Management (IDCM)**	**2.P Prerequisite** **2.1 Integrated Design Process** **2.2 Green Construction Practices** **2.3 Smart Design and Technologies** **2.4 Design for Engagement and Education on Green Buildings**
	Introduction	This section focuses on the integration design management which maximises the opportunities for integrated and cost-effective green design approaches and construction methodologies; improvement in user's health and wellbeing; smart technologies and innovative approaches for green design and construction.
2.P	**Prerequisite**	**IDCM P1 Sustainability Champions – Project** **IDCM P2 Environmental Management Plan** **IDCM P3 Timber Used for Temporary Works**
	Background	This part sets out the minimum requirements for integrated design management in terms of engaging the Project BEAM Professional (BEAM Pro) to facilitate the certification, non-virgin timber used for temporary works, Environmental Management Plan and Waste Management Plan during construction.
2.1	**Integrated Design Process**	**IDCM 1 Sustainability Champions - Design** **IDCM 2 Complimentary Certification** **IDCM 3 Integrated Design Process** **IDCM 4 Life Cycle Costing** **IDCM 5 Commissioning**
	Background	An integrated process is a comprehensive approach to building systems and equipment design. With the guidance of Project BEAM Pro, the project team looks for synergies among systems and components, the mutual advantages that can help in achieving high levels of building performance for human comfort and environmental benefits. The process should involve rigorous questioning, coordination and challenge to the typical project assumptions. Team members collaborate to enhance the efficiency and effectiveness of every system.
2.2	**Green Construction Practices**	**IDCM 6 Sustainability Champions - Construction** **IDCM 7 Measures to Reduce *Site* Emissions** **IDCM 8 *Construction and Demolition Waste* Recycling** **IDCM 9 Construction IAQ Management** **IDCM 10 Considerate Construction** **IDCM 11 Building Management Manuals** **IDCM 12 Operator Training plus Chemical Storage and Mixing Room**
	Background	Construction *site* activities can be the significant source of environmental degradation, unless appropriate steps are taken to reduce the emissions to air, land and water, and to reduce annoyance from construction related noise. It is the responsibility of contractors to do all in their ability to employ appropriate construction methods to reduce air, noise, water and light pollution.

2.3	**Smart Design and Technologies**	**IDCM 13**	**Digital Facility Management Interface**
		IDCM 14	**Occupant Engagement Platform**
		IDCM 15	**Document Management System**
		IDCM 16	**BIM Integration**
	Background	To encourage the use of automation, data and behavioural science to enable the building professionals to boost and maintain energy efficiency by optimising equipment and related processes for energy performance and comfort requirements.	
2.4	**Design for Engagement and Education on Green Buildings**	**IDCM 17**	**Design for Engagement and Education on Green Buildings**
	Background	To encourage public education that focuses on strategies and solutions applied to the green buildings.	

2	**Integrated Design and Construction Management**	**2.P**	**Prerequisite**

IDCM P1 Sustainability Champions – Project

Extent of Application All buildings

Objective Facilitate the application of the BEAM Plus certification process and to ensure the compliance of relevant requirements of the BEAM Plus Manual.

Credits Attainable Prerequisite

Credit Requirement Prerequisite achieved for demonstrating that an accredited BEAM Professional (BEAM Pro) with a valid credential for BEAM Plus New Buildings is engaged as the project BEAM Pro of the consultant team.

The project BEAM Pro shall:

1. Act as the point of contact with the Hong Kong Green Building Council and the BEAM Society Limited for administrative matters relating to BEAM Plus certification;
2. Participate as one of the key project team members in the design and construction stages, with the assistance of the Construction BEAM Pro (and Affiliates, if any) defined under IDCM 6 if any, to oversee the submission materials are in compliance with relevant requirements of the BEAM Plus Manual. The project BEAM Pro may also assume other roles in the consultant team of the project;
3. Create a BEAM Plus NB Certification Checklist including project goals, performance and BEAM Plus target rating;
4. Provide guidance to the project and construction teams regarding BEAM Plus principles, structure, timing, certification process and requirements of credits; and
5. Advise the Client on relevant professionals or parties on respective tasks to address relevant BEAM Plus certification requirements.

Assessment

1) Complete the prescribed form with qualification details, appointment information and confirmation of appointment of the project BEAM Pro. The appointed project BEAM Pro should provide valid credentials from appointment to completion of the certification process. If more than 1 project BEAM Pro was employed for the project, the applicant should clearly document the works for each BEAM Pro and how the works are handed over and the timeline for their involvement.
2) Provide a BEAM Plus NB Certification Checklist which shall include the following:

   2.1 Determine the BEAM Plus certification level to pursue (certified, Bronze, Silver, Gold, or Platinum);

   2.2 Select the BEAM Plus credits to meet the targeted certification level; and

   2.3 Identify the responsible parties to ensure the BEAM Plus requirements for each prerequisite and selected credits are met.

   2.4 Changes between PA and FA stage should be recorded and a summary should be submitted to report the changes in submission.

3) Provide a copy of the meeting minute (date and content of the minute will be reviewed for compliance) showing the participation of the Project BEAM Pro. Confidential or sensitive project information on the minute is not required and should be excluded:

3.1 Introductory workshop/ meeting
Highlight the attendance of project BEAM Pro and his/ her section in providing guidance to the project team regarding BEAM Plus principles, structure, timing and certification processes;

3.2 Kick-off meeting with building main contractor
Highlight the attendance of BEAM Pro and contractor representative(s). Indicate the coordination with construction BEAM Pro (and Affiliates, if any) as defined under IDCM 6, if any. Highlight the key BEAM Plus requirements during the construction stage; and

3.3 One review meeting minute
Highlight the attendance of BEAM Pro and the section of providing guidance on BEAM Plus requirements to the contractors during construction.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_P1_00	BEAM Plus NB submission template for IDCM P1	✓	✓
IDCM_P1_01	Prescribed form [IDCM-P1-1_Form_r1] on details of Project BEAM Pro, appointment information and confirmation of appointment	✓	✓
IDCM_P1_02	BEAM Plus NB Certification Checklist	✓	✓
IDCM_P1_03	A copy of the meeting minute of introductory workshop/ meeting	✓	-
IDCM_P1_04	A copy of the meeting minute of kick-off meeting with main building contractor/ Construction BEAM Pro	✓*	✓
IDCM_P1_05	A copy of the meeting minute of review meeting with contractor	✓*	✓
* Evidences of compliance with prerequisite requirements for construction works carried out prior to PA (first submission) shall be submitted in PA.			

Remarks

(a) Additional Information

Hong Kong Green Building Council publishes the latest registers of BEAM Professionals and BEAM Affiliates on its website.

[ONLINE] Available at:
https://www.practitioner.hkgbc.org.hk/beam-professional
[Accessed Aug 2019]

(b) Related Credits

IDCM 1 Sustainability Champions – Design
The related credit encourages the engagement of Design BEAM Pro(s) and/ or Affiliates engaged by respective core design disciplines to integrate BEAM standards and practices into the planning, design and construction of the building.

IDCM 3 Integrative Design Process
The related credit encourages early consideration of integrative building design process, buildability and operational issues to support holistic and cost-effective outcomes of building performance, human health and environmental benefits.

IDCM 6 Sustainability Champions – Construction
The related credit encourages the engagement of BEAM Pros and/ or Affiliates engaged by contractors during construction to work collaboratively with the project BEAM Pro to monitor progress against targeted construction-related BEAM Plus requirements.

2 Integrated Design and Construction Management	**2.P**	**Prerequisite**
	IDCM P2	**Environmental Management Plan**
Extent of Application	All buildings	
Objective	Encourage a high standard of environmental management during construction.	
Credits Attainable	Prerequisite	
Credit Requirement	Prerequisite achieved for demonstrating that an Environmental Management Plan has been properly prepared.	
Assessment	1) An *Environmental Management Plan (EMP)* shall be prepared to address potential significant environmental aspects and impacts, to propose appropriate mitigation measures, to include environmental monitoring and auditing plans and to propose a waste management system. Reference shall be made to all of the following: 1.1. Environment, Transport and Works Bureau (ETWB)'s Technical Circular (Works) 19/2005, Appendix C [1]; 1.2. Hong Kong Construction Association (HKCA)'s Best Practice Guide for Environmental Protection on Construction Sites, Section 3.2.3 [2]; 1.3. Environmental Protection Department (EPD)'s Environmental Monitoring and Audit - Guidelines for Development Projects in Hong Kong, Appendix D2 [3] (further clarify the requirement is required by EIA?) 1.4. Building Departments, PNAP ADV-19, Construction and Demolition Waste [4] 1.5. Project Administration Handbook for Civil Engineering Works, Section 4.1.3, Construction and Demolition Materials [5] 2) For a project that is subject to EPD's scrutiny, environmental measurement points agreed by EPD shall be adopted.	

1 Environment, Transport and Works Bureau (ETWB). Technical Circular (Works) 19/2005, Appendix C. [ONLINE] Available at: http://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/19/1/C-2005-19-0-1.pdf. [Accessed August 2019].

2 Hong Kong Construction Association (HKCA). Best Practice Guide for Environmental Protection on Construction Sites, 3.2.3. [ONLINE] Available at: http://www.hkca.com.hk/uploads/eversioin_docs/e33f38c5128a824b4f7cb18b7b5ab751.pdf. [Accessed August 2019].

3 Environmental Protection Department (EPD). Environmental Monitoring and Audit - Guidelines for Development Projects in Hong Kong Appendix D2. [ONLINE] Available at: http://www.epd.gov.hk/eia/hb/materials/images/AppendixD2.pdf. [Accessed August 2019].

4 Building Departments, PNAP ADV-19, Construction and Demolition Waste. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/ADV/ADV019.pdf. [Accessed August 2019].

5 Project Administration Handbook for Civil Engineering Works, Section 4.1.3, Construction and Demolition Materials [ONLINE] Available at https://www.cedd.gov.hk/filemanager/eng/content_80/PAH%202018%20Chapter%204%20Rev%2001%20HL%20-%20190718.pdf [Accessed Aug 2019].

3) Provide EMP(s) of construction (demolition and foundation to be included, if any) prepared by contractors and reviewed/ endorsed by Construction BEAM Pro (or Construction BEAM Affiliate) defined under IDCM 6 or Project BEAM Pro defined under IDCM P1. If the EMP is reviewed/ endorsed by the construction BEAM Pro/ Affiliate as defined under IDCM 6, supporting documents for IDCM 6 need to be appended to IDCM_P2_01.

4) Provide extracts of tender documents (e.g. specifications) highlighting the clause requiring contractors to prepare EMP(s), if no construction stage has commenced before the submission of PA stage.

5) Provide endorsed EMP(s), if any construction stage has commenced before the submission of PA.

6) If IDCM 7 (d) is targeted, the corresponding plan and measures in achieving the credit should be included in the EMP.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_P2_00	BEAM Plus NB submission template for IDCM P2	✓	✓
IDCM_P2_01	Specification requiring EMP(s) **[or]** EMP(s) of construction (demolition and foundation to be included, if any)	✓ ✓* #	- ✓
* Evidences of compliance with prerequisite requirements for construction works carried out prior to PA (first submission) shall be submitted in PA. # Append supporting document for IDCM 6 if the EMP is reviewed/ endorsed by the defined construction BEAM Pro/ Affiliate.			

Remarks

(a) Additional Information

Environmental Protection Department, Recommended Pollution Control Clauses for Construction Contracts. [ONLINE] Available at: http://www.epd.gov.hk/epd/english/environmentinhk/eia_planning/guide_ref/rpc.html. [Accessed August 2019].

Environmental Protection Department, Quality Powered Mechanical Equipment (QPME) system. [ONLINE] Available at: http://www.epd.gov.hk/epd/english/environmentinhk/noise/qpme/index.html. [Accessed August 2019.

Building Departments, PNRC-17, Control of Environmental Nuisance from Construction Sites. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-

references/practice-notes-and-circular-letters/pnrc/Pnrc17.pdf.
[Accessed August 2019]

Development Bureau (ETWB)'s Technical Circular (Works) 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials. [ONLINE] Available at: http://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/308/1/C-2010-06-01.pdf.[Accessed August 2019].

(b) Related Credits

IDCM 7 Measures to Reduce Site Emissions
The related credit addresses measures to minimise air, noise, water and light pollution during construction of buildings and the infrastructure serving buildings.

IDCM 8 Construction and Demolition Waste Recycling
The related credit encourages best practices in the management of construction resources consumption, including waste reduction.

2	**Integrated Design and Construction Management**	**2.P**	**Prerequisite**

IDCM P3 Timber Used for Temporary Works

Extent of Application All buildings

Objective Encourage the well-managed use of timber.

Credits Attainable Prerequisite

Credit Requirement Prerequisite achieved for demonstrating that no virgin forest products are used for temporary works.

Assessment

1. Timber used for all temporary works (falsework, formworks and hoarding works) shall originate from sustainable forestry or re-used existing material, unless exceptional circumstances occur.
2. Sustainable timber shall be certified by the Forest Stewardship Council (FSC) [1], the American Forest and Paper Association (AFPA) [2]or Programme for the Endorsement of Forest Certification (PEFC) [3] or “known licensed sources” [4].
3. Monthly summary tables which demonstrates prerequisite requirement shall be prepared and declared by contractor
4. In PA, provide extracts of tender documents (e.g. specifications) highlighting the clause precluding the use of virgin timber in all temporary works if no construction works have commenced.
5. Provide records if construction (demolition and foundation to be included, if any) has commenced before the submission of PA.
6. Provide a declaration letter by contractor confirming that no virgin forest products are used for temporary works if records cannot be provided for assessment.

1 Forest Stewardship Council. [ONLINE] Available at: http://www.fsc.org/ [Accessed August 2019]

2 American Forest and Paper Association. [ONLINE] Available at: http://www.afandpa.org/ [Accessed August 2019]

3 Programme for the Endorsement of Forest Certification. [ONLINE] Available at: https://www.pefc.org/ [Accessed Aug 2019]

4 Architectural Services Department, General Specifications for Building 2017, Section 13, Carpentry and Joinery. [ONLINE] Available at: https://www.archsd.gov.hk/media/291197/gs2017.pdf [Accessed August 2019]

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_P3_00	BEAM Plus NB submission template for IDCM P3	✓	✓
IDCM_P3_01	IDCM-P3-1_Form_r1	✓	✓
IDCM_P3_02	Specifications precluding the use of virgin timber **[or]** Declaration letter by contractor	✓ ✓*	- ✓**
IDCM P3_03	Monthly Summary tables with contractor endorsement	-	✓
IDCM P3_04	Timber Product Compliance Certificate	-	✓
* Evidences of compliance with prerequisite requirements for construction works carried out prior to PA (first submission) shall be submitted in PA. ** Declaration is required when monthly record is not completed for assessment.			

Remarks

(a) Additional Information

WWF, Guide to Responsible Purchasing of Forest Products. [ONLINE] Available at: http://assets.wwf.org.uk/downloads/responsible_purchasing.pdf [Accessed Aug 2019]

Buildings Department, PNAP ADV-5 Tropical Hardwood Timber, gives guidance for alternatives to the use of hardwoods in order to reduce the amount of tropical hardwood timber used in building projects. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/ADV/ADV005.pdf [Accessed Aug 2019]

Works Bureau Technical Circular (WBTC) No. 19/2001, "Metallic *Site* Hoardings and Signboards" establishes the revised policy requiring the use of metallic *site* hoardings and signboards in order to reduce the amount of timber used on construction *sites*. This Circular supersedes WBTC 19/99 and shall be read in conjunction with WBTC 32/92 on "The Use of Tropical Hardwood on Construction *Sites*" to reduce the amount of hardwood timber used on construction *sites*. [ONLINE] Available at: https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/153/1/wb1901.pdf [Accessed Aug 2019]

(b) Related Credits

None

2 Integrated Design and Construction Management

2.1 Integrated Design Process

IDCM 1 Sustainability Champions – Design

Extent of Application

All buildings

Objective

Encourage the engagement of BEAM Professionals and/ or Affiliates to integrate BEAM Plus standards and practices into the planning and design of the building.

Credits Attainable

1 + 1 additional BONUS

Credit Requirement

1 credit for at least two (2) members from at least two (2) applicable core design disciplines shall be accredited BEAM Professionals with valid credentials for BEAM Plus New Buildings v2.0 for projects intending to achieve a Bronze rating or above.

1 additional BONUS credit for at least one (1) additional member, from an applicable core design discipline different from the disciplines counted in the above credit, shall be an accredited BEAM Professional with valid credentials for BEAM Plus New Buildings; or alternatively, at least two (2) additional members, of an applicable core design discipline different from the disciplines counted in the above credit, shall be accredited BEAM Affiliates with valid credentials for BEAM Plus New Buildings.

Assessment

The Design BEAM Pro(s) and BEAM Affiliates shall:

1. Be engaged in the applicable core design disciplines from project inception to completion of detailed design and specifications stage of the Project. Core design disciplines shall be justified by the specific nature of the Project. The following disciplines, if they are engaged in the Project, shall form the core design disciplines:

    1.1. Project management;

    1.2. Facility management;

    1.3. Architectural;

    1.4. Structural/ civil engineering;

    1.5. Building services engineering;

    1.6. Surveying;

    1.7. Landscaping;

    1.8. Sustainability / Environmental;

    1.9. Interior designer; and

    1.10. Other as proposed and justified by the specific nature of the Project.

    The Design BEAM Pro(s) and BEAM Affiliates may also assume other roles in the consultant team of the Project.

2. Participate in introductory workshop/ meeting as required under IDCM P1.

3. Participate in *multi-disciplinary design charrette* as required under IDCM 3, if applicable.

3.1. Complete the prescribed form with qualification details, appointment information and confirmation of appointment of the Design BEAM Pro(s) and BEAM Affiliates (if any).

The appointed Design BEAM Pro(s) and BEAM Affiliates (if any) should maintain his/ her accreditation and credential during his/ her appointment.

3.2. Provide a copy of the following meeting minutes (confidential/sensitive project information is not required and should be excluded) showing the participation of the Design BEAM Pro in an introductory workshop/ meeting as required under IDCM P1 and a *multi-disciplinary design charrette* as required under IDCM 3 (if applicable).

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_01_00	BEAM Plus NB submission template for IDCM 1	✓	✓
IDCM_01_01	Prescribed form [IDCM-01-1_Form_r2] with detail information of the Design BEAM Pros (and Design Affiliates, if any)	✓	✓
IDCM_01_02	A copy of the meeting minute of introductory workshop/ meeting	✓	-
IDCM_01_03	A copy of the meeting minute of *multi-disciplinary design charrette* (if any) under IDCM 3	✓	-

Remarks

(a) Additional information

Hong Kong Green Building Council publishes the latest registers of BEAM Professionals and BEAM Affiliates on its website. [ONLINE] Available at: https://practitioner2.hkgbc.org.hk/index.php?r=Beam/Directory [Accessed Aug 2019].

(b) Related credits

IDCM P1 Sustainability Champions - Project
The related prerequisite encourages the engagement of BEAM Pro to facilitate the application for the BEAM Plus certification process and to ensure the compliance of relevant requirements of the BEAM Plus.

IDCM 3 Integrative Design Process
The related credit encourages early considerations for integrative building design process, buildability and operational issues to support holistic and cost-effective outcomes of building performance, human health and environmental benefits.

IDCM 6 Sustainability Champions – Construction
The related credit encourages the engagement of BEAM Pro(s) and/ or Affiliates engaged by contractors during construction to work collaboratively with the Project BEAM Professional to monitor progress towards the targeted construction-related BEAM Plus requirements.

2 Integrated Design and Construction Management

2.1 Integrated Design Process

IDCM 2 Complimentary Certification

Extent of Application All buildings that are applicable for respective BEAM Plus certification tools

Objective Encourage to pursue green building practices from planning, building design, construction, interior fitting-out to operation.

Credits Attainable 3 BONUS

Credit Requirement

(a) BEAM Plus Neighbourhood (ND)

1 BONUS credit where the project is certified by BEAM Plus Neighbourhood (ND) certification.

(b) BEAM Plus Interiors (BI)

1 BONUS credit for preparing the Project for BEAM Plus Interiors (BI) certification.

(c) BEAM Plus Existing Buildings (EB)

1 BONUS credit for preparing the project for BEAM Plus Existing Buildings (EB) certification (comprehensive scheme).

Assessment

(a) BEAM Plus Neighbourhood (ND)

Provide a copy of valid BEAM Plus Neighbourhood Certificate at the time of the first submission of Provisional Assessment of the BEAM Plus New Building (NB) certification.

Provide evidence demonstrating that *site* planning is aligned with and is essentially the same as the *Master Plan* defined in the ND certification.

(b) BEAM Plus Interiors (BI)

Provide justification of the extent of eligible non-domestic premises of the project. Definition of eligible premises shall refer to section 1.2.1 of BEAM Plus Interiors Manual v1.0 [1].

Provide a report demonstrating the prerequisite compliance for at least 50% of total Internal Floor Area (IFA) of all eligible premises in BEAM Plus BI certification.

Confirmation letter by the Client in attaining the BONUS Credit(s) is accepted as an alternative to the above-mentioned evidence for Provisional Assessment.

(c) BEAM Plus Existing Buildings (EB)

Provide a declaration letter by the Applicant/ Owner/ Developer regarding their commitment to pursue BEAM Plus EB certification (comprehensive scheme).

Provide a feasibility study on BEAM Plus EB certification of the project with the following details:

1) Checklist for potential credits and rating;

1 BEAM Society Limited – BEAM Plus Interiors Manual v1.0. [ONLINE] Available at: http://www.beamsociety.org.hk/files/Manual/BEAM%20Plus%20Interiors%20Manual.pdf. [Accessed August 2019].

2) Budget estimation for EB certification; and
3) *Roll-out plan*.

If a feasibility study is not available, confirmation letter by the Client in attaining the Bonus Credit(s) is accepted as alternative to the above mentioned evidence for Provisional Assessment.

Submittals

(a) BEAM Plus Neighbourhood (ND)

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_02_00	BEAM Plus NB submission template for IDCM 2a	✓	✓
IDCM_02a_01	BEAM Plus Neighbourhood (ND) certificate	✓	-
IDCM_02a_02	Evidence to demonstrate adaptation of the *Master Plan* design certified under ND	✓	-

(b) BEAM Plus Interiors (BI)

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_02_00	BEAM Plus NB submission template for IDCM 2b	✓	✓
IDCM_02b_01	Justification of the extent of eligible non-domestic premises	✓*	✓
IDCM_02b_02	Evidence to demonstrate prerequisite compliance for BI **[or]** Confirmation letter by Client (alternative evidence)	✓* ✓	✓ -
* Evidence of credit compliance is required if confirmation letter is not available by Client.			

(c) BEAM Plus Existing Buildings (EB)

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_02_00	BEAM Plus NB submission template for IDCM 2	✓	✓
IDCM_02c_01	Declaration letter by applicant/ owner/ developer on the commitment to pursue BEAM Plus EB certification.	✓	✓
IDCM_02c_02	Feasibility study, including scorecard, budget and *roll-out plan* **[or]** Confirmation letter by Client (alternative evidence)	✓* ✓	- ✓
* Evidence of credit compliance is required if confirmation letter is not available by Client.			

Remarks

(a) Additional Information

The latest manuals of BEAM Plus Neighbourhood, BEAM Plus Interiors and BEAM Plus Existing Buildings are available on Hong Kong Green Building Council's website. [ONLINE] Available at: https://www.hkgbc.org.hk/eng/BPRef-manuals_assessment.aspx.
[Accessed August 2019]

(b) Related Credits

None

2 Integrated Design and Construction Management

2.1 Integrated Design Process

IDCM 3 Integrated Design Process

Extent of Application All buildings

Objective Encourage early consideration of the integrated building design process, buildability and operational issues to support holistic and cost-effective outcomes of building performance, human health and environmental benefits.

Credits Attainable 4

Credit Requirement

(a) Early Considerations for Integrated Building Design Process

1 credit for consideration of the integrated design process regarding *whole-system thinking* to explore the interrelationships among green building design strategies and systems in the conceptual design stage.

1 additional credit for organising at least one *multi-disciplinary design charrette* to formulate passive and active design strategies in the conceptual/ schematic design stages.

(b) Early Design Consideration of Buildability/ Constructability

1 credit for early design consideration of buildability to ease construction and save on-site materials/ labour before completion of the design development stage.

(c) Design Consideration for Operation and Maintenance

1 credit for design consideration of the long-term operation and maintenance needs of the building and its engineering services.

Assessment

(a) Early Considerations for Integrated Building Design

1. <u>Exploration of interrelationships among green building design strategies and systems</u>

Provide a design review report in comparing **preliminary** sustainable design benefits for at least one (1) baseline and one alternative (1) design option for each issue.

The report should at least have the sections below with no less than 500 words for each identified issue:

i. Executive Summary
ii. Project Program
iii. Workshop arranged for integrated design process (with date of workshop, number or arrangement of attendances)
iv. Selected consideration, each with:

A baseline with the same development potentials as the design options. The design should conform to the statutory requirements such as Building Ordinance and Town Planning Ordinance.

An alternative design option with graphical support at concept stage level and board brush calculation in supporting the argument.

v. Conclusion

One or multiple design options is demonstrated to address at least two (2) issues of each of the following considerations:

Considerations	Issues
Site planning and outdoor environmental quality	- Building permeability/ air ventilation/ thermal comfort; - Landscaping/ *site* coverage with greenery; - Neighbourhood daylight access; - Ecological value; - Climate resilience.
Built form/ *orientation* and energy use/ generation	- Cooling load reduction; - Lighting load reduction; - Natural ventilation potential; - Renewable energy opportunities.
Building envelope attributes[1] and energy use	- Cooling load reduction/OTTV/ RTTV estimation; - Lighting load reduction; - Natural ventilation potential.
Note: 1. Building envelope attributes refer to: - insulation values; - window-to-wall ratios; - glazing characteristics; - shading; - window operability.	

Strategies addressing multiple consideration and issues are acceptable.

The sustainable design benefits for respective considerations shall be demonstrated in design appraisal by either:

1) Qualitative assessment report making reference to the Urban Design Guidelines of the Hong Kong Planning Standards and Guidelines Chapter 11 as appropriate:

   a) Identify good design features;

   b) Identify obvious problematic areas and propose some mitigation measures;

   c) Define “focus” and methodologies of any further study in the schematic or design development stages;

2) Spreadsheet calculations; or

3) *"Simple box" environmental/ energy modelling* (simplified massing model that may not include detail of systems)

2. **Multi-disciplinary design charrette**

Provide evidence that at least one *multi-disciplinary design charrette* has been held before the completion of schematic design stage.

The *charrette* shall, at minimum, address the following issues:

2.1 Participants:

a) Developer/ owner representative;
b) User representative (if users are known in design stage);
c) Operation and maintenance team representative (if identified in schematic design stage);
d) Members from core design disciplines as defined in IDCM 1;

2.2 Introduce fundamentals of integrated design process [1]:

a) Well-defined vision, goals and objectives;
b) Collaborative team and open communication;
c) Whole-system thinking and innovative synthesis, and
d) Iterative process and feedback cycles;

2.3 Review and agree on following principal design strategies:

a) Key stakeholders' values, aspirations and requirements;
b) *Functional programming*;
c) *Site* planning and outdoor environmental quality
d) Built form and *orientation*;
e) Building envelope attributes;
f) Key active building systems for energy saving/ generation;
g) Other strategies to be proposed by the Applicant.

(b) Early Design Consideration of Buildability/ Constructability

1. Demonstrate early consideration of buildability to ease construction and save on-site materials/ labour before the completion of the design development stage, either by:

1.1. engaging a construction management consultant;

1.2. design optimisation of voids and complex form; or

1 BC Green Building Roundtable. Roadmap for the Integrated Design Process. [ONLINE] Available at: http://www.greenspacencr.org/events/IDProadmap.pdf [Accessed Aug 2019].

1.3. adopting at least 75% of design measures on the 3S concept (standardisation, simplification and single integrated element) as promulgated in the Development Bureau's Guidelines [2].

1.4. Alternative standard could be proposed.

2. For item (b) 1.1, provide evidence demonstrating that recommendations/ inputs by the construction management consultant/contractor have been reviewed/ adopted. This shall include the following:

2.1. Appointment letter of the construction management consultant or the contractors;

2.2. Correspondence or any of the meeting minute(s) (confidential/sensitive project information is not required and shall be excluded) demonstrating that the design has been reviewed and recommendations have been suggested; and

2.3. The recommendations have been adopted.

3. For item (b) 1.2, provide evidence demonstrating that design of *high voids* and complex forms, if any, have been optimised:

3.1. Percentage of *high voids* to total building height is below 15%; and

3.2. Complexity of tower-built form in terms of tilting, tapering, twisting or free form has been optimised to fulfil both requirements:

Height of building	**Maximum offset of the building measuring against the ground floor plate or any typical floor plate**	**Maximum percentage of total number of floors with offsets measured against the total number of floors of the building**
< 45m	4m	35%
45m < 90m	3m	25%
90m <135m	2m	15%
≥ 135m	1m	5%

4. For item (b) 1.3, provide report with completed prescribed form to demonstrate implementation of at least 75% of listed 3S concept measures.

4.1. Provide extracts of tender documents, contract conditions and/ or specifications highlighting the clause requiring the contractors to carry out 3S concept measures, if construction (demolition and foundation to be included, if any) has not yet commence at PA stage.

2 Department Bureau – Guidelines for Enhancement of Productivity of Skilled Workers in Public Works Projects. [ONLINE] Available at: https://www.devb.gov.hk/filemanager/en/content_29/Guidelines_Enhancement_of_Productivity_(Mar_2013)_English.pdf. [Accessed August 2019].

(c) Design Consideration for Operation and Maintenance

1. Provide evidence that the design has considered the long-term operation and maintenance needs for the building and its engineering services by providing at least 5 of the following features:

   1.1. Building Management System (BMS);

   1.2. Davit arm/ gondola system;

   1.3. External pipe duct or pipe duct in communal areas;

   1.4. Fall arrest system;

   1.5. Maintenance platform for building services installations;

   1.6. Maintenance workshop for facility management;

   1.7. Movable working platform for maintenance;

   1.8. Access and safety provision for external air-conditioning unit at height without use of scaffolding;

   1.9. Others, to be proposed by the Applicant with justification.

Submittals

(a) Early Considerations for Integrative Building Design

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_03_00	BEAM Plus NB submission template for IDCM 3	✓	✓
IDCM_03_01	IDCM-03-1_Form	✓	✓
IDCM_03a_02	Design review report on preliminary sustainable design benefits	✓	-
IDCM_03b_03	*Multi-disciplinary design charrette* report (if applicable)	✓	-

(b) Early Design Consideration of Buildability/ Constructability

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_03_00	BEAM Plus NB submission template for IDCM 3	✓	✓
IDCM_03_01	IDCM-03-1_Form	✓	✓
IDCM_03b_02	For (1), Appointment letter of the construction management consultant or contractors Correspondence or any of the meeting minute(s) with construction management consultant or contractors. Report on adoption of construction management consultant's (or contractors') recommendations	✓ ✓ ✓	- - -
IDCM_03b_03	For (2), design report demonstrating optimisation of *high void*s and complex forms	✓	-
IDCM_03b_04	For (3), report with completed prescribed form to demonstrate compliance with 3s concept measures. **[or]** Extracts of tender documents (e.g. specifications) specifying the requirements for 3s concept measures implementation (if applicable)	✓* ✓	✓ -
* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA.			

(c) **Design Consideration for Operation and Maintenance**

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_03_00	BEAM Plus NB submission template for IDCM 3	✓	✓
IDCM_03_01	IDCM-03-1_Form	✓	✓
IDCM_03c_02	Design report demonstrating the adoption of O&M features	✓	✓
IDCM_03c_03	Dated photo records of the completed O&M features	-	✓

Remarks

(a) Additional Information

For IDCM 3a

Buildings Department – PNAP APP-152, *Sustainable Building Design Guidelines*. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/APP/APP152.pdf [Accessed Aug 2019].

Buildings Department – Codes of Practice and Design Manuals, Code of Practice for Overall Thermal Transfer Value in Buildings 1995. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/code-and-design-manuals/OTTV1995_e.pdf [Accessed Aug 2019].

Buildings Department – PNAP APP-156, Design and Construction Requirements for Energy Efficiency of *Residential Buildings*. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/APP/APP156.pdf [Accessed Aug 2019].

For IDCM 3c

Buildings Department – PNAP ADV-14, Facilities for External Inspection and Maintenance of Buildings. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/ADV/ADV014.pdf [Accessed Aug 2019].

Buildings Department – Appendix A2 of PNAP ADV-33, Essential Information in Plan Submissions. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/ADV/ADV033.pdf [Accessed Aug 2019].

Buildings Department – Circular Letter dated 23 December 2016, Guidelines for Designing Access and Safety Provisions for the Maintenance and Repair (M&R) of External Air Conditioners (ACs) at Height. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/circular/CL_GDASP2016e.pdf [Accessed Aug 2019].

(b) Related Credits

IDCM 4 Life Cycle Costing
The related credit encourages the use of life cycle costing to facilitate an investigation of potential design options, specifications, operation and maintenance

SS P1 Minimum Landscape Requirements
The related prerequisite credit encourages building development to preserve or expand urban greenery.

SS 4 Neighbourhood Daylight Access
The related credit encourages building development which is sensitive to the needs of neighbours in terms of preserving daylight and views.

SS 7 Biodiversity
The related credit encourages strategies to preserve and/or enhance the ecological value of the *site* in terms of habitat and biodiversity.

SS 8 Urban Heat Island Mitigation
The related credit encourages higher overall *site* coverage of greenery and stipulates minimum *site* coverage of greenery in the *Primary Zone* (the 15m vertical zone of a *site* along the abutting street level).

SS 9 Immediate Neighbourhood Wind Environment
The credit encourages improvement in wind environments around and adjacent to the buildings and adequate considerations of wind amplification, and where appropriate, suitable mitigation measures are provided.

SS 10 Outdoor Thermal Comfort
The related credit considers the positive effect of shading by trees and the surrounding ground surface temperatures of greenery within the *site*.

EU 1 Low Carbon Passive Design
The related credit encourages passive building design allowing buildings to respond to the local climate; reducing the reliance on active servicing for human comfort.

EU 5 Renewable and Alternative Energy Systems
The related credit encourages the wider application of renewable energy sources in buildings.

2	**Integrated Design and Construction Management**	**2.1 Integrated Design Process**

IDCM 4 Life Cycle Costing

Extent of Application	All buildings
Objective	Encourage the use of life cycle costing to facilitate investigation of potential design options, specifications, operation and maintenance.
Credits Attainable	1
Credit Requirement	1 credit for conducting life cycle costing for active systems.
Assessment	Conduct life cycle costing analysis with design options for each of the below active system, if present in the project construction scope: 1) Hot water system; 2) Interior lighting system; and 3) Air-conditioning system; The life cycle costing exercise can be non-discounted and should include the following costs: 1) Acquisition; 2) Operation (utilities); and 3) Maintenance (replacements, planned maintenance and management costs). While developing design options, the applicant should consider different configurations and specifications, for example, initial costs, number of equipment units involved, equipment efficiency and lifespan, etc. Indicate cost of each design option of active system over 20, 30, 40 and 50 years and highlight which design option will have the lowest life cycle cost at the 50th year. Prepare a life cycle costing report including all the assumptions made and the results of life cycle costing. Substantiate the costs with catalogues, suppliers' recommendations, quotes Cost approximations suggested by Quantitative Surveyor are also accepted. No professional life cycle costing software is required for this study. Note that the costing exercise imposes no obligation for implementation but encourages consideration of the costs of systems throughout their life cycle. The life cycle costing report should include at least the below items with a minimum of 8 A4 pages: 1. Executive Summary 2. Project Description with Construction scope 3. System options to be considered

4. Life cycle costing and analysis
5. Conclusion

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_04_00	BEAM Plus NB submission template for IDCM 4	✓	✓
IDCM_04_01	Life cycle costing report	✓	✓

Remarks

(a) Additional Information

ISO 15686-5:2008 Buildings & constructed assets – Service life planning – Part 5: Life cycle costing

(b) Related Credits

None

2 Integrated Design and Construction Management

2.2 Integrated Design Process

IDCM 5 Commissioning

Extent of Application All buildings

Objective Ensure the building systems perform as design specified and buildings operate as design intended.

Credits Attainable 4

Credit Requirement 2 credits for demonstrating (a) the appointment of commissioning authority (CxA) before tender stage and (b) providing a commissioning plan.

1 credit for providing a commissioning review report before construction as described in part (c).

1 credit for providing commissioning reports as described in part (d).

Assessment

(a) Engage Commissioning Authority (CxA) – (a) + (b): 2 credits

1. Identify a Chartered Engineer, Registered Professional Engineer, Member of HKIE (relevant discipline), ASHRAE BCxP as the CxA.
2. The CxA should have the proper experience and credentials including adequate expertise in the commissioning of electrical and mechanical systems, equipment and components to develop and implement effective commissioning.
3. The CxA should have direct experience with at least two similar projects and must have been involved before the start of schematic design stage to countercheck that the systems will meet the design intents.
4. The CxA must not be responsible for any aspect of the project design or construction management or supervision for the subject building.
5. The CxA must not be an employee of the design firm.
6. The CxA must not be an employee of, or contracted through, a contractor or construction manager dealing with construction contracts. For design and build projects, the owner should directly employ the CxA.
7. The CxA may be a qualified employee or consultant of the owner.
8. Reporting of all conditions and findings must be immediate and directly from the CxA to the Client. The CxA shall be responsible for:
   - 8.1. Review and approval of commissioning specifications;
   - 8.2. The development of a commissioning plan;
   - 8.3. Facilitate and ultimately oversee the commissioning process for all systems to be commissioned; and

8.4. Document whether systems, equipment and components are functioning in accordance with the design intent and in accordance with the construction documents.

(b) Develop Commissioning Plan

1. Establish a preliminary commissioning plan for the CxA to outline the scope of commissioning and systems to be tested.

2. Project roles and responsibilities, the commissioning team's project directory, and schedule of commissioning activities should all be included in the commissioning plan.

3. The Commissioning plan is a living document that is updated throughout the life of the project and will become the basis for the final commissioning report.

4. The Commissioning plan should include the following content:
   - 4.1. Goals and objectives;
   - 4.2. General project information;
   - 4.3. Systems to be commissioned;
   - 4.4. Description of the Commissioning team, including team members, roles and responsibility;
   - 4.5. Description of the Commissioning team's communication protocol, coordination, meetings and management;
   - 4.6. Development of system (if applicable) functional test procedures for the following:
     - 4.6.1. HVAC&R systems and associated controls;
     - 4.6.2. Light and daylighting controls;
     - 4.6.3. Domestic hot water systems (including swimming pool if heating is provided);
     - 4.6.4. Lift and escalator systems; and
     - 4.6.5. Renewable energy systems;
   - 4.7. Verification of system performance;
   - 4.8. Reporting deficiencies and the resolution process; and
   - 4.9. Acceptance of the building systems.

(c) Commissioning Review Report

1. Before construction begins, develop commissioning requirements based on the systems included in the design and incorporate them into the construction documents.

2. Commissioning specifications informing the contractors and/ or sub-contractors of their roles and responsibilities throughout the commissioning process.

3. Before construction begins, review and document whether the system is designed in accordance to the design intent as acknowledged by the project owner.

(d) Commissioning Report

1. After all commissioning tasks except seasonally deferred commissioning have been completed, the commissioning report(s) with all the approved checklists and endorsement from CxA shall be provided.

2. The Commissioning report should include the following content:
   - 2.1. Executive summary of commissioning process and results, system deficiencies identified and resolutions, outstanding issues identified.
   - 2.2. List of participants and their respective roles;
   - 2.3. Brief building description;
   - 2.4. Commissioning process scope;
   - 2.5. Design review log;
   - 2.6. Installation verification checklist;
   - 2.7. List of systems commissioned;
   - 2.8. Equipment documentation;
   - 2.9. Functional performance tests including date and time of test, individuals present during testing, visual inspection observations, sensor checks, device checks, operating mode tests and results;
   - 2.10. List of outstanding commissioning issues and any testing that is scheduled on a later date; and
   - 2.11. All outstanding deficiencies identified during or as a result of commissioning activities should be listed and highlighted.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_05_00	BEAM Plus NB submission template for IDCM 5.	✓	✓
IDCM_05_01	Specification on the scope of services of CxA.	✓	✓
IDCM_05_02	Organisation Chart of the project team with CxA's involvement and a brief description of the commissioning tasks.	✓	✓
IDCM_05_03	CV of CxA to demonstrate adequate expertise of the CxA.	✓	✓
IDCM_05_04	Commissioning Plan meeting the requirements with endorsement by CxA.	✓	✓
IDCM_05_05	Commissioning specifications detailing the commissioning requirements for each system and equipment.	✓	✓
IDCM_05_06	Endorsed commissioning review report to demonstrate all tasks in part (c)	-	✓
IDCM_05_07	Endorsed commissioning report to demonstrate all commissioning tasks fulfilling part (d)	-	✓

Remarks

(a) Additional information

The Chartered Institution of Building Services Engineers (CIBSE) – Air distribution systems. CIBSE. Commissioning Code A. [ONLINE] Available at:http://www.cibse.org/ [Accessed August 2019].

The Chartered Institution of Building Services Engineers (CIBSE) – Water distribution systems. CIBSE Commissioning Code W.

The Chartered Institution of Building Services Engineers (CIBSE) – Automatic controls. CIBSE Commissioning Code C.

Building Services Research and Information Association (BSRIA) – Commissioning air systems. Application procedures for buildings. [ONLINE] Available at: https://www.bsria.co.uk/__ [Accessed Aug 2019].

American Society of Heating, Air-conditioning, and Refrigerating Engineers (ASHRAE) – Standard and Guidelines on Commissioning Essentials. [ONLINE] Available at: http://www.ashrae.org/ [Accessed August 2019].

Architectural Services Department, Building Services Branch – Testing and Commissioning Procedure. [ONLINE] Available at: https://www.archsd.gov.hk/en/publications-publicity/testing-commissioning-procedure.aspx. [Accessed August 2019].

(b) Related Credits

None

2	**Integrated Design and Construction Management**	**2.2**	**Green Construction Practices**

IDCM 6 Sustainability Champions – Construction

Extent of Application

All buildings

Objective

Encourage the engagement of BEAM Professionals and/or Affiliates by contractors during construction to work collaboratively with the project BEAM Professional to monitor progress towards the targeted construction-related BEAM Plus requirements.

Credits Attainable

1

Credit Requirement

1 credit for at least two (2) accredited BEAM Professionals with valid credentials for BEAM Plus New Buildings v2.0 are engaged by the main/ lead contractor for the project intending to achieve a Bronze rating or above.

Alternatively,

1 credit for at least one (1) accredited BEAM Professional and two (2) accredited BEAM Affiliates, with valid credentials for BEAM Plus New Buildings v2.0 are engaged by the main/ lead contractor of the project intending to achieve a Bronze rating or above.

Assessment

1. The Construction BEAM Pro(s) and BEAM Affiliates shall:
   - 1.1. Be engaged by main/ lead contractor of *superstructure* from commencement of the respective contract (i.e. if applicable project scope covers foundation and *superstructure*, a Construction BEAM Pro shall be engaged at foundation stage) to completion of the certification process.
   - 1.2. If more than one construction BEAM Pros are engaged during the construction stages, supporting documents should be provided to document the hand-over.
   - 1.3. Collaborate with the project BEAM Pro to monitor the progress towards the targeted construction-related BEAM Plus requirements as defined in the BEAM Plus NB certification checklist.
   - 1.4. Participate in the kick-off meeting and at least 1 review meeting as required under IDCM P1.
   - 1.5. Check and ensure that the construction-related submission materials comply with requirements of attempted credits in the BEAM Plus Manual. The Construction BEAM Pro(s) and BEAM Affiliates may also assume other roles in the construction team of the project.
2. Complete the prescribed form with qualification details, appointment information and confirmation of the appointment of the Construction BEAM Affiliates, if any, and the BEAM Pro(s).

The appointed Construction BEAM Affiliates, if any, and BEAM Pro(s) should maintain his/ her accreditation and credentials during his/her appointment.

Provide copies of relevant contract documents highlighting the clause requiring the main/ lead constructor to engage related Construction BEAM Pro(s) and BEAM Affiliates, if construction has not yet commenced at PA stage.

3. Provide meeting minutes (confidential/sensitive project information is not required and should be excluded) showing the participation of the Construction BEAM Pros (and Design Affiliates, if any) in the kick-off meeting and at least one review meeting as required under IDCM P1, which shows the checking and compliance efforts by Construction BEAM Pro(s) and BEAM Affiliate(s) (if any).

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_06_00	BEAM Plus NB submission template for IDCM 6	✓	✓
IDCM_06_01	Prescribed form [IDCM-06-1_Form_r1] on details of Construction BEAM Affiliates if any, and BEAM Pro(s), appointment information and confirmation of appointment	✓*	✓
IDCM_06_02	Contractor documents requiring engagement of Construction BEAM Pro(s) and BEAM Affiliates (if applicable)	✓	-
IDCM_06_03	A copy of the Meeting minute of kick-off meeting with the Project BEAM Pro	✓*	✓
IDCM_06_04	Any of the Meeting minute(s) of review meeting with the Project BEAM Pro	✓*	✓
* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA.			

Remarks

(a) Additional Information

Hong Kong Green Building Council publishes the latest registers of BEAM Professionals and BEAM Affiliates on its website. [ONLINE] Available at:
https://practitioner2.hkgbc.org.hk/index.php?r=Beam/Directory
[Accessed Aug 2019].

(b) Related Credits

IDCM P1 Sustainability Champions - Project
The related prerequisite encourages the engagement of BEAM Professionals to facilitate the application for the BEAM Plus certification process and to ensure the compliance of relevant requirements of the BEAM Plus.

IDCM 1 Sustainability Champions - Design
The related credit encourages the engagement of BEAM Pros and/ or Affiliates engaged by respective core design disciplines to integrate BEAM Plus standards and practices into the planning, design and construction of the building.

2 Integrated Design and Construction Management

2.2 Green Construction Practices

IDCM 7 Measures to Reduce Site Emissions

Extent of Application

All buildings

Objective

Minimise pollution (air, noise, water discharge and light) during the demolition (if any), construction of buildings and the infrastructure serving buildings.

Credits Attainable

4

Credit Requirement

(a) Minimisation of Air Pollution

1 credit for providing adequate monitoring and mitigation measures to minimise air pollution during construction (demolition and foundation are included, if any).

(b) Minimisation of Noise Pollution

1 credit for providing adequate monitoring and mitigation measures to minimise noise pollution during construction (demolition and foundation are included, if any).

(c) Minimisation of Water Pollution

1 credit for providing adequate monitoring and mitigation measures to minimise water pollution during construction (demolition and foundation are included, if any).

(d) Minimisation of Light Pollution

1 credit for providing adequate mitigation measures to minimise light pollution during construction (demolition and foundation are included, if any).

Note:

1) Partial credit shall be awarded for individual construction stage (i.e. demolition, foundation and *superstructure* in a default ratio of 1:1:3). The Applicant may submit justification and propose an alternative ratio based on the relative pollution control extent and resource demand in various construction stages. For a project that covers all 3 stages, the partial credit attainable for demolition, foundation and *superstructure* are 0.2, 0.2 and 0.6 respectively. Similarly, for a project where demolition is not required or not under the Client's control, the partial credit attainable for foundation and *superstructure* are 0.25 and 0.75 respectively.

2) All applicable stages must be included in the partial credit calculation.

Assessment

(a) Minimisation of Air Pollution

1. Proactive dust control provisions shall be referred to Good Housekeeping Checklist in Appendix 4.1 of Hong Kong Construction Association's Best Practice Guide for Environmental Protection on Construction Sites [1]. Checklist of dust control provisions is provided in the prescribed form.

2. Provide baseline monitoring measurements for point(s) as prescribed in IDCM P2.

   Provide extracts of tender documents, contract conditions and/ or specifications highlighting the clause requiring the contractors to provide baseline monitoring measurements if construction has not yet commenced at the PA stage.

3. Provide monthly environmental management report(s) to demonstrate the following:

   3.1. Implementation of monitoring and mitigation measures to minimise air pollution as defined in *Environmental Management Plan (EMP)* under IDCM P2;
   3.2. There are no convictions or complaints about air emissions from site, that have been upheld by the Environmental Protection Department or police leading to the issue of a fine or prosecution;
   3.3. Implementation of proactive dust control provisions with the completed prescribed forms; and
   3.4. Total Suspended Particulates (TSP) levels are satisfactory according to IDCM P2, Assessment 1) 1.3.
   3.5. For project compliance with EPD's Environmental Impact Assessment monitoring in construction work, no additional work is required to demonstrate the monthly compliance. Environmental Monitoring and Audit are NOT required.
   3.6. Measurement of 24-hour TSP levels is NOT required.

   The report(s) should be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM 6 or the project BEAM Pro as defined under IDCM P1.

1 Hong Kong Construction Association – Best Practice Guide for Environmental Protection on Construction Sites. [ONLINE] Available at: http://www.hkca.com.hk/uploads/eversioin_docs/e33f38c5128a824b4f7cb18b7b5ab751.pdf. [Accessed August 2019].

4. Provide extracts of tender documents (e.g. specifications) highlighting the clause requiring the contractors to provide monthly environmental management report(s) if construction (demolition and foundation to be included, if any) has not yet commenced at PA stage.

(b) Minimisation of Noise Pollution

1. Proactive noise control provisions shall refer to section 6.9 of Hong Kong Construction Association's Best Practice Guide for Environmental Protection on Construction Sites. Checklist of noise control provisions are provided in the prescribed forms.

2. Provide baseline monitoring measurements for point(s) as prescribed in submitted Environmental Management Plan in IDCM P2.

   Provide extracts of tender documents, contract conditions and/ or specifications highlighting the clause requiring the contractors to provide baseline monitoring measures if construction (demolition and foundation to be included, if any) has not yet commenced at PA stage

3. Provide monthly environmental management report(s) to demonstrate the following:

   3.1. Implementation of monitoring and mitigation measures to minimize noise pollution as defined in the *Environmental Management Plan (EMP)* under IDCM P2;
   3.2. There are no convictions or complaints about noise emissions from site, that have been upheld by the Environmental Protection Department or Police leading to the issue of a fine or prosecution;
   3.3. Implementation of proactive noise control provisions with the completed prescribed form; and
   3.4. Noise levels that complied with the noise level limitation according to IDCM P2, Assessment 1) 1.3.

   The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM 6 or the project BEAM Pro as defined under IDCM P1.

4. Provide extracts of tender documents (e.g. specifications) highlighting the clause requiring the contractors to provide monthly environmental management report(s) if construction

(demolition and foundation to be included, if any) has not yet commenced at PA stage.

(c) Minimisation of Water Pollution

1. Proactive wastewater management provisions shall be referred to Environmental Protection Department's Practice Note for Professional Persons on Construction Site Drainage [2]. Checklist of wastewater management provisions is provided in the prescribed forms.

2. Provide monitoring measurements fulfilling permit requirement as prescribed in IDCM P2, Assessment 1) 1.3.

3. Provide extracts of tender documents, contract conditions and/ or specifications highlighting the clause requiring the contractors to provide baseline monitoring measurements if construction has not yet commenced at the PA stage

4. Provide monthly environmental management report(s) to demonstrate the following:

   4.1. Implementation of monitoring and mitigation measures to minimise water pollution as defined in *Environmental Management Plan (EMP)* under IDCM P2;

   4.2. There are no convictions or complaints about water pollution from site, that have been upheld by the Environmental Protection Department or Police leading to the issue of a fine or prosecution;

   4.3. Implementation of proactive wastewater control provisions with completed prescribed form; and

   4.4. Wastewater discharge qualities fulfilling permit requirement according to IDCM P2, Assessment 1) 1.3.

   The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM 6 or the project BEAM Pro as defined under IDCM P1.

5. Provide extracts of tender documents (e.g. specifications) highlighting the clause requiring the contractors to provide monthly environmental management report(s) if construction (demolition and foundation to be included, if any) has not yet commenced at PA stage.

2 Environmental Protection Department – Practice Note for Professional Persons ProPECC PN 1/94. Construction Site Drainage. [ONLINE] Available at: http://www.epd.gov.hk/epd/sites/default/files/epd/english/resources_pub/publications/files/pn94_1.pdf .[Accessed August 2019].

(d) Minimisation of Light Pollution

1. Provide evidence demonstrating that external light control measures have been implemented during construction (demolition and foundation are included, if any). External light control measures shall include all of the following:

   1.1. Operating hours for light

      1.1.1. Switch off external lighting (essential light and feature light not included) when not needed or after operating hours.

      1.1.2. Switch off feature lighting (e.g. hoarding lighting) after 11p.m.

      1.1.3. Maintain only essential light (e.g. lighting for safety and security) at the acceptable level as required.

   1.2. Automatic controls for lighting

      1.2.1. Incorporate automatic control (e.g. timer switch) to switch off the external lighting when not needed or after operating hours.

   1.3. Lighting nuisance control measures

      1.3.1. Position and aim the lighting at hoarding properly to avoid overspill of light to the outside area being lit up.

      1.3.2. For lighting up vertical structures (e.g. signs & hoarding), direct the beam to the structures and avoid overspill of light.

      1.3.3. Provide lighting with appropriate shields, baffles, louvers and cut-off features to prevent light overspill to nearby residence and into the sky, and glare from the light source.

   1.4. Prevention of glare to road users

      1.4.1. Ensure the external lighting along site boundary is appropriately positioned, aimed or shielded so that illumination of nearby roads will not be adversely affected.

2. Provide extracts of tender documents (e.g. specification) highlighting the clause requiring the contractors to provide monthly environmental management report(s) if construction (demolition and foundation to be included, if any) has not yet commence at PA stage.

Submittals

(a) Minimisation of Air Pollution

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_07_00	BEAM Plus NB submission template for IDCM 7	✓	✓
IDCM_07_01	IDCM-07-1_Form_r1	✓	✓
IDCM_07a_02	A total of 3^ monthly environmental management reports at a minimum with at least 1 report for each of the construction stages. **[or]** Extracts of tender documents (e.g. specifications) specifying the requirements of Monthly environmental management report(s) (if applicable)	✓* ✓	✓ -
* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA. ^ If there are less than 3 construction stages, a minimum total of 3 quarterly reports should still be submitted. In the case of more than 3 construction stages, extra no. of quarterly report(s) covering the extra stage(s) should be submitted.			

(b) Minimisation of Noise Pollution

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_07_00	BEAM Plus NB submission template for IDCM 7	✓	✓
IDCM_07_01	IDCM-07-2_Form_r1	✓	✓
IDCM_07b_02	A total of 3^ monthly environmental management reports at a minimum with at least 1 report for each of the construction stages. **[or]** Extracts of tender documents (e.g. specifications) specifying the requirements of Monthly environmental management report(s) (if applicable)	✓* ✓	✓ -

* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA. ^ If there are less than 3 construction stages, a minimum total of 3 quarterly reports should still be submitted. In the case of more than 3 construction stages, extra no. of quarterly report(s) covering the extra stage(s) should be submitted.

(c) Minimisation of Water Pollution

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_07_00	BEAM Plus NB submission template for IDCM 7	✓	✓
IDCM_07c_01	A total of 3^ monthly environmental management reports at a minimum with at least 1 report for each of the construction stages. **[or]** Extracts of tender documents (e.g. specifications) specifying the requirements of Monthly environmental management report(s) (if applicable)	✓* ✓	✓ -
* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA. ^ If there are less than 3 construction stages, a minimum total of 3 quarterly reports should still be submitted. In the case of more than 3 construction stages, extra no. of quarterly report(s) covering the extra stage(s) should be submitted.			

(d) Minimisation of Light Pollution

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_07_00	BEAM Plus NB submission template for IDCM 7	✓	✓
IDCM_07_01	IDCM-07-4_Form_r1	✓	✓
IDCM_07d_02	Evidence demonstrating the implementation of external light control measures	✓*	✓

	[or] Extracts of tender documents (e.g. specifications) specifying the requirements of external light control measures (if applicable)	✓	-
* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA.			

Remarks

(a) Additional Information

Building Departments – PNAP ADV-4, Control of Environmental Nuisance from Construction Sites. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/ADV/ADV004.pdf [Accessed Aug 2019].

Environmental Protection Department, guidelines & references: Air – [ONLINE] Available at: http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/ air_guidelines.html [Accessed August 2019]

Noise –[ONLINE] Available at: https://www.epd.gov.hk/epd/english/environmentinhk/noise/noise_maincontent.html _[Accessed August 2019]

https://www.epd.gov.hk/epd/misc/construction_noise/contents/index.php/en/index.html [Accessed August 2019]

Environmental Bureau. Guidelines on Industry Best Practices for External Lighting Installations. [ONLINE] Available at: http://www.enb.gov.hk/sites/default/files/en/node78/ guidelines_ex_lighting_install_eng.pdf [Accessed August 2019]

(b) Related Credits

IDCM P2 *Environmental Management Plan*
The related prerequisite credit encourages a high standard of environmental management during construction.

2 Integrated Design and Construction Management	**2.2**	**Green Construction Practices**

IDCM 8 ***Construction* and *Demolition Waste* Recycling**

Extent of Application

IDCM 8a – All buildings requiring demolition which are under the Client's control.

IDCM 8b – All buildings

Objective

Encourage best practices in the management of construction resource consumption, including waste reduction.

Credits Attainable

2 + 4 additional BONUS

Credit Requirement

(a) ***Demolition Waste* Recycling**

1 credit for demonstrating compliance with the Waste Management Plan and the application of proactive waste management provisions during demolition; and recycling at least 15% of *demolition waste*.

1 additional BONUS credit for demonstration of recycling at least 30% of *demolition waste*.

For exemplary performance, 1 additional BONUS credit for demonstration of recycling at least 60% of *demolition waste*.

(b) Construction Waste Recycling

1 credit for demonstrating compliance with the Waste Management Plan and the application of proactive waste management provisions during construction (foundation to be included, if any); and recycling at least 15% of *construction waste* (foundation waste to be included, if any).

1 additional BONUS credit for demonstration of recycling at least 30% of *construction waste* (foundation waste to be included, if any).

For exemplary performance, 1 additional BONUS credit for demonstration of recycling at least 60% of *construction waste* (foundation waste to be included, if any).

Assessment

Proactive waste management provisions shall be referred to the Good Housekeeping Checklist in Appendix 8.2 of Hong Kong Construction Association's Best Practice Guide for Environmental Protection on Construction Sites [1]. Checklist of waste management provisions is provided in the prescribed form.

(a) ***Demolition Waste* Recycling**

1. Provide a Construction and Demolition Material Management Plan (C&DMMP). Reference shall be made to Civil Engineering

1 Hong Kong Construction Association – Best Practice Guide for Environmental Protection on Construction Sites. [ONLINE] Available at: http://www.hkca.com.hk/uploads/eversioin_docs/e33f38c5128a824b4f7cb18b7b5ab751.pdf. [Accessed August 2019].

and Development Department (CEDD)'s Project Administration Handbook, Chapter 4, Paragraph 4.1.3 [2].

2. Provide monthly waste management report(s) to demonstrate the implementation of the following:
   2.1. The Waste Management Plan (WMP) as defined in *Environmental Management Plan (EMP)* under IDCM P2; and
   2.2. Proactive waste management provisions and the completed prescribed form.

3. Provide copy(ies) of the monthly waste and recycling report(s) that include the following:
   3.1. Waste flow tables (see prescribed form);
   3.2. All waste and recycling records; and
   3.3. Collection organisation/ recycler information.

4. Provide a summary of the percentage of *demolition waste* recycled (either by weight or by volume) prepared and declared by contractor, *Demolition waste* (including broken concrete and excavated materials) that is diverted from Government public fill reception facilities and *reused*/ recycled in other projects/ facilities shall be included.

5. Provide extracts of tender documents, contract conditions and/ or specifications highlighting the clause requiring the contractors to carry out waste management measures and recycle *demolition waste*.

(b) *Construction Waste* Recycling

1. Provide a Construction and Demolition Material Management Plan (C&DMMP). Reference shall be made to Civil Engineering and Development Department (CEDD)'s Project Administration Handbook, Chapter 4, Paragraph 4.1.3 [2].

2. Provide monthly waste management report(s) to demonstrate the implementation of the following:
   2.1. The Waste Management Plan (WMP) as defined in *Environmental Management Plan (EMP)* under IDCM P2; and

2 Civil Engineering and Development Department (CEDD)'s Project Administration Handbook, Chapter 4, Paragraph 4.1.3. [ONLINE] Available at: https://www.cedd.gov.hk/filemanager/eng/content_80/PAH%202018%20Chapter%204%20Rev%2001%20clean%20-%20190718.pdf. [Accessed August 2019].

2.2. Proactive waste management provisions with the completed prescribed form.

Monthly waste management report(s) shall be prepared from the commencement of construction (foundation to be included, if any) to the completion of all construction activities.

3. Provide copy(ies) of the monthly waste and recycling report(s) that include the following:

   3.1. Waste flow table (see prescribed form);

   3.2. All waste and recycling records; and

   3.3. Collection organisation/ recycler information.

4. Provide a summary of the percentage of *construction waste* recycled (either by weight or by volume) prepared and declared by contractor. *Construction waste* (including broken concrete and excavated materials) that is diverted from Government public fill reception facilities and *reused*/ recycled in other projects/ facilities shall be included.

5. Provide extracts of tender documents, contract conditions and/ or specifications highlighting the clause requiring the contractors to carry out waste management measures and recycle *construction waste* (foundation waste is to be included, if any) if construction (foundation is to be included, if any) has not yet commenced at PA stage.

Submittals

(a) *Demolition Waste* Recycling

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_08_00	BEAM Plus NB submission template for IDCM 8	✓	✓
IDCM_08_00	IDCM-08-1_Form_r1	✓	✓
IDCM_08a_02	Endorsed Demolition Waste Management Plan	✓	✓
IDCM_08a_03	Extracts of tender documents (e.g. specifications) specifying the requirements of waste management measures (if applicable) **[or]**	✓	-
IDCM_08a_04	Any 3 monthly waste management reports.	✓*	✓
IDCM_08a_05	Monthly summary of the waste and recycling reports.	✓*	✓
IDCM_08a_06	Summary of the percentage of *demolition waste* recycled	✓*	✓
* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA.			

(b) *Construction Waste* Recycling

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_08_00	BEAM Plus NB submission template for IDCM 8	✓	✓
IDCM_08_01	IDCM-08-1_Form_r1	✓	✓
IDCM_08b_02	Endorsed *Construction Waste* Management Plan	✓	✓
IDCM_08b_03	Extracts of tender documents (e.g. specifications) specifying the requirements of waste management measures (if applicable) **[or]**	✓	-
IDCM_08b_04	Any 3 monthly waste management reports.	✓*	✓
IDCM_08b_05	Monthly summary of the waste and recycling reports.	✓*	✓
IDCM_08b_06	Summary of the percentage of *construction waste* recycled	✓*	✓
* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA.			

Remarks

(a) Additional Information

Building Departments – PNAP ADV-19, *Construction* and *Demolition Waste*. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/ADV/ADV019.pdf [Accessed Aug 2019].

Development Bureau's Technical Circular (Works) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials". [ONLINE] Available at: https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/308/1/C-2010-06-01.pdf [Accessed August 2019].

Environmental Protection Department publishes the latest information of waste collectors and recyclers on its website. [ONLINE] Available at:http://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/guide_ref_dwc.html. [Accessed August 2019].

(b) Related Credits

IDCM P2 *Environmental Management Plan*
The prerequisite encourages a high standard of environmental management and a waste management system for the sorting, recycling and the proper disposal of materials during construction (demolition and foundation are to be included, if any).

2 Integrated Design and Construction Management	**2.2**	**Green Construction Practices**

IDCM 9 Construction IAQ Management

Extent of Application

All areas to implementing a Construction IAQ Management Plan; and
All areas with central air-conditioning and ventilation systems for undertaking a building 'flush out' or bake out' and replacement of all filters prior to occupancy.

Objective

Ensure that project materials and ventilation systems are not contaminated by construction activities.

Credits Attainable

1

Credit Requirement

1 credit for implementing a Construction IAQ Management Plan, undertaking a building 'flush out' or 'bake out', and replacement of all filters prior to occupancy.

Assessment

1. Provide a Construction IAQ Management Plan that includes the following:

    1.1. An overview of tasks to be executed;
    1.2. A list of reference documents, including environmental legislation and guidelines;
    1.3. A list of participants in the process and their responsibilities;
    1.4. A plan for management, communication and documentation;
    1.5. Construction IAQ management plan control measures [1] on: HVAC protection, source control, pathway interruption, housekeeping, scheduling;
    1.6. Monitoring and auditing of implementation;
    1.7. Expected written work products should include checklists and worksheets; and
    1.8. A schedule of activities.

2. Provide copy(ies) of the monthly report(s) demonstrating the effective implementation of the Construction IAQ Management Plan during the indoor construction period. A master programme shall also be included.

    The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM 6 or Project BEAM Pro as defined under IDCM P1.

    Provide extracts of tender documents (e.g. specifications) highlighting the clause which requires the contractors to carry out considerate measures, if indoor construction has not yet commenced at PA stage.

1 Sheet Metal & Air Conditioning Contractors' National Association (SMACNA). ANSI/SMACNA 008•2008 Guidelines for Occupied Buildings Under Construction. Chapter 3. [ONLINE] Available at: https://www.smacna.org/store/browse-by-topic/indoor-environmental-air-quality [Accessed August 2019]

3. Provide a report to demonstrate:

   3.1. Technical information for the filtration media used during construction and prior to occupancy;
   3.2. Details of building flush-out procedures including actual dates of the flush-out;
   3.3. The filtration media used had a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ANSI/ASHRAE 52.2-2012 [2] or equivalent performance specification;
   3.4. A flush-out with new filtration media is being carried out after the completion of construction and prior to occupancy;
   3.5. Flushing duration as defined by calculation of the fresh air required to attain the IAQ certification 'good' class requirement;
   3.6. No construction work done in the vicinity of the space during the flushing out; and
   3.7. The space was protected against any recontamination after flushing out.

   The report shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM 6 or Project BEAM Pro as defined under IDCM P1.

   Provide extracts of tender documents (e.g. specifications) highlighting the clause which requires the contractors to carry out considerate measures, if indoor construction has not yet commenced at PA stage.

2 American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) – ANSI/ASHRAE Standard 52.2-2012. Method of Testing General Ventilation Air-cleaning Devices for Removal Efficiency by Particle Size. ONLINE] Available at: www.ashrae.org [Accessed Aug 2019]

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_09_00	BEAM Plus NB submission template for IDCM 9	✓	✓
IDCM_09_01	Construction IAQ Management Plan for indoor construction within the *site*	✓	✓
IDCM_09_02	Any 3 monthly report(s) on the implementation of the Construction IAQ Management Plan during indoor construction period **[or]** Extracts of tender documents, (e.g. specifications) specifying the requirements for the implementation of the Construction IAQ Management Plan (if applicable)	✓* ✓	✓ -
IDCM_09_03	Report on filter replacement and flush out **[or]** Extracts of tender documents (e.g. specifications) specifying the requirements for filter replacement and flush out (if applicable)	✓* ✓	✓ -
* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA.			

Remarks

(a) Additional Information

None

(b) Related Credits

None.

2 Integrated Design and Construction Management

2.2 Green Construction Practices

IDCM 10 Considerate Construction

Extent of Application All buildings

Objective Encourage care of workers, mitigate nuisances to immediate neighbours and promote good practices of tree protection during construction.

Credits Attainable 1

Credit Requirement 1 credit for demonstrating considerate measures to the neighbourhood, passers-by and workers. Good tree protection practices where tree preservation within the project *site* is required, should also be carried out.

Note:

1) Partial credit shall be awarded for individual construction stages (i.e. demolition, foundation and *superstructure* in a default ratio of 1:1:3). The Applicant may submit justification and propose an alternative ratio based on the relative pollution control extent and resource demand in various construction stages. For a project covering all 3 stages, the partial credit attainable for demolition, foundation and *superstructure* are 0.2, 0.2 and 0.6 respectively. Similarly, for a project where demolition is not required or not under the Client's control, the partial credit attainable for foundation and *superstructure* are 0.25 and 0.75 respectively.

2) All applicable stages must be included in the partial credit calculation.

Assessment

1. Considerate measures to (a) neighbourhood, passers-by and (b) workers, shall refer to the assessment criteria recommended in "Being Considerate to Neighbourhood and Passers-by" and "Care of Workers and Others" in the Considerate Contractors *Site* Award Scheme Guidelines [1,2]. A checklist of considerate measures is provided in the prescribed form.

2. Good tree protection practices shall make reference to the Guideline in "Tree Preservation during Development by Greening, Landscape and Tree Management Section" of Development Bureau, HKSAR Government [3]. A checklist of good tree protection practices is provided in the prescribed form.

3. Provide quarterly report(s) with the completed prescribed form to demonstrate the implementation of considerate measures to (a) neighbourhood, passers-by, and (b) workers during construction (demolition and foundation to be included, if any); and the application of corrective actions to avoid continuous dissatisfaction/ non-compliance of any item(s).

---

1 Development Bureau and Construction Industry Council. Considerate Contractors Site Award Scheme Guideline for Non-Public Works Site Participation, Appendix V Scope of Assessment Criteria. [ONLINE] Available at: http://www.devb.gov.hk/filemanager/en/content_175/24th_CCSAS_Non_Public_Works_Sites_Guidelines_Eng_v3.pdf. [Accessed August 2019].

2 Development Bureau and Construction Industry Council. Considerate Contractors Site Award Scheme Guideline for Public Works Site Participation, Appendix V Scope of Assessment Criteria. [ONLINE] Available at: http://www.devb.gov.hk/filemanager/en/content_175/24th_CCSAS_Public_Works_Sites_Guidelines_English_Final.pdf. [Accessed August 2019].

3 Development Bureau - Greening, Landscape and Tree Management Section. Guideline on Tree Preservation during Development. [ONLINE] Available at: https://www.greening.gov.hk/filemanager/content/pdf/tree_care/Guidelines_on_Tree_Preservation_during_Development_e.pdf. [Accessed August 2019].

Provide extracts of tender documents (e.g. specifications) highlighting the clause which requires the contractors to carry out considerate measures, if construction (demolition and foundation to be included, if any) has not yet commenced at PA stage.

Valid Considerate Contractors *Site* Awards certificate(s) for New Works Contracts under Considerate Contractors *Site* Award Scheme (CCSA) shall be accepted as an alternative compliance path for the considerate measures, hence no quarterly report is required.

4. Provide quarterly report(s) with the completed prescribed form to demonstrate good tree protection practices during construction (demolition and foundation to be included, if any); and the application of corrective actions to avoid continuous dissatisfaction/ non-compliance of any item(s).

   Provide extracts of tender documents (e.g. specifications) highlighting the clause which requires the contractors to carry out good tree protection practices, if construction (demolition and foundation to be included, if any) has not yet commenced at PA stage.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_10_00	BEAM Plus NB submission template for IDCM 10	✓	✓
IDCM_10_01	A total of 3^ quarterly reports at a minimum with at least 1 quarterly report for each of the construction stages with the completed prescribed form [IDCM-10-1_Form_r1] to demonstrate compliance with considerate measures	✓*	✓
	[or]		
	Extracts of tender documents (e.g. specifications) specifying the requirements for considerate measures (if applicable)	✓	-
	[or]		
	Valid CCSA Certificate (alternative compliance path, if applicable)	✓	✓
IDCM_10_02	Any 3 quarterly report(s) with the completed prescribed form to demonstrate compliance in good tree protection practices (if applicable)	✓*	✓
	[or]		
	Extracts of tender documents (e.g. specifications) specifying the requirements for good tree protection practices (if applicable)	✓	-

* Evidences of compliance with credit requirements for construction works carried out prior to PA (first submission) shall be submitted in PA.

^ If there are less than 3 construction stages, a minimum total of 3 quarterly reports should still be submitted. In the case of more than 3 construction stages, extra no. of quarterly report(s) covering the extra stage(s) should be submitted.

Remarks

(a) Additional Information

Provision of hoardings, covered walkways and other necessary precautionary measures are statutorily required to protect the neighbourhood, passers-by and workers during construction.

Buildings Department, PNAP APP-21, Demolition Works – Measures for Public Safety. [ONLINE] Available at: http://www.bd.gov.hk/english/documents/pnap/APP/APP021.pdf [Accessed 5 July 2017]

Buildings Department, PNAP APP-23, Hoardings, Covered Walkways and Gantries (including Temporary Access for Construction Vehicles) Part IX of Building (Planning) Regulations. [ONLINE] Available at: http://www.bd.gov.hk/english/documents/pnap/APP/APP023.pdf [Accessed 5 July 2017]

Development Bureau – Greening, Landscape and Tree Management Section. Guidelines on Tree Preservation during Development. [ONLINE] Available at: https://www.greening.gov.hk/filemanager/content/pdf/tree_care/Guidelines_on_Tree_Preservation_during_Development_e.pdf [Accessed 5 July 2017]

(b) Related Credits

None.

2	**Integrated Design and Construction Management**	**2.2 Green Construction Practices**

IDCM 11 Building Management Manuals

Extent of Application All buildings

Objective Encourage the provision of a fully documented operations and maintenance manual to enable building operators to implement the design intent and a fully documented energy management manual containing instructions that enables systems to operate at a high level of energy efficiency.

Credits Attainable 1

Credit Requirement 1 credit for providing a fully documented Operations and Maintenance Manual and Energy Management Manual.

Assessment

1. Building Operations and Maintenance Manual (O&M Manual)

1.1. The O&M Manual shall include all of the following:

1.1.1. the design intent;

1.1.2. the basis of design; and

1.1.3. full sequences of operation for all equipment and systems, including HVAC&R systems and associated controls, light and daylighting controls, domestic hot water systems and renewable energy systems; all of which must meet the legal requirements and industry wide standards.

1.2. The description of the **design intent** shall include all of the following:

1.2.1. space temperature and humidity criteria

1.2.2. levels operator and/ or occupant control over HVAC systems;

1.2.3. ventilation requirements and related indoor air quality criteria

1.2.4. performance criteria related to energy efficiency;

1.2.5. environmental responsiveness of the facility;

1.2.6. and commissioning criteria.

1.3. The **basis of design** shall include all of the following:

1.3.1. details of occupancy;

1.3.2. space activity and any process requirements;

1.3.3. applicable regulations, codes, and standards;

1.3.4. design assumptions;

1.3.5. performance standards and benchmarks; and

1.3.6. control system appropriate for the skill of the operations and maintenance staff.

1.4. The operations and maintenance manual must include for each piece of equipment and each system:

1.4.1. the name and contact information of the manufacturer or vendor and installing contractor;

1.4.2. submittal data; and

1.4.3. operations and maintenance instructions with the models and features for the subject *site* clearly marked.

1.5. The manual shall include only data for equipment that is actually installed, and include the following:

1.5.1. instructions for installation, maintenance, replacement, start-up;

1.5.2. special maintenance requirements and sources for replacement parts/ equipment;

1.5.3. parts list and details of any special tooling requirements;

1.5.4. performance data; and

1.5.5. warranty information.

1.6. The manual shall include an as-built documentation package for controls covering all of the following:

1.6.1. control drawings and schematics;

1.6.2. normal operation;

1.6.3. shutdown;

1.6.4. unoccupied operation;

1.6.5. seasonal changeover;

1.6.6. manual operation;

1.6.7. controls set-up and programming;

1.6.8. troubleshooting;

1.6.9. alarms; and

1.6.10. final sequences of operation.

2. Energy Management Manual (EMM)

2.1. The EMM for all energy-related systems shall include the following:

2.1.1. Descriptions of the final design intent and basis of design, including brief descriptions of each system;

2.1.2. Final sequences of operations for all equipment;

2.1.3. Procedures for seasonal start-up and shutdown, manual and restart operation;

2.1.4. As-built control drawings;

2.1.5. For all energy-saving features and strategies, rationale description, operating instructions, and caveats about their function and maintenance relative to energy use;

2.1.6. Recommendations and brief method for appropriate accounting of energy use of the whole building;

2.1.7. Specifications of re-calibration frequency of sensors and actuators by type and use;

2.1.8. Recommendations for continuous commissioning or recommended frequency for re-commissioning by equipment type, with reference to tests conducted during initial commissioning;

2.1.9. Recommendations regarding seasonal operational issues affecting energy use;

2.1.10. List of all user-adjustable set points and reset schedules, with a discussion of the purpose of each and the range of reasonable adjustments with energy implications;

2.1.11. Schedules of frequency of reviewing the various set points and reset schedules to ensure that they are still near optimum;

2.1.12. List of time-of-day schedules and a frequency of reviewing them for relevancy and efficiency;

2.1.13. Guidelines for establishing and tracking benchmarks for building energy use and primary plant equipment efficiencies;

2.1.14. Guidelines for ensuring that future renovations and equipment upgrades will not result in decreased energy efficiency and will maintain the design intent;

2.1.15. List of diagnostic tools, with a description of their use, that will assist facility staff of the building in operating equipment more efficiently;

2.1.16. A copy of the commissioning report; and

2.1.17. Index of all commissioning documents with notation of their location.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_11_00	BEAM Plus NB submission template for IDCM 11	✓	✓
IDCM_11_01	Owner's requirements/ specification on provision of O&M Manual for all systems.	✓	✓
IDCM_11_02	Operations and maintenance manual adequately cover the major energy consuming building services systems and equipment where the manual includes the details given in the assessment criteria.	-	✓
IDCM_11_03	Owner's requirements/ specification on the provision of Energy Management Manual for energy-related systems.	✓	✓
IDCM_11_04	A dedicated Energy Management Manual meeting the requirements as stipulated in the assessment criteria.	-	✓

Remarks

(a) Additional Information

American Society of Heating, Air-conditioning, and Refrigerating Engineers (ASHRAE) – Preparation of Operating and Maintenance Documentation for Building Systems. ASHRAE Guideline 4. Atlanta. [ONLINE] Available at: https://www.ashrae.org/ [Accessed August 2019]

J H Armstrong. Building Services Research and Information Association (BSRIA) – Operating and Maintenance Manuals for Building Services Installations. Application Guide 1/87. Dec. 1990. [ONLINE] Available at: https://www.bsria.co.uk/ [Accessed August 2019].

(b) Related Credits

None

2 Integrated Design and Construction Management

2.2 Green Construction Practices

IDCM 12 Operator Training plus Chemical Storage Room

Extent of Application All buildings

Objective Encourage the provision of training for operations and maintenance staff to the minimum specified and demonstrate adequate maintenance facilities are provided for operations and maintenance work.

Credits Attainable 1

Credit Requirement 1 credit for providing training for operations and maintenance staff to the minimum specified; and demonstrating that adequate maintenance facilities are provided for operations and maintenance work.

Assessment **(a) Operator Training**

1. The training program should be carried out by the appointed Facilities Management Team or client representatives.

2. The training program shall cover as a minimum the items listed below:

   2.1. General purpose of each building system including basic theory of operation, capabilities and limitations, and modes of control and sequences of operation;
   2.2. Review of control drawings and schematics;
   2.3. Procedures for start-up, shutdown, seasonal changeover, normal operation, unoccupied operation and manual operation;
   2.4. Controls set-up and programming;
   2.5. Troubleshooting;
   2.6. Alarms;
   2.7. Interactions with other systems;
   2.8. Operational monitoring and record keeping requirements, and the use of data for analysing system performance;
   2.9. Adjustments and optimising methods for energy conservation;
   2.10. Any relevant health and safety issues;
   2.11. Inspection, service, and maintenance requirements for each system, including any need for specialised services;
   2.12. Sources for replacement parts/ equipment; and
   2.13. Any tenant interaction issues.

3. The demonstration portion of the training program shall include the following:

3.1. Typical operation examples of each system;

3.2. Start-up and shutdown procedures;

3.3. Operation under all specified modes of control and sequences of operation;

3.4. Procedures under emergency or abnormal conditions; and

3.5. Procedures for effective operational monitoring.

4. Verify that the training of the building's operations and maintenance staff was undertaken for all commissioned systems and major equipment, using the operations and maintenance manual, and the energy management manual as the basis for the training.

5. Demonstrate that the provided operation and maintenance facilities are adequate.

6. A permanent room for training is not necessary. Evidence of carrying out operator training (e.g. record of attendance) is required.

(b) Chemical Storage Room

1. A centralised chemical storage and mixing room for each individual building on the *site* (i.e. janitor and central storage area) should be provided where buildings include provision of housekeeping and chemical products that create odour during their mixing processes (non-residential spaces which will be managed and maintained for multiple occupant's usage). Chemical products include HVAC and cleaning relates (e.g. refrigerants, cleansing chemicals) for all building's future operation and maintenance items and equipment.

2. *For Residential building* (including clubhouse) without chillers, chemical storage is not required.

3. No size requirement for the chemical storage room.

4. Submit details in the form of drawings and a report with ventilation calculation to demonstrate the following chemical storage areas provision:

4.1. A drainage point and a water supply point;

4.2. An exhaust route for ventilation system to vent out (e.g. exhaust route to centralised exhaust riser) and maintain negative pressure with respect to adjacent spaces when the doors to the room are closed;

4.3. A separate area with self-closing and lockable door; and

4.4. Full height-partitions.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_12_00	BEAM Plus NB submission template for IDCM 12	✓	✓
IDCM_12_01	Owner's requirements/ specification on the provision of Training Report(s) and records of operation and maintenance facilities.	✓	✓
IDCM_12_02	Copies of Training program (e.g. PowerPoint presentation, training manual, etc.) which cover the items listed.	-	✓
IDCM_12_03	Evidences of operator training (e.g. sample record of attendance) verifying that training of the building's operations and maintenance staff was undertaken for all commissioned systems and major equipment, using the operations and maintenance manual, and the energy management manual as the basis for the training.	-	✓
IDCM_12_04	Drawing(s) to show the required drainage point, water supply points are implemented	✓	✓
IDCM_12_05	Drawing(s) and ventilation calculations demonstrating that chemical storage and mixing areas are equipped with the required provisions.	✓	✓
IDCM_12_06	Drawing(s) to show the chemical storage and mixing room doors and partitions provision	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credit

None

2 Integrated Design and Construction Management

2.3 Smart Design and Technologies

IDCM 13 Digital Facility Management Interface

Extent of Application All non-*residential building* and common areas of *residential buildings*

Objective Encourage provision of digital interfaces to enable future facility management teams to review the building operation performance

Credits Attainable 1 BONUS

Credit Requirement 1 BONUS credit for providing a digital interface in addition to the project design metering provision for future facility management team to review the building operation performance.

Assessment Develop and implement a digital interface for future facility management team to review data collected by the electricity metering system installed in the building. The assessment focuses on the interface provision for providing vision regarding operation characteristics. This is for future implementation of first class (Cat I) energy management opportunities (EMOs), with reference to the Code of Practice for Building Energy Audit 2015 [1]. Metering system design and hardware quality is not assessed in this credit.

The interface should be a provisional media, providing the information below for the future facility management team to review the building operation. The format and media used for the interface is not restricted provided the credit objectives are achieved by meeting the requirements below:

1) Providing charts and summaries for **hourly** data collected. **Minimum** data required should refer to below table:

System (if applicable)		**Data point for Performance Auditing**
Outdoor Condition		• Air Temperature (°C) • Humidity (RH) • Daylight (Lux)
Building		• Total Energy Use Intensity (kWh/m2) [Daily, Monthly & Annual] • Total HVAC Energy Use Intensity (kWh/m2) [Daily, Monthly & Annual] • Total Lighting Energy Use Intensity (kWh/m2) [Daily, Monthly & Annual]
HVAC System	Each Equipment in HVAC (Water Side)	• Electricity (kW and kWh) • Operation Hour

1 Electrical and Mechanical Services Department – Code of Practice for Building Energy Audit 2015. [ONLINE] Available at: http://www.beeo.emsd.gov.hk/en/pee/EAC_2015.pdf. [Accessed August 2019].

	- Chillers - Heat pumps - Pumps - Heat Rejection	• Supply & Return Water temperature (°C) • Water Flow rate (m^3/s)
	Each Equipment in HVAC (Water Side) - Absorption Chiller - Boiler	• Fuel (kW and kWh) • Operation Hour • Supply & Return Water temperature (°C) • Water Flow rate (m^3/s)
	Each Equipment in HVAC (Air Side) - Primary Air/ Air handling Unit Fans - Ventilation Fans	• Electricity (kW and kWh) • Operation Hour • Each service Zone temperature (°C) • Supply & Return Air temperature (°C) • Flow rate (m3/s)
	VRV and Unitary System	• Electricity (kW and kWh)
	Exhaust System - Carpark Exhaust Ventilation - Toilet Exhaust Ventilation (>5kW each)	• Electricity (kW and kWh) • Operation Hour • CO / NOx concentration level (if applicable)
Lift and Escalators System	Each Lift and Escalators	• Electricity (kW and kWh)

2) Keeping inventories and records of the identified systems, including manuals, technical brochures indicating their configurations and characteristics.
3) Enabling a trend of total building electricity use reporting for the last 12 months.
4) Enabling a trend of total electricity costs reporting for the last 12 months.
5) As-built drawing and system schematic that shows the layouts of energy consuming equipment and systems, and drawings showing the layout of the building.
6) Providing Operation and Maintenance programmes that include the timing of major alterations, additions or replacements for the building.

Achievement of EU 4 is not required as the basic requirement in assessing this credit.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_13_00	BEAM Plus NB submission template for IDCM 13	✓	✓
IDCM_13_01	Specifications of monitoring system for future facility management team	✓	✓
IDCM_13_02	Schematics of interface demonstrating compliance with the requirements	✓	✓
IDCM_13_03	Test and commissioning records	-	✓
IDCM_13_04	Operation manual	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

This credit may act as a platform gathering and processing the data collected in EU 4 Metering and Monitoring.

In conjunction with IDCM 3c Early Consideration Of Operational Issues, it is recommended to consult the facility management team while specifying the document management system.

2 Integrated Design and Construction Management

2.3 Smart Design and Technologies

IDCM 14 Occupant Engagement Platform

Extent of Application All non-*residential buildings*

Objective Encourage the provision of digital platforms to connect building occupants and the building status to drive behaviour change.

Credits Attainable 1 BONUS

Credit Requirement 1 BONUS for providing a digital platform to engage building occupants.

Assessment Develop a digital platform for future occupants to understand the building status. The platform shall contain information to be reviewed by the respective occupant only. The digital platform should contain data referenced to the EU 4 part (a) requirement and provide the following information:

1) Description of green measures implemented in the building;
2) Energy consumption in the occupants' respective leased spaces;
3) Recommendations to conserve energy use in the building; and
4) Healthy lifestyle tips.

The digital platform should be in a form of one of the following:

1) Digital displays in at least one common area(s) accessible by all occupants;
2) Mobile applications accessible by all occupants; and
3) Web-based applications accessible by all occupants.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_14_00	BEAM Plus NB submission template for IDCM 14	✓	✓
IDCM_14_01	Specifications of digital platform for future occupants	✓	✓
IDCM_14_02	Test and commissioning records	-	✓
IDCM_14_03	Operation manual	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

This credit may act as a platform to present the data collected in EU 4 - Metering and Monitoring in a simple way for occupants to understand the building status.

2 Integrated Design and Construction Management

2.3 Smart Design and Technologies

IDCM 15 Document Management System

Extent of Application All buildings

Objective Encourage tidy and digital documentation throughout the design and construction process for the ease of handing over to facility management teams.

Credits Attainable 2

Credit Requirement

(a) Project Team Document Management
1 credit for demonstrating the use of document management systems within the design team.

(b) Facility Management Team Document Management
1 credit for demonstrating the use of document management platform by the building owner or building management company.

Assessment

(a) Project Team Document Management

1. Demonstrate coordinated use of Design Team Document Management among design teams which shall include the following members:
   - 1.1. Project Owner;
   - 1.2. Architects / project designers;
   - 1.3. MEP engineers;
   - 1.4. Structural engineers
   - 1.5. Quantity Surveyors; and
   - 1.6. Contractors.
2. Provide specifications of the document management system including:
   - 2.1. Naming rules for the digital documents to follow;
   - 2.2. Filing rules, in the form of hierarchy, for the digital documents to follow; and
   - 2.3. File format of digital documents.
3. The document management system should perform the following functions:
   - 3.1. Storage of documents;
   - 3.2. Spare storage for future documents;
   - 3.3. Allow update of existing documents;
   - 3.4. Accessible online;
   - 3.5. Support multiple users access and different level of access rights;
   - 3.6. Alarms and notifications; and

3.7. Security protection by passwords.

4. The document management system should store the following documents:

4.1. Project timeline / programme;

4.2. Meeting minutes;

4.3. All documents submitted to government bodies; and

4.4. Material submissions from contractors.

(b) Facility Management Team Document Management

1. Provide specifications of the document management platform by the building owner/ building management company including:

1.1. Naming rules for the digital documents to follow;

1.2. Filing rules, in the form of hierarchy, for the digital documents to follow; and

1.3. File format of digital documents.

2. The document management system should perform the following functions:

2.1. Storage of documents;

2.2. Spare storage for future documents;

2.3. Allow update of existing documents;

2.4. Accessible online;

2.5. Support multiple users access and different level of access rights;

2.6. Alarms and notifications; and

2.7. Security protection by passwords.

3. The document management system should store all documents specified in IDCM 11 – 14 in addition to the following:

3.1. Approved drawings by all government departments;

3.2. All documents submitted to government bodies;

3.3. As-built drawings;

3.4. Waste management manual;

3.5. Water management manual;

3.6. Warranty of building equipment;

3.7. Tenant fitting out guide;

3.8. Tenancy green guide; and

3.9. Tenant feedback procedures notes and records.

Submittals

(a) Project Team Document Management

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_15_00	BEAM Plus NB submission template for IDCM 15a	✓	✓
IDCM_15a_01	Specifications of document management system	✓	-
IDCM_15a_02	Evidence (e.g. screenshots) to demonstrate the use of document management system (reference to EB)(check the document with IT)	-	✓

(b) Facility Management Team Document Management

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_15_00	BEAM Plus NB submission template for IDCM 15b	✓	✓
IDCM_15b_01	Specifications of document management system	✓	-
IDCM_15b_02	Evidence to demonstrate the platform will be used by building owner/ building management company.	-	✓

Remarks

(a) Additional Information

Hong Kong Green Building Council – Hong Kong Green Office Guide. [ONLINE] Available at: https://www.hkgbc.org.hk/eng/engagement/guidebooks/green-office-guide/index.jsp [Accessed Aug 2019].

Hong Kong Green Building Council – Hong Kong Green School Guide. [ONLINE] Available at: https://www.hkgbc.org.hk/eng/engagement/guidebooks/green-school-guide/index.jsp [Accessed Aug 2019].

Hong Kong Green Building Council – Hong Kong Green Shop Guide. [ONLINE] Available at: https://www.hkgbc.org.hk/eng/engagement/guidebooks/green-shop-guide/index.jsp [Accessed Aug 2019].

Hong Kong Green Building Council – Green Tenancy Driver For Office Buildings. [ONLINE] Available at: https://www.hkgbc.org.hk/eng/engagement/guidebooks/green-tenancy-driver/index.jsp [Accessed Aug 2019].

The Hong Kong Institute of Surveyors - Green Property Management Practices. [ONLINE] Available at: http://www.hkis.org.hk/ufiles/gpmp2015.pdf. [Accessed August 2019].

(b) Related Credits

In conjunction with IDCM 3c Early Consideration Of Operational Issues, it is recommended to consult the facility management team while specifying the document management system.

2	**Integrated Design and Construction Management**	**2.3 Smart Design and Technologies**

IDCM 16 BIM Integration

Extent of Application All buildings

Objective Encourage the design team to discuss and work through the design platform and deliver holistic solution using Building Information Modelling (BIM)

Credits Attainable 1 + 1 additional BONUS + 2 BONUS

Credit Requirement

(a) Coordinated Use of BIM within Design Teams
1 credit for the coordinated use of BIM among the design team.

(b) Coordinated Use of BIM within Design and Construction Teams
1 additional BONUS for coordinated use of BIM among the design team and the contractors.

(c) BIM for Time
1 BONUS for using the BIM model for scheduling, cost and quantity, schedules preparation and tracking the project budget.

(d) BIM for Facility Management Use
1 BONUS for updating the BIM model to as-built condition.

Assessment

(a) Coordinated Use of BIM within Design Teams

1. Prepare a project execution plan including the following content:
   - 1.1. Project BIM objectives;
   - 1.2. Model Level of Development (LOD);
   - 1.3. Methods of communication;
   - 1.4. Project BIM standards; and
   - 1.5. Model/Data validation protocols.
2. Demonstrate coordinated use of BIM among design teams which shall include the following members:
   - 2.1. Architects/project designers;
   - 2.2. MEP engineers; and
   - 2.3. Structural engineers.
3. Demonstrate the use of BIM performing the following functions:
   - 3.1. Coordinate spatial design;
   - 3.2. Clash detection; and
   - 3.3. Building performance simulation.

4. The BIM model should be at least LOD 300 as defined in The American Institute of Architects (AIA) Project Building Information Modelling Protocol Form [1] for builder and MEP elements.

(b) Coordinated Use of BIM within Design and Construction Teams

In addition to requirements in a), provide one representing document (e.g. crashes report) to demonstrate use of BIM among design teams and the contractors

(c) BIM for Time

1. Demonstrate the use of BIM in performing the following functions:
   1.1. Report real time on-site construction activity;
   1.2. Review construction progress against the construction programme;
   1.3. Prepare cost and quantity schedules; and
   1.4. Track project budget.

(d) BIM for Facility Management Use

Update the BIM model to the as-built condition including fixtures, finishes and equipment data.

Demonstrate that the BIM will be handed over to the facility management team for facility management use.

Submittals

(a) **Coordinated Use of BIM within Design Teams**

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_16a_00	BEAM Plus NB submission template for IDCM 16a	✓	✓
IDCM_16a_01	Project execution plan	✓	✓
IDCM_16a_02	Specifications of BIM software	✓	-
IDCM_16a_03	Project-specific documents demonstrating the performance of functions	✓	✓

1 The American Institute of Architects (AIA) - The American G202™ – 2013, Project Building Information Modelling Protocol Form [ONLINE] Available at: https://www.aiacontracts.org/ [Accessed August 2019]

(b) Coordinated Use of BIM within Design and Construction Teams

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_16b_00	BEAM Plus NB submission template for IDCM 16b	✓	✓
IDCM_16b_01	Project execution plan	✓	✓
IDCM_16b_02	Specifications of BIM software	✓	-
IDCM_16b_03	Project-specific representing document demonstrating the coordination among design team and construction team	✓	✓

(c) **BIM for Time**

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_16c_00	BEAM Plus NB submission template for IDCM 16b	✓	✓
IDCM_16c_01	Project execution plan	✓	✓
IDCM_16c_02	Specifications of BIM software	✓	-
IDCM_16c_03	Project-specific documents demonstrating the use of BIM which performs the function requirements	✓	✓

(d) **BIM for Facility Management Use**

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_16d_00	BEAM Plus NB submission template for IDCM 16	✓	✓
IDCM_16d_01	Specifications of an as-built BIM model to be provided by contractor	✓	-
IDCM_16d_02	Specifications of handing over the as-built BIM model to facility management	✓	-

IDCM_16d_03	Evidence of handing over the as-built BIM model to facility management		✓

Remarks

(a) Additional Information

Housing Authority - Building Information Modelling. [ONLINE] Available at: http://www.housingauthority.gov.hk/en/business-partnerships/resources/building-information-modelling/. [Accessed August 2019].

Buildings Department - Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers ADV-34. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/ADV/ADV034.pdf. [Accessed Aug 2019].

(b) Related Credits

The use of BIM is a valuable add-on to IDCM 3 Integrative Design Process as it facilitates integrative design by strengthening the coordination within the project team.

2	**Integrated Design and Construction Management**	**2.4**	**Design for Engagement and Education on Green Buildings**
		IDCM 17	**Design for Engagement and Education on Green Buildings**

Extent of Application

All buildings

Objective

Encourage public education that focuses on strategies and solutions applied to the green buildings.

Credits Attainable

1 + 1 additional BONUS

Credit Requirement

1 credit for providing any two (2) education elements from the following list of green building design measures and provisions accredited by BEAM Plus and implemented in the project. The Project must achieve a rating of Bronze or above.

1) Provide users with manuals for all green building design measures and provisions.

2) Provide educational signage system that is integrated with the major communal areas of the project to educate users and visitors about the benefits of the green building design measures and provisions.

3) Provide users a platform for sustainable living showcase demonstration, experience or sharing that are relevant to the enabling design measures and provisions in the project. e.g. websites, regular publications available to the public, newspapers or other means.

4) Additional or alternative education element(s) proposed by the Applicant with substantiation demonstrating strategies compatible with the listed strategies for achieving the credit objective.

1 additional BONUS credit for providing four (4) education elements mentioned above on green buildings.

Assessment

Present evidence of the education elements provided to the users and/ or visitors that focuses on strategies and solutions applied to the project.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
IDCM_17_00	BEAM Plus NB submission template for IDCM 17	✓	✓
IDCM_17a_01a	User manual: Synopsis & content framework	✓	-
IDCM_17a_01b	User manual: Completed manual	-	✓
IDCM_17a_02a	Educational signage plan	✓	-
IDCM_17a_02b	Record photos of educational signage	-	✓
IDCM_17a_03	Supporting document of education platform(s) provided, e.g. pdf of the website or pdf of the electronic newsletter, etc.	-	✓
IDCM_17a_04a	Other supporting document(s) for the additional or alternative education element(s) proposed by applicant	✓	-
IDCM_17a_04b	Record photos of additional or alternative education element(s) proposed by applicant	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

3 Sustainable *Site*

3.P Prerequisite
3.1 Neighbourhood Integration
3.2 Ecologically Responsible Design
3.3 Bioclimatic Design
3.4 Climate Resilience and Adaptability

Introduction

This section focuses on the planning and design to harness the sustainable design potentials of a *site* for its occupants and neighbours, preserve/ enhance its ecological capacity, optimize its microclimate and create better climate resilience. *Site* attributes and scale of development have been taken account of in the formulation of the assessment criteria.

Site locations/ *Site* planning and design strategies in the following aspects will be assessed for their sustainable design quality and performances:

- Building disposition, *orientation* and form;
- Spatial relationship of the building(s) to the immediate built and natural environment;
- Relationship of the building(s) to the *site* topography and ground conditions;
- Overall massing of the proposed development;
- *Site* coverage of greenery, choice of plant species, tree coverage/ preservation;
- View factors and ambient forces;
- Balance of built-up and landscaped/ open area;
- Environmental enhancement to the surroundings of the *site*; and
- Master landscaping strategy; and
- Conservation and protection of archaeological remains, historic buildings and monuments.

3.P Prerequisite

SS P1 Minimum Landscaping Requirements

Background

This part sets out the minimum requirements of greenery coverage on *site* and provisions for viability of planting for all buildings with *site* area of 1,000 m^2 or above.

3.1 Neighbourhood Integration

SS 1 Pedestrian-oriented and Low Carbon Transport
SS 2 Neighbourhood Amenities
SS 3 Building Design for Sustainable Urbanism
SS 4 Neighbourhood Daylight Access
SS 5 Noise Control for Building Equipment

Background

Integration with the neighbourhood is addressed in terms of pedestrian-oriented transport, adequacy of local amenities, sustainable urban design, daylight access for neighbouring sensitive receivers and reduction of noise from building services equipment to neighbours.

The planning and design issues which affect the environmental performance of a *site* and master layout planning should include:

- Disposition of individual buildings within the *site*;
- Spatial relationship of the building(s) to the immediate built and natural environment;

- Relationship of the building(s) to the *site* topography and ground conditions;
- Overall massing of the proposed development;
- Built form of the buildings;
- *Orientation* of buildings in relationship to view factors and ambient forces;
- Balance of built-up and landscaped/ open area;
- Environmental enhancement to the surroundings of the *site*; and
- Master landscaping strategy;
- Conservation and protection of archaeological remains, historic buildings and monuments.

Tall buildings can cause substantial overshadowing of neighbouring developments and amenities, affecting both direct and indirect sunlight and light from the sky. Noise emissions from equipment on and around buildings contributes to noise pollution with potential impacts on neighbouring properties. It is the responsibility of the project team to alleviate adverse effect on neighbouring properties by good design and proper installation and maintenance.

3.2 Ecologically Responsible Design

SS 6 Light Pollution Control
SS 7 Biodiversity

Background

Habitat conservation is the most effective means to minimise development impacts on the natural environment and endangered species (if any). If an area of high biodiversity is identified in the *site*, it is encouraged to formulate management strategies to protect habitats and any rare or endangered species within the land under ownership.

Light pollution may be regarded as waste light from lighting schemes that produces glare, obscures the night sky, adversely effects nocturnal ecosystems and may intrude on neighbouring properties.

3.3 Bioclimatic Design

SS 8 Urban Heat Island Mitigation
SS 9 Immediate Neighbourhood Wind Environment
SS 10 Outdoor Thermal Comfort

Background

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.

Site planning, building design and landscaping strategies can enhance a *site*'s microclimate. Elevated temperatures can be mitigated through the choice of finishes on buildings and horizontal hard surfaces that reflect heat, the application of shading or planted vegetation, and the enhancement of building permeability.

3.4 Climate Resilience and Adaptability

SS 11 Stormwater Management
SS 12 Design for Climate Change Adaptation

Background

Hong Kong is located along the common track of tropical cyclones and hence experiences very heavy rainstorms at times. In the New Territories, the area is characterised by its wide floodplain and low-lying terrain. In the past decades, rapid urbanisation has turned natural ground to hard paved

impervious areas. In the old built-up areas in Kowloon and in parts of Hong Kong Island, insufficient drainage capacity and dense land development aggravate the potential for flooding in the neighbourhoods. The climate change brings further challenges such as sea level rise and increased occurrence of extreme weather.

A high standard of stormwater management can reduce the risk of flooding and promote groundwater recharge. The “Sponge City” benchmarks to control the total stormwater run-off volume in Mainland China (Shenzhen) has been taken as reference in formulating the standards. Furthermore, the impact of projected climate change scenarios on building development are also encouraged. Using available best practice of local or national industry standard of weather data, a study on the projected variations in temperature, rainfall and storm surge, that will occur based on a building life cycle of 50 years as a result of climate change, is carried out and the respective strategies on improving climate resilience are considered.

3 Sustainable *Site* **3.P Prerequisite**

SS P1 Minimum Landscaping Requirements

Extent of Application

All *sites* with *site* area of 1,000 m^2 or more.

Objective

Encourage building development to preserve or expand urban greenery.

Credits Attainable

Prerequisite

Credit Requirement

Prerequisite achieved for demonstrating compliance with minimum planting provisions in terms of viability and *site* coverage of greenery of at least 20% of the *site*.

Assessment

(a) Minimum Provisions for Viability of Planting

1. Submit tree survey plans and tree assessment report if there are existing trees on the project site.

2. Highlight any existing trees to be preserved on the plan

3. Reserve vertical and horizontal soil for preserved, transplanted or added trees and all planted areas:

   3.1 Soil volume per tree shall be at a minimum of $12m^3$;

   3.2 Soil depths shall be at least 1.2m, 0.6m and 0.3m for trees, shrubs and grass/ ground covers respectively.

4. Demonstrate by citing relevant literature or reference that plant species used for covered greenery are shade tolerant.

5. Provide at least a means of irrigation for planting areas.

6. Provide access for the maintenance to the planting areas.

(b) Minimum S*ite* Coverage of Greenery

1. Provide a minimum of 20% overall *site* coverage of greenery (method of measurement and calculation of *site* coverage of greenery except otherwise stated below shall be in accordance with Buildings Department PNAP APP-152 *Sustainable Building Design Guidelines* [1]):

   1.1 The minimum *site* coverage of greenery in the *primary zone* required in the PNAP is not assessed under this prerequisite.

   1.2 Covered greenery areas above the primary zone (measured from 45o projected line taken from the edge of building) in communal areas accessible to the public, occupiers or visitors shall be counted (50% reduction factor applies).

   1.3 Vertical greening within 15m vertical zone from communal areas accessible to the public, occupiers or visitors shall be counted (no reduction factor applies but vertical frames with

1 Buildings Department - PNAP APP-152 Sustainable Building Design Guidelines

a height more than 7.5m are not accountable for vertical greening provided by climbing or weeping plants).

1.4 The maximum accountable percentage of greening features stated in the PNAP Appendix D is not assessed under this prerequisite.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_P1_00	BEAM Plus NB submission template for SS P1	✓	✓
SS_P1_01	Tree survey plans and tree assessment schedules highlighting any existing/ preserved trees (if applicable)	✓	-
SS_P1_02	Landscape plans and sections showing soft landscape layout, irrigation provisions, maintenance access, soil volumes/ depths of all planted areas for trees, shrubs and grass/ groundcover	✓	✓
SS_P1_03	Planting plans, planting schedules and extracts of relevant literature or reference demonstrating plant species with shade tolerance are used for any covered greenery	-	✓
SS_P1_04	Summary for the total and breakdowns of areas and *site* coverage of greenery of accountable greenery areas and greening features	✓	✓
SS_P1_05	Drawings and planting schedules for soft landscape works highlighting the locations, areas and dimensions of accountable greenery areas and greening features, plant types and highlighting plant species with shade tolerance that are used for any covered greenery	✓	✓

Remarks

(a) Additional Information

The Practice Note No. 7/2007 of Lands Department HKSAR provides the guidance on minimum soil volume and depth for trees.
Greening, Landscape & Tree Management Section of Development Bureau, HKSAR provides guidelines for proper planting practices for trees.

(b) Related Credits

SS 1 Pedestrian-oriented and Low Carbon Transport
The related credit encourages the shading of main pedestrian paths by trees. The soil space of trees shall meet the minimum standards stipulated in SS P1.

SS 8 Urban Heat Island Mitigation
The related credit encourages a higher overall *site* coverage of greenery and stipulates the minimum *site* coverage of greenery in the

Primary Zone (the 15m vertical zone of a *site* along the abutting street level).

SS10 Outdoor Thermal Comfort
The related credit considers the positive effect of shading by trees and the surrounding ground surface temperatures of greenery within the *site*.

SS 11 Stormwater Management
The related credit considers the softscape provided with the *site* for infiltration and detention in stormwater management.

WU 2 Water Efficient Irrigation
The related credit considers water efficient irrigation for greenery provided within the *site*.

HWB 2 *Biophilic Design*
The related credit encourages human-nature connection for building occupants.

3 Sustainable *Site* 3.1 Neighbourhood Integration

SS 1 Pedestrian-oriented and Low Carbon Transport

Extent of Application All buildings

Objective Encourage the use of pedestrian-oriented, low carbon and/ or public transport, with an aim to create a safer, more sustainable and appealing environment that promotes human interaction, a sense of place as well as integration with the surrounding pedestrian transport network.

Credits Attainable 2 + 1 additional BONUS + 2 BONUS

Credit Requirement

(a) Accessibility to Public Transport

1 credit for achieving Accessibility Index of 15 or more for all buildings of a development.

(b) Pedestrian-oriented Access

1 credit for achieving 50% or more of the applicable pedestrian-oriented transport planning measures.

1 additional BONUS credit for achieving 100% of the applicable pedestrian-oriented transport planning measures.

(c) Cycling Facilities and Network Integration

1 BONUS credit for providing cycling facilities within the *Site* and integrating with the public cycling network if a public cycling network exists or has been planned nearby.

(d) Charging Facilities for Electric Vehicle (EV)

1 BONUS credit for providing EV medium chargers for at least 50% of all parking spaces and EV charging-enabling for all parking spaces (including visitor car parks).

Assessment

(a) Accessibility to Public Transport

1. Indicate the distances shown alongside unhampered walking routes within a walking distance of 1,000m from the *site* main entrance(s) to each public transport [1] stop or the main entrance of each station in vicinity on an A3-sized scaled drawing.

2. Provide evidence of service frequencies of the public transport.

3. Calculate the Accessibility Index (AI) [2] for all buildings of a development using the spread sheet template [3].

   3.1. Use service frequency data at peak periods for the calculation of waiting time.

   3.2. Adopt a walking speed of 80m per minute for the calculation of walk time.

---

1 Public transport includes railways, bus (franchised bus/ non-franchised public bus), green minibus (GMB), tram and ferry

2 Transport for London. Measuring Public Transport Accessibility Levels. [ONLINE] Available at: https://files.datapress.com/london/dataset/public-transport-accessibility-levels/PTAL-methodology.pdf [AccessedAugust 2019]

3 BEAM Society Ltd. – Accessibility Index Calculation Spread Sheet Template.

3.3. For a walking route using mechanical means to assist pedestrian movement, provide evidences to demonstrate:

3.3.1. The mechanical means shall be in operation either at least between 7am to 7pm every day or a period that meets the specific needs of building users (occupancy pattern of the project to be justified by the Applicant);

3.3.2. Mapping of the start and end points of the mechanical means shall be shown on a scaled drawing, and

3.3.3. Calculation of the combined horizontal commuting time (walk times) and the horizontal commuting times of the mechanical means to the public transport services (wait time for vertical transportation to be excluded), with substantiation by supplier's information on the commuting speed of the mechanical installation. The combined horizontal commuting time to the public transport services shall not be more than 10 minutes.

4. Provide evidence issued by a government agency or a quasi-government body for the targeted operation date of any future public transport services/ facilities. Future services/ facilities provisions not operable at the time of building completion will be accepted if they will be in operation no later than one year after the occupation of the proposed development.

5. For a *site* served by dedicated shuttle service vehicles for the development and to be considered under the AI method, provide the following:

5.1. Notification of services provisions by the service provider to building users confirming that:

5.1.1. Routes and stops of the shuttle services providing connection links to the public transport,

5.1.2. Capacity of the shuttle service vehicles,

5.1.3. Locations of the shuttle service drop-off/ pick-up points, and

5.1.4. Operating frequency of the services.

5.2. Justification of the adequacy of the service if the capacity of the shuttle service vehicles is below 16 passengers.

5.3. An undertaking letter by the developer/ property owner for the provision of the shuttle service for a minimum of 5 years. A minimum of 1 year rolling contract in place with the service provider submitted.

(b) Pedestrian-oriented Access

1. Demonstrate compliance for the applicable pedestrian-oriented transport planning measures using the following score table.

2. Complete the prescribed form to indicate whether the following sub-items are achieved or not.
3. Provide justifications for each of the achieved sub-item and descriptions with illustrations, drawings and photos of measures adopted.

4. Provide justifications for each of the non-applicable sub-item.

Safe Environment		**Score**
a	Segregation between main pedestrian pathways and vehicular traffic for private cars/ taxis within the Site if there is no speed limit or the targeted speed is higher than 20 km/h; **OR**	1
	Vehicular traffic calming measures adopted and speed limit signs provided for a speed of no more than 20 km/h for over 50% of roads within the Site; **OR**	1
	Vehicular traffic calming measures adopted and speed limit signs provided for a speed of no more than 20 km/h for 100% of roads within the Site.	2
b	Whole length of *main pedestrian access pathways* to be overlooked from any *normally occupied spaces* of buildings within or outside the *site*.	1
c	Lighting of the illuminance of all pedestrian pathways within the *site* is at least 50 lux.	1
Convenient Environment		**Score**
d	Short and direct pathways as compared to the vehicular access/ pathways.	1
e	Minimised level changes for pathways meeting recommended design requirements of barrier-free access in Chapter 4 of BFA 2008.	1
f	Widths of the street furniture and greening zones along the main pedestrian pathways meeting recommended widths of HKPSG Chapter 8 [4].	1
g	Widths for the main pedestrian pathways meeting recommended widths of HKPSG Chapter 8 [4].	1
h	Clear and easily understood wayfinding signage is sited prominently and in predictable locations within the *Site*.	1
Pleasant Environment		**Score**
i	Car parking spaces not exceeding the minimum requirement from the government, excluding parking for shuttle service vehicles; **OR**	1
	No car parking is provided other than provisions intended for use by people with a disability and for shuttle service vehicles.	2
j	Planting zone of a minimum width of 1m along the main pedestrian pathways.	1
k	Main pedestrian pathways under covered or shaded by trees.	1
l	Pedestrian pathways designed with high architectural/ landscape quality, with design features intended for human delight/ celebration of culture or public art.	1

4 Planning Department. Hong Kong Planning Standards and Guidelines. Chapter 8: Internal Transport Facilities [ONLINE] Available at https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/sum/pdf/sum_ch8_en.pdf [Accessed Aug 2019]

Note:
Main pedestrian pathways are defined as pathways of width not less than 2m for pedestrian circulation from building main entrance(s) to *site* entrance(s) or amenities within the *site*.

5. The following assessment requirements for car parking facilities shall be fulfilled for scoring the first point under Pleasant Environment:

   5.1. The car parking spaces not exceeding the minimum requirement from the government (lease/ engineering conditions). If no requirement is stipulated in lease/ engineering conditions, the lower bound number of any recommended range in HKPSG Chapter 8 [4] or Transport Department (TD)'s advice shall be followed;

   5.2. Simultaneous free flow of vehicles in and out of the car park at the point of access, and

   5.3. Provisions to avoid ground contamination from oil run-off by:

      5.3.1. For covered parking spaces: Petrol interceptors, and

      5.3.2. For open parking spaces: Petrol interceptors or, if there is no open transport interchange/ vehicular servicing area, pervious paving and construction with a maximum gradient of 1:20, a depth of at least 600mm from top surface of paving to anticipated highest water table, and a permeability rate of at least 0.1mm/sec.

6. Demonstrate that the width of each horizontal screen, covered walkway or trellis over main pedestrian pathways shall be at least 2m.

7. If shading for main pedestrian pathways is provided by trees at-grade, demonstrate by an ecologist or a landscape architect that:

   7.1. The shade provided should be a continuous strip of trees planted along the pedestrian route.

   7.2. Suitable species of broadleaved trees (not palms conifers) with sufficient anticipated crown diameters are provided to offer shade.

   7.3. The tree coverage shall be measured using the estimated crown diameters of 10 years after landscape installation, with evidence of crown measurement of the species taken in similar local growing conditions.

   7.4. A shaded pedestrian route of a minimum width of 2m under the trees shall be demonstrated on plan.

(c) Cycling Facilities and Network Integration

1. Demonstrate that there is a public cycling network within 500m walking distance from the perimeter of the *site*, either existing or planned (to be in operation no later than one year after the occupation for the proposed Project).

2. Demonstrate that the following facilities are provided by means of layout and drawings, supplementary calculations and photos of the installed facilities:

   2.1. Cycling tracks and parking facilities complying with the requirements in Section 6 – Cycling of Internal Transport Facilities presented in the Chapter 8 of HKPSG [5] or Transport Department (TD)'s requirements.

   2.2. The cycling tracks comply with the following conditions:

      2.2.1. A continuous cycling network within the *Site* and the existing/ planned public cycling network if the public cycling network is immediately adjacent to the *Site*, and

      2.2.2. The cycling network within the *Site* shall have physically designated in-/ off-street cycle tracks or are integrated with roads designed for a target speed of 20 km/h or slower.

   2.3. For non-residential projects or non-residential portion of mixed-use projects, shower and changing facilities of at least one shower for the first 100 regular building occupants (excluding occasional visitors) and one additional shower facility for every additional 150 regular building occupants' users.

(d) Charging Facilities for Electric Vehicles (EV)

1. For both Indoor parking and outdoor parking space, basic EV charging-enabling/ facilities requirements are as follows:

   Provide descriptions with illustrations, schematic drawings and photos of the EV charging-enabling for ALL the carparking spaces with reference to the requirements in Technical Guidelines for Electric Vehicle (EV) Charging-enabling for Car Parks of New Building Developments [6].

2. Demonstrate that 50% of all the carparking spaces are provided with EV charging facilities that meet the following requirements:

   2.1. Installation of medium chargers with output power not less than 7kW;

   2.2. Sockets/ connectors provided are widely applicable for various EV brands/ types of the market;

   2.3. Medium chargers with both American SAE standard and European IEC standard sockets/ connectors shall be provided for all visitor car parks.

---

5 Planning Department. Hong Kong Planning Standards and Guidelines. Chapter 8: Internal Transport Facilities [Online] Available at: https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/sum/pdf/sum_ch8_en.pdf (Accessed Aug 2019)

6 Technical Guidelines for Electric Vehicle (EV) Charging-enabling for Car Parks of New Building Developments [Online] Available at: https://www.epd.gov.hk/epd/sites/default/files/epd/english/environmentinhk/air/prob_solutions/files/guidelines_on_enabling_eng.pdf (Accessed Aug 2019)

2.4. For **outdoor** EV chargers, safety requirement in IEC 60364-7-722 is required with protection of at least IPX4

Submittals

(a) Accessibility to Public Transport

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_01_00	BEAM Plus NB submission template for SS 1	✓	✓
SS_01_01	SS-01a-1_Form_REV2	✓	✓
SS_01a_02	Scaled drawing on an A3-sized sheet indicating the distances alongside unhampered walking routes from *site* entrance(s) to stops/ stations of public transport services	✓	✓
SS_01a_03	Evidence of service frequencies of public transport	✓	✓
SS_01a_04	Accessibility Index (AI) calculation spreadsheet	✓	✓
SS_01a_05	Evidence for the operating hours and required information of mechanical means to assist pedestrian movement, and calculation of the combined horizontal commuting time (If a walking route uses a mechanical means to assist pedestrian movement)	✓	✓
For future services/ facilities provisions in operation no later than one year after the completion and occupation of the proposed development, please include the followings:		***PA***	***FA***
SS_01a_06	Evidence issued by a government agency or a quasi-government body for the targeted operation dates of any future public transport services/ facilities	✓	✓
SS_01a_07	Evidence showing the actual occupation date of the proposed development	-	✓
If shuttle service is provided, please include the followings:		***PA***	***FA***
SS_01a_08	Scaled building layout plans for drop-off/ pick-up point(s) of shuttle service vehicles	✓	✓
SS_01a_09	Notification of shuttle service provisions by the service provider to building users confirming that: - Routes and stops that provide connection links to the public transport, - Capacity of the shuttle service vehicles, - Locations of the shuttle service drop-off/ pick-up points, and	-	✓

	Fixed operating frequency of the services.		
SS_01a_10	Justification for the adequacy of services (if the capacity of shuttle service vehicles is below 16 passengers)	-	✓
SS_01a_11	Undertaking letter by the developer/ property owner that the shuttle services will be provided for a minimum of 5 years.	-	✓
SS_01a_12	A minimum of 1 year rolling contract in place with the service provider information.	-	✓
SS_01a_13	Evidence of shuttle services in project completion	-	✓

(b) Pedestrian-oriented Access

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_01_00	BEAM Plus NB submission template for SS 1	✓	✓
SS_01_01	SS-01-1_Form_r1	✓	✓
SS_01b_02	Drawings and descriptions on the relevant pedestrian-oriented features	✓	✓
SS_01b_03	Relevant parts of the lease conditions/ engineering conditions on the car park provisions (If applicable)	✓	✓
SS_01b_04	Extracts of HKPSG's recommended minimum car park provisions, or Transport Department advice on minimum car park provisions (If applicable and there is no requirement stipulated for car park provision in the lease or engineering conditions)	✓	✓
SS_01b_05	Plans showing a shaded pedestrian route under trees for main pedestrian pathways; Report on species of trees and anticipated crown diameters 10 years after landscape installation (If applicable and shading for main pedestrian pathways is provided by trees at-grade)	✓	✓
SS_01b_06	Evidence of pedestrian-oriented features in project completion	-	✓

(c) Cycling Facilities and Network Integration

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_01_00	BEAM Plus NB submission template for SS 1	✓	✓

SS_01c_01	Scaled drawing on an A3-sized sheet indicating the nearby public cycling network	✓	✓
SS_01c_02	Drawings and calculations of cycling tracks, parking and other facilities within the *site* meeting stipulated requirements	✓	✓
SS_01c_03	Extracts of HKPSG's recommended cycling facilities provisions, or Transport Department advice on cycling facilities provisions	✓	✓
SS_01c_04	Evidence of cycling facilities in project completion	-	✓

(d) Charging Facilities for EV

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_01_00	BEAM Plus NB submission template for SS 1	✓	✓
SS_01d_01	Drawings and description of EV charging facility provisions	✓	✓
SS_01d_02	Evidence of EV charging facilities in project completion	-	✓

Remarks

(a) Additional Information

Recommended design requirements for barrier free access are published in the Design Manual for Barrier Free Access 2008 of the Buildings Department HKSAR.

Civil Engineering and Development Department, HKSAR publishes projects on the latest and on-going cycle track networks in its website.

Transport Department, Public Transport in Hong Kong. [ONLINE] Available at:
http://www.td.gov.hk/en/transport_in_hong_kong/public_transport/
[Accessed August 2019]

(b) Related Credits

SS P1 Minimum Landscaping Requirements

The related prerequisite requires a minimum *site* coverage of greenery that may contribute to the design of a pleasant environment for pedestrians.

SS 2 Neighbourhood Amenities

The related credit promotes a good pedestrian accessibility to amenities within and in the vicinity of the *Site*. Better integration of the surrounding pedestrian networks and pedestrian pathways within the *site* will achieve enhanced accessibility for building users and/ or the public.

SS 7 Biodiversity

The related credit encourages strategies to preserve and/ or enhance the ecological value of the *site* in terms of habitat and biodiversity.

SS 8 Urban Heat Island Mitigation

The related credit encourages a higher overall *site* coverage of greenery and stipulates minimum *site* coverage of greenery in the *Primary Zone* (the 15m vertical zone of a *site* along the abutting street level). The enhanced greenery in the *Primary Zone* will contribute to a more pleasant pedestrian environment.

SS 10 Outdoor Thermal Comfort

The related credit considers the positive effect of shading by trees and the surrounding ground surface temperatures of greenery within the *site*.

SS 11 Stormwater Management

The related credit considers the hardscape and softscape provided with the *site* for infiltration and detention in stormwater management that may contribute to the design of a pleasant environment for pedestrians and the pervious construction to avoid ground contamination from oil run-off for open carpark.

3 Sustainable *Site* **3.1 Neighbourhood Integration**

SS 2 Neighbourhood Amenities

Extent of Application All buildings

Objective Encourage building development that is integrated within, and an asset to, the immediate neighbourhood.

Credits Attainable 2

Credit Requirement

(a) Amenities for Building Users

1 credit where adequate amenities for building users are located within the *site* or 500m walking distance/ an equivalent horizontal commuting time from the *site* entrance(s).

(b) Shared Amenities for Neighbourhood

1 credit where adequate shared amenities for the neighbourhood are provided within the *site* and are made available for public use.

Assessment

(a) Amenities for Building Users

1. Provide a report based on a survey of the immediate neighbourhood and the development itself to demonstrate that at least 15 amenities for building users are located within the *site* or 500m walking distance from the *site* entrance(s) to the main entrances of the amenities or the common entrance of a collective amenity (a complex comprising 2 or more amenities).

Building Amenities	**Building Types**					
	C1	C2	E1	E2	R	O
Food outlets						
Restaurants/ cafes/ food & beverage outlets	C	✓	C	C	C	✓
Community retail						
Convenience/ grocery stores	C	✓	C	C	C	✓
Supermarkets/ wet markets	✓	✓	✓	✓	✓	✓
Other retail shops	✓	✓	✓	✓	✓	✓
Services						
Banks or Automated Teller Machines	C	✓	✓	C	C	✓
Hairdressers	✓	✓	✓	✓	✓	✓
Pharmacy (with registered license and for retail purpose)	✓	✓	✓	✓	✓	✓
Laundry or dry cleaners	✓	✓	✓	✓	✓	✓
Community facilities						
Nursery classes */ kindergartens */ day care/ child care facilities	✓	✓		✓	✓	✓

Elderly care facilities	✓	✓	✓	✓	✓	✓
Primary/ secondary school*	✓	✓		✓	✓	✓
Arts venues */ public entertainment [1]	✓	✓	✓	✓	✓	✓
Places of worship	✓	✓	✓	✓	✓	✓
Medical/ health facilities (including dental clinic) *	✓	✓	✓	✓	✓	✓
Libraries	✓	✓	✓	✓	✓	✓
Post offices */ postal facilities	✓	✓	✓	✓	✓	✓
Community hall *	✓	✓	✓	✓	✓	✓
Public Toilets	✓	✓	✓	✓	✓	✓
Recreational facilities/open spaces						
Active recreational facilities or open spaces *	C	✓	C	C	✓	✓
Passive recreational facilities or open spaces *	✓	✓	✓	✓	C	✓

Legend:

C	Core amenity for building type
✓	Amenity relevant to building type
*	Definition referred to in HKPSG Chapter 3/ Chapter 4 [2]

Building Types:

C1 C2	*Commercial buildings*	Office / Retail /Mixed-use Hotel
E1 E2	*Educational buildings*	Pre-school / Primary / Secondary School Tertiary / Post-secondary Education / Universities
R	*Residential buildings*	
O	*Other building types*	

2. Indicate lines and distances shown alongside of unhampered walking routes from the site entrance(s) to the main entrance of each amenity or each collective amenity in vicinity on an A3-sized scaled drawing.

   2.1 When there are multiple *site* entrances in a development, the one having the least numbers of amenities complying with the credit requirements shall be demonstrated for compliance.

1 Public entertainment means any entertainment to which the general public is admitted with or without payment (ref. to Cap 172 Places of Public Entertainment Ordinance, HKSAR)

2 Planning Department. Hong Kong Planning Standards and Guidelines. Chapter 3: Community Facilities / Chapter 4: Recreation, Open Space and Greening. [ONLINE] Available at: https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/pdf/ch3.pdf [Accessed Aug 2019], https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/pdf/ch4.pdf [Accessed Aug 2019]

3. Demonstrate that the available amenities shall include at least 2 different core amenities (core amenities are regarded as the most vital and essential basic services / recreational facilities) referred above for:

   3.1 Office, retail or mixed-use buildings;

   3.2 Pre-school, primary or secondary school;

   3.3 Tertiary, post-secondary education or universities, and

   3.4 *Residential buildings*.

4. Count 2 or more of any relevant amenity as 2 amenities. For example, 3 cafes and 2 ATMs shall be counted as 4 amenities.

5. The predominant service of the development itself could be counted as an amenity for this credit. For example, a school development itself is countable as an amenity for this credit.

6. For a walking route using a mechanical means to assist pedestrian movement, provide evidences to demonstrate:

   6.1 The mechanical means having no restricted operating hour or in operation when the counted amenities are opened;

   6.2 Mapping of the start and end points of the mechanical means to be shown on a scaled drawing, and

   6.3 Calculation of combined horizontal commuting time (walk times and the horizontal commuting times on the mechanical means to amenities being no more than 5 minutes (wait time for vertical transportation to be excluded; walking speed of 80m per minute to be adopted for calculation of walk time)), with substantiation by supplier's information on the commuting speed of the mechanical installation.

(b) Shared Amenities for Neighbourhood

1. Demonstrate that at least 5 amenities referred in SS 2a are provided within the *Site* and will be made available for public use, and no core amenity is needed to be counted.

2. Provide evidence that prominent and permanent public signage is provided on *site* or at least one notice in the public domain (websites, regular publications available to the public, newspapers or other means proposed by the Applicant) is served to notify the public about the shared amenities for neighbourhood, and any arrangement to be made for using the facilities.

3. State any restrictions or conditions of access to the amenities that will be in place. Reasonable opening time restriction and / or fees charged for the use of the amenities by public shall be acceptable for this credit. Private clubhouses primarily for residents or building occupants of the proposed development shall not be counted in this credit requirement.

<u>For both SS 2a and SS 2b:</u>

4. Provide justifications to count amenities that are not listed in this credit for consideration. The justification shall be considered based on the individual merits of the amenities, basic necessity,

psychological and/ or physical wellbeing of the immediate neighbourhood.

5. Provide evidence for the targeted opening schedules for future amenities provisions not operable at the time of building completion. The amenities can be counted if they will be in operation no later than one year after the occupation of the proposed development.

Submittals

(a) Amenities for Building Users

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_02_00	BEAM Plus NB submission template for SS 2a	✓	✓
SS_02_01	SS-02-1_Form_r1	✓	✓
SS_02a_02	Scaled drawing on an A3-sized sheet indicating the distances alongside unhampered walking routes from the *site*'s entrance(s) to amenities	✓	✓
SS_02a_03	Evidence for the operating hours and required information of the mechanical means to assist pedestrian movement, and detailed account of combined horizontal commuting time (If a walking route uses a mechanical means to assist pedestrian movement)	✓	✓
SS_02a_04	Justifications on the needs of building users/public to count amenities that are not listed (If applicable)	✓	✓
SS_02a_05	Evidence for the targeted opening schedules for future amenities provisions (If applicable)	✓	✓
SS_02a_06	Evidence of the actual occupation date of the proposed development (If future amenities with known targeted opening schedules are counted)	-	✓
SS_02a_07	Evidence of the amenities identified in the vicinity within walking distance	✓	-
SS_02a_08	Evidence of the amenities provided within the *Site* for building users	-	✓

(b) Shared Amenities for Neighbourhood

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_02_00	BEAM Plus NB submission template for SS 2b	✓	✓
SS_02_01	SS-02-2_Form_r1	✓	✓
SS_02b_02	Scaled drawing on an A3-sized sheet indicating the shared amenities within the *Site*	✓	✓
SS_02b_03	Justifications on the needs of building users/ public to count amenities that are not listed (If applicable)	✓	✓

SS_02b_04	Evidence for the targeted opening schedules for future amenities provision (If applicable)	✓	✓
SS_02b_05	Evidence for the public on-*site* signage or evidence of notice in the public domain for the shared amenities	-	✓
SS_02b_06	Evidence of the amenities provided within the *site*	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

SS 1 Pedestrian-oriented and Low Carbon Transport
The related credit promotes good pedestrian accessibility to public transport. Better integration of the surrounding pedestrian networks and pedestrian pathways within the *site* will achieve enhanced accessibility for building users and/ or the public.

3 Sustainable *Site* **3.1 Neighbourhood Integration**

SS 3 Building Design for Sustainable Urbanism

Extent of Application All buildings

Objective Encourage a people-oriented and place-making approach for a sustainable urban design and conserve *cultural heritage*.

Credits Attainable 2 + 1 additional BONUS + 1 BONUS

Credit Requirement **(a) Sustainable Urban Design**

Preparing a *site* design appraisal report demonstrating a proactive approach in achieving a people-oriented and place-making approach for a sustainable *site* planning.

Credit (s)	Percentage of achievement in site design appraisal report
1	at least 30% of applicable sustainable urbanism measures are achieved
2	at least 60% of applicable sustainable urbanism measures.
2 + 1 additional BONUS	at least 90% of applicable sustainable urbanism measures.

(b) Conservation of *Cultural Heritage*

1 BONUS credit for demonstrating that a proper heritage impact assessment mechanism and its recommendations have been implemented.

Assessment **(a) Sustainable Urban Design**

1. Complete a checklist in the submission template of this credit to indicate which sub-items are achieved, not achieved or not applicable.

2. Provide a *site* design appraisal report demonstrating a proactive approach in achieving relevant applicable sustainable urbanism measures for *public realm* (interpreted as public spaces within and surrounding the *Site* for socialisation and enjoyment by the community), providing justifications on all the achieved or not applicable sub-items of the following:

   2.1 Avoid dwarfing effect in *public realm*, considering visual effect of the building masses/ forms/ heights from public spaces in relation to human scale.

   2.2 Create or preserve visual corridors and prominent pedestrian linkages in *public realm* to less developed rural areas in urban fringe or towards adjacent public open spaces in vicinity. (This sub-item is not applicable for sites where there is no surrounding public open space or less developed rural area in vicinity.)

   2.3 Create or preserve visual corridors in *public realm* from inland to the waterfront of the Victoria Harbour or major

water bodies such as Inner Port Shelter, Junk Bay, Ma Wan, South China Sea, Tolo Harbour. (This sub-item is not applicable for inland *sites* where *public realm* has no view of the water bodies.)

2.4 Harmonise building masses/ forms/ heights with the natural environment in rural areas or urban fringe. (This sub-item is not applicable for inland urban *sites* where *public realm* has no view of the natural environment.)

2.5 Avoid monotony by diversified but yet compatible building masses/ forms/ heights in relation to topography or character of surrounding landscape/ developments.

2.6 Create stepped and compatible building height profile within the *Site* in relation to topography, water bodies or character of surrounding landscape/ developments.

2.7 Preserve views to selected sections of ridgelines/ peaks by maintaining a 20% building free zone [1] as viewed from relevant vantage points [2] or give punctuation effects of the ridgelines by special landmark mega tower design with high quality architectural design at suitable locations [3]. (This sub-item is not applicable for inland *sites* that could not be seen from the afore-mentioned vantage points on both sides of Victoria Harbour.)

2.8 Preserve views to local building/ landscape features and public spaces from *public realm* by appropriate building masses/ forms / heights.

2.9 Open up or preserve view from *public realm* to any adjacent heritage feature. Arrange massing of larger elements of the new development furthest from an adjacent heritage feature and smaller elements of the massing closer to the feature. (This sub-item is not applicable for *sites* where there is no adjacent heritage feature.)

2.10 Provide building set-back (at least 2m from *site* boundary) from street and neighbourhood amenities along street to activate *public realm*. (This sub-item is not applicable for *sites* with no street frontage.)

2.11 Create building masses/ forms as high quality architectural landmark features in *public realm*/ waterfront to create *orientation* and a sense of place.

2.12 Provide public open spaces of diverse shapes and sizes for social and cultural events with prominent pedestrian linkages.

---

1 Planning Department. Hong Kong Planning and Standards Guidelines. Chapter 11: Urban Design Guidelines. Figure 2: Building Free Zone to Preserve Views to Ridgelines. [ONLINE] Available at: https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/sum/pdf/sum_ch11_en.pdf [Accessed Aug 2019]

2 Planning Department. Hong Kong Planning and Standards Guidelines. Chapter 11: Urban Design Guidelines. Figure 3: Vantage Points. [ONLINE] Available at https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/sum/pdf/sum_ch11_en.pdf [Accessed Aug 2019]

3 Planning Department completed the "Urban Design Guidelines for Hong Kong" (the UDG Study) in 2003 and has suggested that no additional high-rise nodes should be designated outside the southern tip of West Kowloon Reclamation and Tsim Sha Tsui area.

2.13 Avoid monotony by diversified but yet compatible building facade/ streetscape design in *public realm* (styles/ colours/ materiality/ architectural details) in relation to surrounding developments.

2.14 Define entrance(s) and focal point(s) in *public realm* to create a sense of place.

2.15 Provide high quality architectural design of seating, pedestrian signage, pavement surface and other street furniture in the *public realm* to strengthen human scale and to complement the character of the area or the adjacent developments.

2.16 Harmonise architectural design, especially in the lower floors, with an adjacent built heritage in terms of style, scale, proportion, colour and/ or materials (at least 2 of these items). (This sub-item is not applicable for *sites* where there is no adjacent built heritage.)

2.17 Create landscape with seasonal colour changes and scenic effect to enhance street character.

2.18 Provide suitable landscaping to minimise negative visual impact of stilted structures on sloping *sites*. (This sub-item is not applicable for *sites* where there is no stilted structure.)

(b) Conservation of *cultural heritage*

1. Compile a comprehensive inventory of *cultural heritage* within or in the vicinity of the *Site* (interpreted as not more than 50m measured from the nearest point of the *site* boundary (inclusive of works area) in accordance with the Technical Circular (Works) No. 6/2009 for Heritage Impact Assessment Mechanism for Capital Works Projects [4]).

   1.1 *Cultural heritage* referred to in this credit include declared monuments/ Grade 1 to Grade 3 historic buildings confirmed by the Antiquities Advisory Board (AAB) and other *sites*/ historic buildings proposed to be recorded/ graded by AAB. The information of *cultural heritage* shall be assembled from the Antiquities and Monuments Office (AMO) [5], public libraries and archives and tertiary institutions.

   1.2 If there is any potential heritage *site*/ structure/ feature/ building within or in the vicinity of the *Site*, present a latest record by AMO's grading confirmation or advice on the heritage value of the *site*/ structure/ feature/ building.

2. For a project with culture heritage within or in the vicinity of the *Site*, demonstrate that a heritage impact assessment mechanism in accordance with Development Bureau's Technical Circular (Works) No. 6/2009 "Heritage Impact Assessment Mechanism for

4 Development Bureau. Technical Circular (Works) No. 6/2009: Heritage Impact Assessment Mechanism for Capital Works Projects. [ONLINE] Available at: http://www.heritage.gov.hk/images/impact/TC_Heritage.pdf [Accessed August 2019]

5 Antiquities and Monuments Office, Hong Kong. [ONLINE] Available at: https://www.amo.gov.hk/en/main.php [Accessed Aug 2019]

Capital Works Projects" [4] and its recommendations have been implemented.

Submittals

(a) Sustainable Urban Design

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_03_00	BEAM Plus NB submission template for SS 3	✓	✓
SS_03_01	SS-03-1_Form_r1	✓	✓
SS_03a_02	*Site* design appraisal report demonstrating a proactive approach in achieving relevant applicable sustainable urbanism measures	✓	✓
SS_03a_03	Provide detailed narrative and supporting information such as existing *site* photos, layout plans, renderings, etc. to demonstrate compliance	✓	✓

(b) Conservation of *Cultural Heritage*

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_03_00	BEAM Plus NB submission template for SS 3	✓	✓
SS_03_01	SS-03-1_Form_r1	✓	✓
SS_03b_02	Heritage impact assessment report	✓	✓
SS_03b_03	Supporting documents and photos for implementation of recommendations in heritage impact assessment report	-	✓

Remarks

- **Additional Information**

  None

- **Related Credits**

  SS 1 Pedestrian-oriented and Low Carbon Transport
  The related credit encourages pleasant pedestrian-oriented design and may help achieve the people-oriented and vibrant streetscape.

  SS 2 Neighbourhood Amenities
  The related credit encourages building developments to provide neighbourhood amenities and will help activate *public realm*.

  SS 7 Biodiversity
  The related credit encourages habitat preservation/ enhancement that may contribute to the landscape quality of the *public realm*.

  SS 8 Urban Heat Island Mitigation
  The related credit encourages greenery and building setback that may enhance the quality of the *public realm*.

3 Sustainable *Site* **3.1 Neighbourhood Integration**

SS 4 Neighbourhood Daylight Access

Extent of Application All buildings

Objective Encourage building development which is sensitive to the needs of neighbours in respect of preserving daylight and views.

Credits Attainable 1

Credit Requirement 1 credit for the designs which the access to daylight of neighbouring sensitive buildings is maintained to the prescribed levels.

Assessment

1. Demonstrate **<u>either</u>** by:

   1.1 Computational lighting simulation / physical modelling, the Vertical Daylight Factors (VDFs) [1] on the facades of the lowest floors of the sensitive buildings most affected by the proposed development are either unchanged or are no less than 12%, **OR**

   1.2 Unobstructed Vision Area (UVA) Method [1], the UVAs of the windows on the lowest floors of the sensitive buildings most affected by the proposed development are unchanged (this method is only applicable for a project having no sensitive building within the *Site*)

2. For development located in an area where daylight is thought to be of no value to neighbouring properties, submit a scaled map covering the assessment area (see below sensitive building) to substantiate.

3. Submit a daylight access study report demonstrating compliance with the assessment criteria. The report should include:

   3.1 Types and locations of the sensitive buildings identified within the *Site* and in the vicinity on an A3-sized scale drawing;

   <u>For VDF simulation / physical modelling method</u>:

   A software validation report from the software developer should be provided to ensure the accuracy of the simulation by the software.

   3.2 Modelling assumptions;

   3.3 Screen captures of project building, surrounding building and terrain of the 3D model;

   3.4 Screen captures of the Sensitive Receivers' locations;

   <u>For UVA method</u>:

   3.5 Scaled drawings showing the UVA at Sensitive Receivers before and after the proposed development;

4. The report should be endorsed by a locally qualified professional who has at least 3 years of relevant experience in natural daylight study.

---

1 Buildings Department - PNAP 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 Aug 2019]

4.1 Sensitive Buildings

4.1.1 Assessment area shall be 1H (H being the building height (m) of the tallest building on the project *site*) or 100m away from the project *site*, whichever is larger;

4.1.2 All sensitive buildings within the assessment area (excluding those within the *site*) shall be assessed to determine the value of daylight;

4.1.3 Sensitive buildings include:

a. *Residential buildings*;

b. Premises that requires daylight to enhance the lighting environment for the occupants to perform tasks, such as offices and schools;

c. Premises that require daylight for energy saving and an improved environment for the transient stage of occupation, such as the circulation area of shopping centres and indoor games halls; and

d. Premises that require daylight primarily for view, such as hotels and hospitals.

e. Examples of premises that should be included: Commercial, education, shopping centre, hall, church, temple, hotel, hostel, hospitals and shops

f. Temporary structures are not required to be modelled

4.2 Sensitive Receivers

4.2.1 Sensitive receivers should be placed at the glazing of the lowest floors of sensitive buildings within the assessment area.

5. The below requirements should be fulfilled in the daylight simulation:

5.1 Sky model should use CIE overcast sky (10,000 lux)

5.2 Overall external reflectance of an average of 0.2 for building (include the project development, unless other supporting i) and 0.2 for ground

5.3 Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department.

5.4 The surrounding building and large structures should be included in the simulation model. The surrounding area should 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 building geometry can be simplified as blocks.

5.5 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. Where smaller terrain area is desired, the applicant should

propose a terrain area with justification and the terrain area should be surrounded by a wall with a height of the average height of the surrounding buildings.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_04_00	BEAM Plus NB submission template for SS 4	✓	✓
SS_04_01	CV of the professional as described in credit requirement	✓	✓
SS_04_02	*Site* plan indicating the location of the sensitive receiver	✓	✓
SS_04_03	Daylight access study report	✓	✓
SS_04_04	Validation Report of the simulation software	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

3 Sustainable *Site* **3.1 Neighbourhood Integration**

SS 5 Noise Control for Building Equipment

Extent of Application All buildings

Objective Encourage proactive design techniques to reduce the nuisance caused to the neighbours by noise from building services equipment.

Credits Attainable 1

Credit Requirement 1 credit for demonstrating that the level of the intruding noise at the facade of potential noise sensitive receivers is in compliance with the criteria recommended in the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction *Sites* [1].

Assessment

1. Provide evidence in a form of detailed analysis, appropriate calculations or measurements to demonstrate that the levels of the intruding noise at the facades of existing or potential noise sensitive receivers comply with the following assessment criteria:

   1.1 Provide a background noise measurement report with detailed monitoring records to support the ANL requirements of day time and night time and background noise.

   1.2 On the basis of promoting good environmental design assessment, existing uses and land uses under statutory plans of Town Planning Ordinance should be examined to identify existing or potential noise sensitive developments. Where there is a piece of vacant land and no available information to verify its use, it should be assumed that it will become a noise sensitive receiver.

   1.3 Ideally, assessment should be made at the facade on the noise sensitive receiver. Under circumstances that access to the noise sensitive development is not granted for measurement, calculation or a combination of measurement at a nearby location with calculation adjustment is permitted.

   1.4 The noise assessments shall be conducted in accordance with the Technical Memorandum [1].

   1.5 Noise sensitive receivers should follow the Technical Memorandum. Only buildings external to the *site* boundary are assessed.

   1.6 The major noise sources include chillers, water cooling towers, fans (duct type and centrifugal) and ducts [2]. Only equipment provided by the developer/owner is assessed.

   1.7 All fixed noise sources should be located and designed so that when assessed in accordance with the Technical Memorandum, the level of the intruding noise at the facade of the nearest sensitive receiver should be at least 5 dB(A) below the

1 Environmental Protection Department - Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites. [ONLINE] Available at: https://www.epd.gov.hk/epd/sites/default/files/epd/english/environmentinhk/noise/guide_ref/files/tm_nondomestic.pdf

[Accessed Aug 2019]

appropriate ANL shown in Table 2 of the Technical Memorandum or, in the case of the background being 5 dB(A) lower than the ANL, should not be higher than the background, in accordance with paragraph 4.2.13, Chapter 9 of the Hong Kong Planning Standards and Guidelines [2]. Applicants are required to justify the selected Area Sensitivity Rating (ASR).

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_05_00	BEAM Plus NB submission template for SS 5	✓	✓
SS_05_01	Layout plans indicating the location of the major noise sources and NSR's location and corresponding distance	✓	✓
SS_05_02	Noise Prediction/ assessment report	✓	✓
SS_05_03	Equipment catalogue showing the sound power level of equipment	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

2 EPD - Good Practices on Ventilation System Noise Control (April 2006)

3 Hong Kong Planning Standards and Guidelines, Chapter 9 Environment [ONLINE] Available at: https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/pdf/ch9.pdf [Accessed Aug 2019]

3 Sustainable *Site* **3.2 Ecologically Responsible Design**

SS 6 Light Pollution Control

Extent of Application All buildings

Objective Ensure that the exterior lighting and building design do not create unwanted and unnecessary light pollution.

Credits Attainable 2

Credit Requirement

(a) Control of Obtrusive Artificial Light

1 credit for demonstrating that the obtrusive light from exterior lighting meets the specified performance for the environmental zone in which the building development is located.

(b) Control of External Light Reflection from Building

1 credit for demonstrating that the sunlight reflection from external surfaces of the buildings is controlled by using materials with acceptable external light reflectance.

Assessment

(a) Control of Obtrusive Artificial Light

1. Provide a scaled map showing the immediate neighbourhood of the *Site* highlighting the surrounding buildings included in the assessment. Only buildings outside the *site* boundary are assessed.

2. Provide a schedule of all exterior lighting fixtures, including their quantities, locations and model references and compile supplier information on the performance of the light fixtures used for modelling studies.

3. Provide the exterior lighting layout plan showing types and locations of all exterior lighting fixtures.

4. Demonstrate that the relevant recommendations in the HKSAR Government's Guidelines on Industry Best Practices for External Lighting are complied with [1].

5. Meet the obtrusive light control requirements, using either the calculation method or backlight-uplight-glare (BUG) method when all installed luminaires' BUG rating information is available. If partial exterior luminaires are not BUG rated, hybrid approach (Calculation method & BUG method) could be used to show the credit compliance.

<u>Calculation Method</u>

6. Demonstrate that the exterior lighting design complies within the maximum figure for each parameter (sky glow, light into windows, source intensity, and building luminance), taken from Table 1 and Table 2 in ILP Guidance Notes [2]. Provide justification of environmental zone, note that it is a district-scale consideration.

---

1 Environment Bureau. Guidelines on Industry Best Practices for External Lighting. [ONLINE] Available at: http://www.enb.gov.hk/sites/default/files/en/node78/guidelines_ex_lighting_install_eng.pdf [Accessed August 2019]

2 The Institution of Lighting Professionals. Guidance notes for the reduction of obtrusive light, GN01:2011 https://www.theilp.org.uk/documents/obtrusive-light/ [Accessed August 2019]

7. Prepare a light pollution calculation report for modelling studies to demonstrate compliance of the above criteria, including:

   7.1 Assumptions adopted;

   7.2 Screen capture of input parameters;

   7.3 Screen capture of modelled buildings;

   7.4 Results highlighting compliance of credit requirements.

BUG Method

8. Demonstrate that the specific light source installed in the luminaire do not exceed the luminaire uplight, backlight and glare ratings, taken from IES TM-15-11 – Addendum A[3], based on mounting location and distance from the property line (assessment boundary). Provide justification of Model Lighting Ordinance (MLO)[4] lighting zone, note that it is a district-scale consideration,

9. Define assessment boundary on layout

10. BUG values are typically published by product manufacturers. If published BUG data do not address the design position of the luminaire (or are not available at all), ratings can be calculated by reviewing a luminaire's photometric test data and zonal lumen distribution and comparing the data with maximum zonal lumens for backlight, uplight, and glare established in IES TM-15-11, Addendum A. Software calculation for BUG rating is acceptable to reflect the compliance.

11. Prepare a BUG method report to demonstrate compliance of the above criteria, including:

    11.1 Highlighting manufacturer BUG rating information for installed luminaires

    11.2 Software calculation (if applicable) for the BUG rating with all assumption adopted, screen capture of input parameters and results of BUG rating.

Hybrid Method

12. Assessment requirements combined Calculation Method and BUG Method.

* Exemptions from this credit assessment

13. The following exterior lighting is exempted from the requirements, provided it is controlled separately from the non-exempt lighting:

    13.1 Specialised signal, directional, and marker lighting for transportation.

    13.2 Lighting for theatrical purposes for stage, film, and video performances.

    13.3 Hospital emergency departments, including associated helipads.

---

3 Backlight, Uplight, and Glare (BUG) Ratings - IES TM-15-11 – Addendum A, https://ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf [Accessed August 2019]

4 Illuminating Engineering Society and International Dark-Sky Association (IES/ IDA) Model Lighting Ordinance User Guides, http://darksky.org/wp-content/uploads/bsk-pdf-manager/16_MLO_FINAL_JUNE2011.PDF [Accessed August 2019]

(b) Control of External Light Reflection from Building

1. Demonstrate objectively that the sunlight reflection from the external surfaces of the building development is properly controlled and meets the following requirements:

External surfaces of various parts of the building development	**Total**	**Specular**
	External Light reflectance not to exceed	
Glass	20%	Nil
At least 50% (measured by surface areas) of materials (other than glass) on building facades and roof	Nil	10%

Note:

(i) Specular reflectance is the type of reflectance when light is reflected away from the reflecting surface at the same angle as it is incident.

(ii) Total external light reflectance is the sum of specular and diffuse reflectance.

2. The testing of reflectance values for any material shall be conducted by accredited laboratories in accordance with ASTM E903: Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres, or equivalent, with an integrating sphere of minimum 150mm diameter.

Submittals

(a) Control of Obtrusive Artificial Light

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_06_00	BEAM Plus NB submission template for SS 6	✓	✓
SS_06a_01	Scaled map showing immediate neighbourhood of the *site* for assessment	✓	✓
SS_06a_02	External lighting layout plans	✓	✓
SS_06a_03	Schedule of exterior lighting fixtures and lighting catalogues on performance data	✓	✓
SS_06a_04	Light pollution calculation report **[and/ or]**	✓	✓
	BUG method report	✓	✓
SS_06a_05	Report on the compliance of Guidelines on Industry Best Practices for External Lighting	✓	✓

(b) Control of External Light Reflection from Building

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_06_00	BEAM Plus NB submission template for SS 6	✓	✓

SS_06b_01	Schedules or drawings on materials used on the external surfaces of the building development	✓	✓
SS_06b_02	Some similar reference material catalogues/ test reports showing their specular reflectance values to demonstrate the design intent for the proposed types and finishes of the surface materials; schedule of external materials and proposed finishes treatments, and tender specifications on the specular reflectance requirements of the materials	✓	-
SS_06b_03	Calculations for surface areas using different materials (other than glass) to demonstrate compliance in design stage and when the building is completed respectively	✓	✓
SS_06b_04	Photos of the building facade	-	✓
SS_06b_05	Catalogues or test reports confirming the relevant external light reflectance of materials used on the external surfaces of the building development	-	✓

Remarks

(a) Additional Information

International Dark-sky Association. Information Resource. [ONLINE] Available at: http://www.darksky.org/resources. [Accessed August 2019]

International Commission on Illumination. Guidelines for Minimising Sky Glow. Technical Report CIE 126: 1997.

(b) Related Credits

None

3 Sustainable *Site* **3.2 Ecologically Responsible Design**

SS 7 Biodiversity Enhancement

Extent of Application All *site* with existing tree except *brownfield sites* or *sites* on reclaimed land for SS 7a.
Sites with adjacent areas of medium or high ecological value for SS 7b..

Objective Preserve and/ or enhance the biodiversity of the *site*.

Credits Attainable 1 + 2 additional BONUS + 3 BONUS

Credit Requirement **(a) Reduction of Ecological Impact**

Credit	Requirement
1	All identified habitat types on Site are of low or negligible indicative ecological values **OR** All identified habitat types on Site of medium to high indicative ecological value are preserved intact and are either unaffected by the planned development
1 additional BONUS	Existing trees are retained in situ such that the combined *girth* of the retained trees, with individual *girth* of at least 150mm for below requirement. At least 20% of the total *girth* of all existing trees on *site*.
1 additional BONUS	Existing trees are retained in situ such that the combined *girth* of the retained trees, with individual *girth* of at least 150mm for below requirement. At least 40% or more of the total *girth* of all existing trees on *site*.

(b) Enhancement of Biodiversity

Prepare a manual on biodiversity-friendly landscape maintenance, **PLUS** each of the following measures for enhancing the biodiversity of the Site:

1. 1 BONUS plus Physical connectivity between areas with ecological values
2. 1 BONUS plus Increase diversity and complexity of planting
3. 1 BONUS plus Wildlife-friendly building features (e.g. windows and lighting)

Assessment **(a) Reduction of Ecological Impact**

1. Provide a habitat map of the *Site* to identify the locations, dimensions and areas of all existing habitat types within the *Site* and determine their corresponding indicative ecological value. The mapping of habitat types, their definition and ecological value identification shall make reference to Terrestrial Habitat Mapping and Ranking Based on Conservation Value[1]. Types of habitats and their indicative ecological values are summarised below:

1 Sustainable Development Unit, Environment Bureau, HKSAR. 2009. Terrestrial Habitat Mapping and Ranking Based on Conservation Value.

Ecological Value	Habitat Types
High Value	Fung Shui Forest; Montane Forest; Lowland Forest; Mixed Shrubland; Freshwater/ Backish Wetland; Natural Watercourse; Seagrass Bed; and Intertidal Mudflat.
Medium Value	Shrubby Grassland (including Baeckea Shrubland) Plantation or Plantation/ Mixed Forest; Fishpond/ Gei Wai; Sandy Shore; Rocky Shore; and Cultivation.
Low Value	Bare Rock or Soil; Grassland; Modified Watercourse; Artificial Rocky/ Hard Shoreline; Golf Course/ Urban Park; and Quarry
Negligible Value	Rural industrial storage/ containers; Landfill; and Others.

2. Provide an ecological impact reduction report to demonstrate one of the following is achieved:

   2.1 All identified habitat types on Site are of low or negligible indicative ecological value; **OR**

   2.2 All identified habitat types on Site of medium to high indicative ecological value are preserved intact and are either unaffected or enhanced by the planned development.

3. Retention of Trees

   3.1 Provide a detailed tree survey of all trees on Site in accordance with the Development Bureau Technical Circular (Works) No. 7/2015 of the HKSAR Government.

   3.2 Demonstrate the girth of retained trees shall be at least 20% (or 40%) of the total girth of all existing trees on *site*.

   3.3 The retained trees counting towards the 20% (or 40%) less than 150mm and shall each have no more than 25% of its crown pruned to enable construction and operation of the Project.

   3.4 Trees transplanted within the Site do not qualified as retained trees of this BONUS credit.

(b) Enhancement of Biodiversity

1. Prepare a Biodiversity-friendly Landscape Maintenance Manual including the sections below for at least 20 A4 pages:

   a. Design objectives of biodiversity enhancement

b. Maintenance requirement

c. Waste minimisation

2. Prepare a Biodiversity enhancement report to indicate the measures to be implemented:

2.1. Physical connectivity

2.1.1. Provide planting plans and demonstrate the physical interconnectivity between new planting area and any preserved areas of medium to high ecological value within the Site or any areas of medium to high indicative ecological value adjacent to the Site (supported by a habitat map of adjacent area) [2]

2.1.2. Physical interconnectivity refers to contiguous planting areas less than 2m wide apart, without broken by occasional footpaths, installations or other features wider than 2m.

2.1.3. Demonstrate the total connected area is more than 5% of the total Site area.

2.2. Increase diversity and complexity of planting

2.2.1. Provide planting plans and demonstrate plant species type, characteristics of the species chosen (tree/ shrub/ herb/ climber), nativeness (native/ exotic), quantity and location.

2.2.2. Demonstrate the planting scheme incorporated **ALL** elements below:

a. Chosen diverse plant species. Reference to 10;20-30 rule for planting. [3]

b. Increase complexity of vegetation structure and provide habitats for wildlife by mixing vegetation with varied heights. [4]

c. Use >50% native or adaptive species

3. Wildlife-friendly building features

3.1. Demonstrate features on design drawings that reduce bird collision:

3.1.1. Design that avoid bird collision on windows (e.g. use pattern on glass/ façade/ shades, translucent glass) [5]

2 Sustainable Development Unit, Environment Bureau, HKSAR. 2009. Terrestrial Habitat Mapping and Ranking Based on Conservation Value.

3 Development Bureau, HKSAR, 2018 Street Tree Selection Guide “Chapter 9 – Complementary Vegetation Community Mix”

4 Development Bureau, HKSAR, 2018 Street Tree Selection Guide “Chapter 9 – Complementary Vegetation Community Mix”

5 Sheppard, C. 2011. Bird-Friendly Building Design. American Bird Conservancy, The Plains, VA. USA

3.1.2. Design essential outdoor lighting only and adopt measures to minimise impacts of outdoor lighting to wildlife (e.g. use narrow-spectrum light bulbs to lower the range of species affected by light; use light sources that emit minimal UV light and avoid the white and blue wavelengths; use shields to minimise light spill) [6]

4. The biodiversity enhancement report should be endorsed by qualified landscape architect or ecologist. Measures identified as not applicable (N/A) for specific project, or alternative measures proposed other than those listed for compliance is acceptable with justification.

Submittals

(a) Reduction of Ecological Impact

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_07_00	BEAM Plus NB submission template for SS 7	✓	✓
SS_07a_01	Habitat mapping report (*Site*) with scaled and dimensioned drawings and photographic records of the existing *site* conditions for habitat types identified in the *Site*	✓	✓
SS_07a_02	Ecological impact reduction report on interconnectivity with adjacent areas of ecological value	✓	✓
SS_07a_03	Detailed tree survey of all the trees on *Site*	✓	✓
SS_07a_04	Landscape layout plans, sections showing the retained trees	✓	✓
SS_07a_05	Summary and calculations to demonstrate the girth of retained trees shall be at least 20% (or 40%) of the total girth of all existing trees on *site*	✓	✓

(b) **Enhancement of Biodiversity**

Supporting Documents *Please provide below softcopies with filename prefix as indicated on leftmost column.*		**PA**	**FA**
SS_07_00	BEAM Plus NB submission template for SS 7	✓	✓
SS_07b_01	Biodiversity-friendly landscape maintenance Manual	✓	✓
SS_07b_02	Biodiversity enhancement report	✓	✓

6 Gunnell, K. et al. 2013. Designing for Biodiversity: A Technical Guide for New and Existing Buildings. Second Edition. RIBA Publishing, London. UK.

Remarks

(a) Additional Information

Development Bureau HKSAR Government, 'A Comprehensive Street Tree Management Plan for Hong Kong', Annex IV: Encouraging Biodiversity in the Urban Landscape through Planting Appropriate Tree Species in Hong Kong.

Development Bureau. Greening, Landscape and Tree Management Office (GLMTS) 2010, Guiding principles on use of native plant species in public works projects.

Beck T, Principles of ecological landscape design. Island Press, Washington, Covelo, London.

MacArthur R.H. and Wilson E.O., The theory of island biogeography, Princeton University Press, New Jersey, USA.

(b) Related Credits

SS P1 Minimum Landscaping Requirements
The related prerequisite requires minimum *site* coverage of greenery and minimum provisions for viability of planting, for example, the minimum soil volumes and depths for all plant areas.

SS 1 Pedestrian-oriented and Low Carbon Transport
The related credit encourages the shading of main pedestrian paths by trees. The soil space of trees shall meet the minimum standards stipulated in SA P1.

SS 8 Urban Heat Island Mitigation
The related credit encourages higher overall *site* coverage of greenery.

SS 10 Outdoor Thermal Comfort
The related credit considers the positive effect of shading by trees and the surrounding ground surface temperatures of greenery within the *site*.

SS 11 Stormwater Management
The related credit considers softscape provided with the *site* for infiltration and detention in stormwater management.

WU 2 Water Efficient Irrigation
The related credit considers water efficient irrigation for greenery provided within the *site*.

HWB 2 *Biophilic Design*
The related credit encourages human-nature connection for building occupants.

3 Sustainable *Site* **3.3 Bioclimatic Design**

SS 8 Urban Heat Island Mitigation

Extent of Application All Buildings

Objective Encourage building design to adopt measures to mitigate urban heat effect.

Credits Attainable For *Site* area < 1000m^2: 1

For *Site* area ≥ 1000m^2: 4 + 2 additional BONUS + 4 BONUS

Credit Requirement For *Site* area <1000m^2

(a) Urban Design Guidelines Chapter 11
1 credit for implementing at least 2 *site* level strategies under Section 11 of Hong Kong Planning Standards and Guidelines Chapter 11 Urban Design Guidelines.

For *Site* area ≥ 1000m^2

(a) Sustainable Building Design Measures

(1) 1 credit for providing shade on at least 5% of the *site* area and 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).

(2) 1 credit for demonstrating compliance with prescribed requirements of the SBD Guidelines as promulgated in the PNAP APP-152.

(3) 1 ADDITIONAL BONUS credit for demonstrating compliance with prescribed requirements and relevant prescriptive requirements of the SBD Guidelines as promulgated in the PNAP APP-152 with enhanced performances.

(b) Tree Coverage

2 BONUS credit for demonstrating that at least 10% of the total *Site* Area is provided with tree coverage.
For exemplary performance, ADDITIONAL BONUS credit where 20% or more of the *site* is provided with tree coverage.

(c) Air Ventilation Assessment (AVA)

For conducting an AVA by *wind tunnel* or *Computer Fluid Dynamics (CFD)* according to the prevailing AVA methodology introduced by the Government demonstrating that better or equivalent ventilation performances than a baseline case:

1 Credit for demonstrating annual wind condition

1 Credit for demonstrating summer wind condition.

(d) Intra Urban Heat Island Study

2 BONUS credit for conducting an Intra Urban Heat Island Study demonstrating that a maximum *Intra-Urban Heat Index* (difference between T_{urban} and T_{met}) in summer is less than 0.8 °C.

Assessment

1. For *Site* area <1000m^2

1.1 Demonstrate the *site* planning comply with 2 strategies under Section 11 of Hong Kong Planning Standards and Guidelines Chapter 11 Urban Design Guidelines with:

1.2 Mark up on layout plan for the implemented strategies

1.3 Description on the implemented strategies

For *Site* area ≥ 1000m^2

(a) Sustainable Building Design Measures

1. Non-roof Impervious Surfaces Requirements

Demonstrate that shade is provided on at least 5% of the *site* area and 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). (Podium roof no matter whether it is accessible or not will not be counted as non-roof surfaces).

2. Sustainable Building Design (SBD) Guidelines Requirements

Provide evidences in the form of scaled drawings and calculations to demonstrate compliance with relevant prescriptive requirements of the SBD Guidelines as promulgated in the PNAP APP-152 [1].
Roof materials with *Solar Reflectance Index (SRI)* of 78 or above is acceptable as an alternative to vegetated roof.
Provide a summary of overall *site* coverage of greenery (method of measurement and calculation of *site* coverage of greenery except otherwise stated below shall be in accordance with Buildings Department PNAP APP-152):

2.1 Covered greenery areas above the *primary zone* (measured from 45° projected line taken from the edge of building) in communal areas accessible to public, occupiers or visitors shall be counted (50% reduction factor applies).

2.2 Planters along the perimeter of an inaccessible roof above the *primary zone* but within 15m vertical zone from communal areas accessible to public, occupiers or visitors shall be counted (50% reduction factor applies).

2.3 Vertical greening within 15m vertical zone from communal areas accessible to public, occupiers or visitors shall be counted (no reduction factor applies but vertical frames with a height more than 7.5m are not accountable for vertical greening provided by climbing or weeping plants).

3. Enhanced Performances of Sustainable Building Design Guidelines

Further to requirements stated in SS 8a (2), provide evidence demonstrate compliance with the followings:

1 Buildings Department - PNAP APP-152 Sustainable Building Design Guidelines

3.1 Sustainable Soft Landscape Requirements
Provide the landscape plans for the *site* and detail the landscape treatment of the development including the planting and hard finishes of all landscaped areas, slopes and retaining structures, showing:

a) Planting plans with the character and planting densities for all softworks elements;
b) Tree planting locations;
c) Details of the species;
d) Live load calculation of roof (if planting is provided on the roof), and
e) Maintenance plan for the greenery.

3.2 Demonstrate how soft landscaping has addressed the guidelines and recommendations provided in the Hong Kong Planning Standards and Guidelines Chapter 4 Section 2 Greenery, appropriate to the type and scale of the building development and the immediate surroundings.

3.3 Demonstrate that at least 50% of the plant species used for trees, shrubs and grass/ ground covers respectively in terms of quantities are drought-tolerant to minimise watering requirements.

3.4 Demonstrate that the species, density and topsoil comply with the General Specification for Building Section 25: Landscape, or at least equal equivalent.

3.5 Minimum Separating Distance and Permeability:

Height (H) of the tallest building	Minimum P of buildings in each assessment zone on two projection planes			
	Site area < 20,000m^2 and with Lp < 60m	*Site* area < 20,000m^2 and with Lp ⩾ 60m	*Site* area ⩾ 20,000m^2	
	Each Plane	Each Plane	Plane 1	Plane 2
H ⩽ 60m	20%	25%	25%	30%
H > 60m	20%	25%	25%	40%

3.6 Minimum *Site* Coverage of Greenery:

Site Area	*Site* Coverage of Greenery	
	Primary zone	Overall
< 20,000 m^2	12.5%	30%
⩾ 20,000 m^2	17.5%	40%

(b) Tree Coverage

1. Submit plan drawing or calculation for tree coverage showing the estimated crown spread 10 years after the landscape installation:

2. Tree coverage is defined as the combined plan area under all tree canopies, projected perpendicularly onto the ground/ floor

surface, within the *Site*, where tree canopies are drawn at their estimated spread 10 years after the landscape installation.

3. Evidences for tree diameters prediction shall be provided with reference to examples of existing trees of that species planted in similar conditions in Hong Kong. In order not to overestimate tree crown diameter, the largest dimension permitted in the calculation shall be 12m in diameter for large wide spreading trees.

4. EVA shall be excluded from the total *site* are for the purpose of tree coverage calculation.

(c) Air Ventilation Assessment (AVA)

1. Between *site velocity ratio (SVR)* or *local velocity ratio (LVR)*, show that one of these two ratios increases or remain the same in the optimal option compared to the base case, while the other ratio is not reduced.

2. The annual wind rose (wind probability table) at 400 – 600m of the *site* should be used. The annual or summer prevailing wind used in the simulation should have an accumulated percentage occurrence of 75% (accumulation starts in the order from the highest occurrence to the lowest).The baseline scheme should meet Design Requirements (1) and (2) of Building Separation under the SBD Guidelines.

3. Demonstrate credit compliance by following one of the below routes:

Compliance Route 1: CFD Simulation

4. Submit an *air ventilation assessment* report. The report shall also include simulation assumptions and screen capture of project building, surrounding building and terrain of the 3D model.

5. The *site velocity ratio (SVR)* and *local velocity ratio (LVR)* of all test points should be reported.

6. The modelling methodology should adopt prevailing AVA methodology introduced by the government [2], unless specified below.

7. A software validation report from the software developer should be provided to ensure the accuracy of simulation by the software.

8. The below requirements should be fulfilled in the CFD simulation:

   8.1 Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department, the Government of HKSAR.

   8.2 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

2 Technical Circular No.1/06 Annex A - Technical Guide for Air Ventilation Assessment for Developments in Hong Kong, HPLB & ETWB, the Government of HKSAR

8.3 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.

8.4 For practical reasons, the geometry can be simplified to block.

9. 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 [3] or experimental *site* wind data from *wind tunnel* test.

10. If wind profile is not provided from the above sources, applicant can refine the ground roughness and model the wind profile using power law or log law for each wind direction, based on:

$$\text{Power Law} \quad \left(\frac{U_z}{U_g}\right) = \left(\frac{Z_z}{Z_g}\right)^{\alpha} \qquad \text{Log Law} \quad U_z = \frac{u^*}{\sigma}\ln\left(\frac{Z}{Z_0}\right)$$

U_z Wind speed at height z from ground
U_G wind speed at reference height (top of wind boundary layer)
Z_z height z from ground
Z_G reference height (top of the wind boundary layer)
α power law exponent
σ von Karman constant = 0.4
Z_0 roughness length
u* friction velocity
Z height z from ground, same as Z_z in power law

Terrain crossed by approaching wind	A	Z_G	Z_0
Sea and open space	≈ 0.15	≈ 300	≈ 0.1
Suburban or mid-rise	≈ 0.35	≈ 400	≈ 1
City centre or high-rise	≈ 0.50	≈ 500	≈ 3

11. These coefficients serve as reference only [4]. Applicants should justify the suitability of coefficients for the project.

12. Detailed Study shall be carried out if it is required under the Technical Circular No. 1/06 of Housing, Planning and Lands Bureau (HPLB) and Environment, Transport and Works Bureau (ETWB). The Detailed Study can carry out by *wind tunnel* test or CFD under all 16 prevailing wind conditions.

13. The simulation report should be endorsed by a locally qualified professional with 3 years of relevant experience in CFD simulation.

3 RAMS wind data. [ONLINE] Available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html [Accessed August 2019]

4 Feasibility Study for Establishment of Air Ventilation Assessment System Final Report, Department of Architecture, Chinese University of Hong Kong, Nov 2005

Compliance Route 2: *Wind Tunnel* Test

14. Demonstrate compliance by submitting a wind tunnel test report.

15. The technical standards pertaining to the execution of the current boundary layer wind tunnel studies conform to the guidelines outlined within the Hong Kong Wind Loading Code and are fully in-line with the guidelines of the Air Ventilation Assessment Technical Circular No. 1/06 for developments in Hong Kong.

16. The wind tunnel facilities should comply with the requirements of internationally recognised guides such as the guidelines of the American Society of Civil Engineers (ASCE) Manual of Practice No.67 for Wind Tunnel Studies and the Quality Assurance Manual, AWES-QAM-1-2001 by the Australasian Wind Engineering Society (AWES).

17. The wind profile can be created by the Power Law or the Log Law with appropriate coefficients.

Test Point Locations and Focus Areas for Both Routes

18. The assessment area shall be at least, 1H (H being the building height (m) of the tallest building on the project site) or 100m away from the project site boundary, whichever is larger.

19. Test point shall be placed 2m above pedestrian level within the assessment area.

20. Perimeter test points are positioned on the project site boundary. Typically about 30 perimeter test points well-spaced out and located will suffice.

21. Overall test points are evenly distributed and positioned in the open spaces, on the streets where pedestrians frequently access. For areas that are not open to the public can be exempted. For practical reasons, around 50 test points may be adequate for typical development sites.

(d) Intra Urban Heat Island Study

1. Provide an Intra-urban Heat Island Study report demonstrating that a maximum *Intra-Urban Heat Index* (difference between T_{urban} and T_{met}) in summer is less than 0.8 °C through Urban Heat Island Intensity calculation.

2. Temperature calculation shall be carried out for 10 consecutive days, the 10th day temperature profile between 08:00 to 18:00 hours shall be used for current assessment

3. The calculation should use the maximum temperature difference of T_{urban} and T_{met} between 08:00 to 18:00 hours to represent the Intra Urban Heat Index for the *Site*, where

$$\text{Intra Urban Heat Index} = \text{Max}\,[\,T(t)_{urban} - T(t)_{met}\,] < 0.8$$

$T(t)_{urban}$ = the predicting urban air temperature at the *Site*
$T(t)_{met}$ = the meteorological air temperature

4. In the report, provide a brief summary of the adopted methodology to calculate the *Intra-Urban Heat Index*.

5. Assess an individual *Intra-Urban Heat Index* within the *Site* and report under appropriate area breakdown with the maximum area of 10 ha.

6. The Intra-Urban Heat Island effect of a project is the contribution to the energy balance at a certain time, which can be quantified by *Intra-Urban Heat Index*. The *Intra-Urban Heat Index* here shall be defined by the maximum temperature difference of $T(t)_{urban}$ and $T(t)_{met}$ in the corresponding hour between 08:00 to 18:00 hours on a typical summer day. The detailed calculation methodology shall refer to relevant literature [5,6,7 and 8].

7. In order to capture Intra-Urban Heat Island effect of the Project precisely, the proposed methodology shall address the air temperature changes due to the Intra-Urban Heat Island Effect.

8. The report shall contain detailed considerations of all the factors listed below:

   8.1 Radiation heat gain/ loss from/ to the environment;

      8.1.1 Direct and diffused solar radiation on surface;

      8.1.2 Shading effect from buildings/ trees;

      8.1.3 Radiant heat loss from urban fabric to the surrounding; and

      8.1.4 Effect of Absorptivity/ Emissivity of surfaces;

   8.2 Thermal storage effect of urban fabric;

      8.2.1 Thermal capacity in participating ground layer, building and tree surface etc.;

   8.3 Wind environment;

      8.3.1 Convective heat transfer within urban cluster;

      8.3.2 Computational Fluid Dynamics (CFD) technique shall be used to assess the ventilation of the Project (refer to section below);

   8.4 Evaporative heat transfer;

      8.4.1 Greenery evapotranspiration;

      8.4.2 Evaporative heat transfer from water features; and

---

5 Santamouris M. 2001, 'On the impact of urban climate on the energy consumption of buildings', Solar Energy, vol. 70, pp. 201-216.

6 Oke TR. 1988, 'The urban energy balance', Progress in Physical Geography, vol.12, pp. 471-508.

7 Shashua-Bar, L. Hoffman, M. E. 2002, 'The Green CTTC model for predicting the air temperature in small urban wooded sites', Building and Environment, vol. 37, pp. 1279 –1288.

8 Elnahas, M. M., Willimanson, T. J. 1997, 'An improvement of the CTTC model for predicting urban air temperatures', Energy and Building, vol. 25, pp. 41–49.

8.4.3 Evaporative heat transfer from ground surface.

9. Calculation of $T(t)_{met}$ shall refer to reference environmental condition detailed in "Reference Environmental Conditions for *Intra-Urban Heat Index* Calculation" table.

10. The Applicant should use reference environmental condition in "Reference Environmental Conditions for *Intra-Urban Heat Index* Calculation" table except near ground wind velocity on Project *Site* to calculate $T(t)_{urban}$.

11. In order to calculate $T(t)_{urban}$, the wind environment of the Project shall be derived from Computational Fluid Dynamics (CFD) using *wind tunnel* data or RAMS data as stipulated in *Air Ventilation Assessment* (AVA) Technical Circular and Technical Guide [9].

12. Reference Environmental Conditions [10] for *Intra-Urban Heat Index* Calculation

Hours	Air Temperature, T_a (°C)	Relative Humidity, RH (%)	Global Horizontal Irradiance, GHI (W/m^2)	Diffuse Horizontal Irradiance, DHI (W/m^2)	Near Ground Wind Velocity at the Weather Station, (m/s)
1	28.5	83	0	0	0.5
2	28.3	84	0	0	0.4
3	28.1	85	0	0	0.4
4	28.0	85	0	0	0.4
5	27.8	86	0	0	0.4
6	27.7	87	0	0	0.4
7	27.8	86	0	0	0.4
8	28.1	84	154	93	0.4
9	28.5	82	298	161	0.6
10	29.0	79	449	216	0.7
11	29.8	76	573	259	0.8
12	30.3	74	622	272	0.8
13	30.7	73	638	285	0.9
14	30.9	72	602	287	0.9
15	31.0	72	525	254	0.9
16	31.0	72	429	210	0.8
17	30.5	73	290	154	0.7
18	29.9	75	141	89	0.7

9 Housing, Planning and Lands Bureau, and Environment, Transport and Works Bureau 2006, Technical Circular No. 1/06: Air Ventilation Assessments. [ONLINE] Available at: https://www.devb.gov.hk/filemanager/en/content_679/hplb-etwb-tc-01-06.pdf [Accessed August 2019]

10 HKO (Averaged data from 2009 to 2013)

19	29.5	77	0	0	0.6
20	29.3	78	0	0	0.6
21	29.1	80	0	0	0.5
22	29.0	80	0	0	0.5
23	28.9	81	0	0	0.5
24	28.7	82	0	0	0.5

13. The Intra-urban Heat Island Study report should be endorsed by a locally qualified professional with 3 years of relevant experience in urban heat island study.

Submittals

(a) Sustainable Building Design Measures

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_08_00	BEAM Plus NB submission template for SS 8	✓	✓
For SS 8a(1), please provide the followings:		***PA***	***FA***
SS_08a_01	Scale drawings and calculations to demonstrate compliance with the relevant prescriptive requirements of the light coloured high-*albedo* materials on non-roof impervious surfaces.	✓	✓
SS_08a_02	Reference material catalogues/test reports showing *albedo* values to demonstrate the design intent for the proposed types and finishes of the surface materials regarding the *albedo* requirements of the materials.	✓	-
SS_08a_03	A schedule of external materials, their proposed finishes treatments, and *albedo* requirements of the materials.	✓	-
SS_08a_04	Tender specifications on the *albedo* requirements of the materials	✓	-
For SS 8a(2)& (3), please provide the followings:		***PA***	***FA***
SS_08a_05	Scaled drawings and calculations to demonstrate compliance with relevant prescriptive requirements of the SBD Guidelines (for SS 8a(ii) and/ or (iii) only)	✓	✓
For SS 8a(3), please provide the followings:		***PA***	***FA***
SS_08a_06	Landscape plans, sections planting schedules and extracts of relevant supporting documents showing soft landscape layout, plan density, topsoil of all planted areas for trees, shrubs and grass/groundcover and demonstrating the use of drought-tolerant plant species	✓	✓
SS_08a_07	Live load calculation of roof (if planting is provided on the roof)	✓	✓
SS_08a_08	Maintenance plan of the greenery	-	✓
SS_08a_09	Dated photos of the as-built soft landscape works	-	✓

(b) Tree Coverage

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_08_00	BEAM Plus NB submission template for SS 8	✓	✓
SS_08b_01	Landscape plans, sections planting schedules and extracts of relevant supporting documents showing the soft landscape layout of all planted areas for trees, live load calculation of roof (if planting is provided on the roof) and maintenance plan.	✓	✓
SS_08b_02	Summary for the total and breakdowns of tree coverage areas and evidence for tree diameters prediction	✓	✓
SS_08b_03	Live load calculation of roof (if tree planting is provided on the roof)	✓	✓
SS_08b_04	Maintenance plan of the trees	-	✓
SS_08b_05	Dated photos of the as-built soft landscape works	-	✓

(c) Air Ventilation Assessment (AVA)

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_08_00	BEAM Plus NB submission template for SS 8	✓	✓
For compliance route 1, please provide the followings:		*PA*	*FA*
SS_08c_01	*Air Ventilation Assessment Report*	✓	✓
SS_08c_02	Validation Report of the simulation software	✓	✓
SS_08c_03	CV of the professional as described in credit requirement	✓	✓
For compliance route 2, please provide the followings:		*PA*	*FA*
SS_08c_04	*Wind Tunnel* Test Report	✓	✓

(d) Intra Urban Heat Island Study

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_08_00	BEAM Plus NB submission template for SS 8	✓	✓
SS_08d_01	Intra-urban Heat Island Study report	✓	✓
SS_08d_02	CV of the professional as per requirements in the assessment	✓	✓
SS_08d_03	Landscape plans, sections planting schedules and extracts of relevant supporting documents showing soft landscape layout of all planted areas for trees	✓	✓
SS_08d_04	Summary for the total and breakdowns of tree coverage areas and evidence for tree diameters prediction	✓	✓
SS_08d_05	Validation Report of the simulation software	✓	✓

SS_08d_06	Dated photos of the as-built soft landscape works	-	✓

Remarks

(a) Additional Information

Hong Kong Herbarium on Hong Kong plant species. [ONLINE] Available at: http://www.herbarium.gov.hk/Search_Form.aspx [Accessed 5 July 2017]

Planning Standards and Guidelines Chapter 4 Section 2 Greenery.
General Specification for Building Section 25: Landscape.
Buildings Department- PNAP APP-152 *Sustainable Building Design Guidelines*

(b) Related Credits

SS P1 Minimum Landscaping Requirements
The related prerequisite requires minimum *site* coverage of greenery and minimum provisions for viability of planting, for example, the minimum soil volumes and depths for all plant areas.

SS 1 Pedestrian-oriented and Low Carbon Transport
The related credit encourages the shading of main pedestrian paths by trees. The soil space of trees shall meet the minimum standards stipulated in SS P1.

SS 7 Biodiversity
The related credit encourages strategies to preserve and/ or enhance the ecological value of the *site* in terms of habitat and biodiversity.

SS 10 Outdoor Thermal Comfort
The related credit considers the positive effect of shading by trees and the surrounding ground surface temperatures of greenery within the *site*.

SS 11 Stormwater Management
The related credit considers softscape provided with the *site* for infiltration and detention in stormwater management.

WU 2 Water Efficient Irrigation
The related credit considers water efficient irrigation for greenery provided within the *site*.

HWB 2 *Biophilic Design*
The related credit encourages human-nature connection for building occupants.

3 Sustainable *Site* **3.3 Bioclimatic design**

SS 9 Immediate Neighbourhood Wind Environment

Extent of Application All Buildings

Objective Ensure the wind environment around and adjacent to buildings has been adequately considered regarding wind amplification and, where appropriate, suitable mitigation measures are provided.

Credits Attainable 1

Credit Requirement 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.

Assessment

1. Demonstrate that no test point reported exceeds a frequency weighted wind speed of 4m/s for the annual prevailing wind condition unless it is demonstrated that the excess of 4m/s is not caused by the proposed building.

2. The annual wind rose (wind probability table) at 400 – 600m of the *site* should be used. The annual prevailing wind used in the simulation should have an accumulated percentage occurrence of over 75% (accumulation starts in the order from the highest occurrence to the lowest).

3. Demonstrate credit compliance by following one of the below routes:

Compliance Route 1: *CFD* Simulation

4. Submit a wind environment report. The report shall also include simulation assumptions and screen captures of the project building, surrounding buildings and terrain of the 3D model.

5. A software validation report from the software developer should be provided to ensure the accuracy of simulation by the software.

6. The below requirements should be fulfilled in the *CFD* simulation:

   6.1 Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department, the Government of HKSAR.

   6.2 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.

   6.3 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.

   6.4 For practical reasons, the geometry can be simplified to blocks.

7. Wind data, such as wind frequency, wind rose, wind profile should be adopted from appropriate and reliable sources, such as simulated *site* wind data based on appropriate mathematical models (e.g. RAMS

from Planning Department, the Government of HKSAR [1]) or experimental *site* wind data from *wind tunnel* test.

8. If the wind profile is not provided from the above sources, applicant can refine the ground roughness and model the wind profile using power law or log law for each wind direction, based on:

$$\text{Power Law} \quad \left(\frac{U_z}{U_g}\right) = \left(\frac{Z_z}{Z_g}\right)^{\alpha} \qquad \text{Log Law} \quad U_z = \frac{u^*}{\sigma}\ln\left(\frac{Z}{Z_0}\right)$$

U_z	Wind speed at height z from ground
U_G	wind speed at reference height (top of wind boundary layer)
Z_z	height z from ground
Z_G	reference height (top of the wind boundary layer)
α	power law exponent
σ	von Karman constant = 0.4
Z_0	roughness length
u*	friction velocity
Z	height z from ground, same as Z_z in power law

Terrain crossed by approaching wind	**α**	**Z_G**	**Z_0**
Sea and open space	≈ 0.15	≈ 300	≈ 0.1
Suburban or mid-rise	≈ 0.35	≈ 400	≈ 1
City centre or high-rise	≈ 0.50	≈ 500	≈ 3

9. These coefficients serve as reference only [2]. Applicants should justify the suitability of coefficients for the project.

10. Detailed Study shall be carried out if it is required under the Technical Circular No. 1/06 of Housing, Planning and Lands Bureau (HPLB) and Environment, Transport and Works Bureau (ETWB). The Detailed Study can carry out by *wind tunnel* test or *CFD* under all 16 prevailing wind conditions.

11. The simulation report should be endorsed by a locally qualified professional with 3 years of relevant experience in *CFD* simulation.

Compliance Route 2: *Wind Tunnel* Test

12. Demonstrate compliance by submitting a *wind tunnel* test report.

13. The technical standards pertaining to the execution of the current boundary layer *wind tunnel* studies conform to the guidelines outlined within the Hong Kong Wind Loading Code and are fully in-line with the guidelines of the *Air Ventilation Assessment* Technical Circular No. 1/06 for developments in Hong Kong.

14. The *wind tunnel* facilities should comply with the requirements of internationally recognised guides such as the guidelines of the American Society of Civil Engineers (ASCE) Manual of Practice No.67 for *Wind Tunnel* Studies and the Quality Assurance Manual, AWES-QAM-1-2001 by the Australasian Wind Engineering Society (AWES).

1 RAMS wind data. [ONLINE] Available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html [Accessed August 2019]

2 Feasibility Study for Establishment of Air Ventilation Assessment System Final Report, Department of Architecture, Chinese University of Hong Kong, Nov 2005

15. The wind profile can be created by the Power Law or the Log Law with appropriate coefficients.

Test Point Locations for Both Routes

16. The assessment area shall be at least, 1H (H being the building height (m) of the tallest building on the project *site*) or 100m away from the project *site* boundary, whichever is larger.

17. Test points shall be placed 2m above pedestrian level within the assessment area.

18. Perimeter test points are positioned on the project *site* boundary. Typically, about 30 perimeter test points which are well-spaced out and well located will suffice.

19. Overall test points are evenly distributed and positioned in the open spaces, on the streets where pedestrians frequently access. For areas that are not open to the public can be exempted. For practical reasons, around 50 test points may be adequate for typical development *sites*.

20. Additional test points shall be placed in outdoor recreational areas, open spaces and pedestrian paths within the project *site*.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_09_00	BEAM Plus NB submission template for SS 9	✓	✓
For compliance route 1, please provide the followings:		*PA*	*FA*
SS_09_01	Wind Environment Report	✓	✓
SS_09_02	Validation Report of the simulation software	✓	✓
SS_09_03	CV of the professional as per requirements in the assessment	✓	✓
For compliance route 2, please provide the followings:		*PA*	*FA*
SS_09_04	*Wind Tunnel* Test Report	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

3 Sustainable *Site* **3.3 Bioclimatic Design**

SS 10 Outdoor Thermal Comfort

Extent of Application All *sites* with *site* area of 1,000 m^2 or more.

Objective Ensure adequate thermal comfort of outdoor environment within the *Site*

Credits Attainable 2

Credit Requirement

(a) Shaded or Covered Routes

1 credit is awarded where at least one shaded or covered route, connecting the *site* with nearby amenities/ *site* main entrance/ transport hub.

(b) Passive Open Spaces with Thermal Comfort

1 credit is awarded where 50% or more of the passive open spaces and pedestrian zones achieve thermal comfort. This is demonstrated on a typical summer day at 3:00 pm in Hong Kong.

Assessment

(a) Shaded or Covered Routes

1. Demonstrate at least one pedestrian route within the *site* from a notional building entry point to neighbourhood amenities/ *site* main entrance/ transport hub with shade or cover. The provision of shade or cover is confined to the *site* boundary.

2. The shape of shade or cover can be justified by daylight simulation software considering building self-shading and shading by exterior buildings and trees at the summer solstice at 9:00 am and 3:00 pm in Hong Kong.

(b) Passive Open Spaces with Thermal Comfort

1. This credit applies to passive open space(s) [1] and pedestrian zone(s) within the *Site* Area. A pedestrian zone includes covered, but not enclosed areas such as covered walkways and covered sitting areas.

2. Submit an outdoor thermal comfort report demonstrating anticipated thermal comfort. The report should include the following:

   2.1 Scale drawing(s) depicting the building disposition; and

   2.2 Input data, picture of the 3D model, simulation assumptions

3. Relevant input data should be justified by applicants.

4. The report should be endorsed by a locally qualified professional who has 3 years of relevant experience in outdoor thermal comfort study.

5. The assessment should be based on the following approaches:

   5.1 All passive open spaces and pedestrian routes, hereafter referred to as the Focus Areas, within the *Site* should be included

1 Planning Department – Hong Kong Planning Standards and Guidelines Chapter 4 : Recreation, Open Space and Greening

in the assessment. A demarcation plan of the Focus Areas should be provided in the report

5.2 The climatic conditions of a typical summer day should make reference to the environmental conditions in Table "Reference Environmental Conditions" below, which are based on a 5-year average from 2009 to 2013

5.3 A brief summary of the selected thermal comfort calculation methodology, together with the selected method's recommended thermal comfort range, should be clearly stated in the report

6. Reference Environmental Conditions [2]

Time	**Global Horizontal Irradiance, GHI (W/m^2)**	**Direct Normal Irradiance, DNI (W/m^2)**	**Diffuse Horizontal Irradiance, DHI (W/m^2)**	**Air Temp., T_a (ºC)**	**Relative Humidity, RH (%)**
3PM	525	340	254	31.0	72

7. Demonstrate credit compliance by following one of the below routes:

<u>Compliance Route 1: Thermal Sensation Index (TSI)</u>

TSI [3] can be established using the following formula:

$$\mathrm{TSI} = 1.7 + 0.1118 \times \mathrm{T}_a + 0.0019 \times \mathrm{SR} - 0.322 \times \mathrm{WS} - 0.0073 \times \mathrm{RH} + 0.0054 \times \mathrm{ST}$$

Where,

T_a = air temperature (°C)

SR = horizontal solar radiation (W/m^2)

WS = wind speed (m/s)

RH = relatively humidity (%)

ST = surrounding ground surface temperature (°C)

TSI should be based on the following:

(i) Refer to reference environmental conditions shown in Table above, which outlines solar irradiation, air temperature, and relatively humidity to assess outdoor thermal comfort;

(ii) Surrounding ground surface temperature (ST) of Air Temperature plus 3°C, (i.e. T_a + 3°C) should be used in the TSI equation.

(iii) Wind environment of the *Site* shall use *Computational Fluid Dynamics (CFD)* technique to assess air velocity (m/s) of the Project. The methodology of using *CFD* in outdoor urban scale

2 HKO (Averaged data from 2009 to 2013)

3 Givoni, B., M. Noguchi, H. Saaroni,O, Pocher, Y., Yaacov, N. Feller and S. Becker 2003, Outdoor comfort research issues, Energy and Buildings vol. 33, pp. 77-86.

studies shall refer to *Air Ventilation Assessment* (AVA) Technical Circular and Technical Guide [4];

(iv) Thermal comfort assessment shall consider the effect of shading from immediate surroundings, for example, trees, shading devices, self-shading from buildings; and

(v) The calculations should be based on an area breakdown in the range between 1m^2 and 100m^2.

Where it is demonstrated that 50% or more of the passive open spaces and pedestrian zones, in terms of area, have achieved thermally acceptable range on **a typical summer day at 3:00 pm**, the credit will be awarded.

TSI	Thermal Sensation	
1	Cold	Too cold
2	Slightly Cold	
3	**Acceptably cool**	**Thermally acceptable range**
4	**Neutral**	
5	**Acceptably warm**	
6	Slightly Hot	Too hot
7	Hot	

Compliance route 2: Physiological Equivalent Temperature (PET)

PET [5] should be used to assess the outdoor thermal comfort. Mean radiant temperature, T_r (Air Temperature plus 3°C, (i.e. Ta + 3°C) shall be used.

Thermal Perception	TPC for subtropical region	Range of thermal comfort
Very cold	< 14	Too cold
Cold	≥ 14 to < 18	
Cool	≥ 18 to < 22	
Slightly cool	**≥ 22 to < 36**	**Range of thermal comfort**
Neutral	**≥ 26 to < 30**	
Slightly warm	**≥ 30 to < 34**	
Warm	≥ 34 to < 38	Too hot
Hot	≥ 38 to < 42	
Very hot	≥ 42	

Where it is demonstrated that 50% or more of the passive open spaces and pedestrian zones, in terms of area, have achieved the range of thermal comfort **on a typical summer day at 3:00 pm**, the credit will be awarded.

8. Alternative Route

8.1 The study may elect any widely accepted methodology to demonstrate that the thermal comfort is in accordance with the credit requirement.

8.2 Should any method other than the Thermal Sensation Index (TSI) or Thermal Physiological Equivalent Temperature (PET) be chosen to demonstrate thermal comfort in outdoor spaces (e.g. or

4 Housing, Planning and Lands Bureau, and Environment, Transport and Works Bureau 2006, Technical Circular No. 1/06: air ventilation assessments

5 Hoppe, P. 1999, 'The physiological equivalent temperature—A universal index for the biometeorological assessment of the thermal environment', International Journal of Biometeorology, vol. 43, pp. 71–75.

equivalent indicator/ index for thermal comfort level), supplementary information on methodology, calculation and/ or simulation results should be supplied. The onus is placed on the Applicant to demonstrate the appropriateness of the chosen methodology and relevant precedent(s) where the elected methodology was used and accepted by professionals in the field.

Submittals

(a) Shaded or Covered Routes

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_10_00	BEAM Plus NB submission template for SS 10	✓	✓
SS_10a_01	*Site* plan highlighting at least one shaded or covered pedestrian route	✓	✓
SS_10a_02	Schematics of shades or cover	✓	✓
SS_10a_03	Daylight simulation results to justify shape of shades/cover (if applicable)	✓	✓

(b) Passive Open Spaces with Thermal Comfort

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_10_00	BEAM Plus NB submission template for SS 10	✓	✓
SS_10b_01	Outdoor thermal comfort report	✓	✓
SS_10b_01	CV of professional as described in credit requirement	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

3 Sustainable *Site* **3.4 Climate Resilience and Adaptability**

SS 11 Stormwater Management

Extent of Application All *sites* with *site* area of 1,000 m^2 or more.

Objective Encourage a high standard of stormwater management to reduce risk of flooding and promote groundwater recharge.

Credits Attainable 2 + 1 additional BONUS

Credit Requirement 2 credit for demonstrating that adequate stormwater management design measures have been provided to cater the total volume of runoff for one hour corresponding to a design rainfall of at least 30mm/event for the site in its post-developed conditions.

1 additional BONUS credit for demonstrating that adequate stormwater management measures have been provided to cater the total volume of runoff corresponding to a design rainfall of at least 40mm/event for the site in its post-developed conditions.

Assessment

1. Calculate the stormwater detention storage volume on site required to cater the total volume of runoff for one hour using the following formula:

$V = 10 \times H \times \sum_{\varphi} \times A / 10000$

V: Stormwater storage volume on site required (in m^3)

H: Rainfall intensity (30mm or 40mm for the credit/ bonus respectively) per event

φ: *Runoff coefficient*s of various surfaces/ substrates (please refer to the following table)

A: Areas of various surfaces/ substrates (in m^2)

Surfaces/ substrates	***Runoff coefficients***
Water bodies	1
Flat roof/ road/ hardscape with impervious construction	0.85
Flat roof covered with pebbles	0.65
Green roof (soil depth of at least 300mm)	0.35
Earth-covered (soil depth not more than 500mm) basement	0.35
Pervious paving and construction (maximum slope of porous pavement surface to a gradient of 1:20; the minimum *permeability coefficient* under 15℃ for	0.25

permeable paving / construction should be 1.0 x 10-2 cm/s)	
At-grade softscape	0.15
Earth-covered (soil depth more than 500mm) basement	0.15

Note:

1) The above information has made reference to the design guides for stormwater management/runoff control GB50014 and DB11/685 of PRC.

2) Alternative *runoff coefficients* may be proposed and justified by the Applicant which is subject to approval.

2. Calculate the volume of various designed stormwater management facilities such as detention tanks, sunken plaza/ wet ponds/ reservoirs, *bioretention facilities*, rainwater storage cisterns/ modules, etc.

3. Demonstrate adequate stormwater management measures to meet the credit requirements have been provided by a stormwater management report with a summary of volume/ area calculations, layout drawings and photographic records.

4. Stormwater detention volume will be discharged either by gravity or pumping.

5. It is required to empty the tank within a day to ensure the detention volume is daily available for potential storm event.

6. Stormwater in detention volume will be discharge after 1 hour of rainstorm.

7. For any detention facility with discharge mechanisms, control system is required for discharging the stormwater in order to maintain the daily designed detention volume.

8. Handover the facilities with operation and maintenance checklist as stated in Appendix 9 – 9.5

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_11_00	BEAM Plus NB submission template for SS 11	✓	✓
SS_11_01	Report for stormwater management with a summary of volume/ area calculations, layout drawings and typical construction details/sections of infiltration measures	✓	✓

SS_11_02	Catalogue and test report of the pervious hardscape material	-	✓

Remarks

(a) Additional Information

Sponge City Construction Technical Guide by Ministry of Housing and Urban-Rural Development of PRC

Managing Peak Runoff at Source [ONLINE] Available at:

https://www.pub.gov.sg/Documents/detentionTank.pdf [Accessed 5 July 2017]

Pervious Pavement [ONLINE] Available at:

http://www.asphaltpavement.org/index.php [Accessed 5 July 2017]

Water Permeable Brick (JCT 945 – 2005)

(b) Related Credits

SS P1 Minimum Landscaping Requirements

The related prerequisite requires minimum *site* coverage of greenery and minimum provisions for viability of planting, for example, the minimum soil volumes and depths for all plant areas.

SS 1 Pedestrian-oriented and Low Carbon Transport

The related credit encourages the shading of main pedestrian paths by trees. The soil space of trees shall meet the minimum standards stipulated in SS P1.

SS 7 Biodiversity Enhancement

The related credit encourages preservation/enhancement of existing habitat within the *site*.

SS 10 Outdoor Thermal Comfort

The related credit considers the positive effect of shading by trees and the surrounding ground surface temperatures of greenery within the *site*.

WU 8 Water Harvesting and Recycling

The related credit considers harvesting of rainwater provided within the *site*. Stormwater collected under SS11 could only be discharged

HWB 2 *Biophilic Design*

The related credit encourages human-nature connection for building occupants.

3 Sustainable *Site* **3.4 Climate Resilience and Adaptability**

SS 12 Design for Climate Change Adaptation

Extent of Application All buildings

Objective Encourage reviewing the impact of the projected climate change scenarios on the development and consider strategies to improve climate resilience.

Credits Attainable 1 BONUS + 1 additional BONUS

Credit Requirement 1 BONUS for studying the projected variation in temperature and rainfall and water level rise/ storm surge of adjacent water bodies due to climate change and its impact on the development and prepare mitigation proposal to improve the climate resilience of the building.

1 additional BONUS for including quantitative calculation to support the resilience design which is technically eligible and cost effective.

Assessment

1. Refer to the projected annual rainfall and changes in annual temperature under the medium-low scenario (mean value) [1] and water level rise/ storm surge of adjacent water bodies, suggest 3 negative issues caused by the projected variations which will have impacts on the building such as its structure, facade, outdoor area or building services system.

2. Prepare a climate resilience proposal including at least 1 strategy for each of the above-mentioned negative issue. The strategies should be supported by preliminary design description and expected outcome on resolving the respective negative issue. If necessary, assume a building life cycle of 50-years to outline the possible benefits. No simulations are required for the first BONUS credit. Additional BONUS is granted if applicant demonstrated that the design is cost effective.

3. Note that no obligation is required to implement the proposal.

4. Relevant measures that have been implemented in the design in other credits may be included to demonstrate compliance for this credit.

   Climate Resilience proposal should include a minimum of 10 A4 pages with sections below:

   1. Description of project annual climate change
   2. Impact Identification
   3. Proposal of the Climate Resilience Strategies
   4. Effectiveness of the proposed strategies
   5. Cost effectiveness (for additional BONUS)

1 Hong Kong Observatory - Climate Projections for Hong Kong. [ONLINE] Available at: http://www.hko.gov.hk/climate_change/future_climate_e.htm [Accessed August 2019]

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
SS_12_00	BEAM Plus NB submission template for SS 12	✓	✓
SS_12_01	Climate resilience proposal	✓	✓

Remarks

(a) Additional Information

GovHK – Global Environment Climate Change. [ONLINE] Available at: http://www.gov.hk/en/residents/environment/global/climate.htm [Accessed August 2019]

Environment Bureau - Hong Kong Climate Change Report 2015. [ONLINE] Available at: http://www.enb.gov.hk/sites/default/files/pdf/ClimateChangeEng.pdf [Accessed August 2019]

EPD – Climate Change. [ONLINE] Available at: http://www.epd.gov.hk/epd/english/climate_change/ [Accessed August 2019]

Hong Kong Observatory - Climate Projections for Hong Kong. [ONLINE] Available at: http://www.hko.gov.hk/climate_change/future_climate_e.htm [Accessed August 2019]

(b) Related Credits

None

4	**Materials and Waste**	**4.P Prerequisite** **4.1 Use of Materials** **4.2 Selection of Materials** **4.3 Waste Reduction**
	Introduction	In construction, operations, maintenance and fitting-out of buildings; environmentally-sustainable natural resources should be used as materials to a significant extent. Practical considerations should include extracted raw materials, emissions and embodied energy. There are opportunities to reduce environmental impacts through improved design, choice of materials, and installation methods. The following are of concern: • Pollutants arising from manufacturing, transportation and operation; and • Waste generated and recycled There are opportunities to reduce the use of materials through modular designs allowing off-site prefabrication, lean construction methods, etc.; and to reduce waste from a life cycle perspective, including provisions of appropriately designed waste facilities for waste recycling/ recovery/ *reuse*.
4.P	**Prerequisite**	**MW P1 Minimum Waste Handling Facilities**
	Background	This part sets out the minimum requirement for materials aspects in terms of the provision of waste handling facilities.
4.1	**Use of Materials**	**MW 1 Building Re-use** **MW 2 Modular and Standardised Design** **MW 3 Prefabrication** **MW 4 Design for Durability and Resilience**
	Background	Efficiency in the use of materials can be significantly improved through *reuse* of building elements, such as foundations, main structures, facades, etc. Flexibility in design allows for change in the use of layout of the premises within a building development. High standards of design detailing permit off-site prefabrication of major building components allows for deconstruction, and improves durability and longevity of buildings.
4.2	**Selection of Materials**	**MW 5 Sustainable Forest Products** **MW 6 Recycled Materials** **MW 7 Ozone Depleting Substances** **MW 8 *Regional Materials*** **MW 9 Use of Green Products** **MW 10 Life Cycle Assessment**
	Background	The selection of materials that are environmentally sustainable, have significant recycled content, or otherwise have relatively low environmental impacts and result in lower *embodied energy*, should be considered at the earliest stages of planning and design of building developments, and carried over to the fitting-out and subsequent redecoration.
4.3	**Waste Reduction**	**MW 11 Adaptability and Deconstruction** **MW 12 Enhanced Waste Handling Facilities**
	Background	Designs which enable users to modify the premise layout conveniently and allow for dismantling during demolition can reduce resources consumption and waste generation significantly. Well-managed facilities for the recycling of solid waste encourage recycling and result in reductions in the disposal at landfill *sites*. Buildings should be designed with the provision of facilities for effective on-site sorting, collection, and recycling/ reusing of waste.

4	**Materials and Waste**	**4.P**	**Prerequisite**

MW P1 Minimum Waste Handling Facilities

Extent of Application

All buildings except one-single family domestic building with not more than 3 floors, or domestic part of a composite building for one single family with not more than 3 floors, or a building not normally occupied or for transient stay (e.g. pump house, sewage treatment plant, carpark building).

Objective

Reduce waste generation at source, reduce pressure on landfill *sites* and help to preserve *non-renewable resources* by promoting recycling of waste materials

Credits Attainable

Prerequisite

Credit Requirement

Prerequisite achieved for meeting the minimum provisions of waste recycle facilities for the collection, sorting, storage, recycling (recovered material) and disposal (waste).

Assessment

The assessment shall take into account how a system of waste collection, storage, sorting, recycling and disposal can be managed for the buildings, with consideration given to the adequacy of space provisions on individual floors, within the building as a whole, and at local/ estate level. There should be opportunities for the management of different waste types, such as organic, non-recyclable and recyclable waste. Easy access to the facilities shall be provided for cleaning staff, contractors, building users and waste recycling and collection companies.

(a) Recycle & Waste Management Strategy Plan

1. Provide proposal to:

   1.1 Identify and estimate the quantities of expected waste streams (organic, recyclable and non-recyclable) of the development;

   1.2 Demonstrate compliance with the space requirement of waste recycling facilities (for waste storage, sorting and recycling) as listed in (b);

   1.3 Demonstrate storage for recycling of, as a minimum, materials listed in (c); and

   1.4 Demonstrate management plan, accessibility and hygiene. It includes the outlines of how the municipal solid waste disposal rate can be reduced by the waste management hierarchy - prevention, *reuse*, recycling, recovery and disposal; what is the collection and separation methodology of waste and recyclables; and how the building users dispose refuses and recyclables and janitorial staffs collect and deliver to refuse storage and material recovery chambers (RS&MRC) & Refuse Chutes.

(b) Waste Recycling Facilities

1. Refuse storage and material recovery chambers (RS&MRC) Provision

   Demonstrate RS&MRC of adequate size to cope with the waste generated. Prescribed space requirements are listed below:

	Overall floor space of RS&MRC#
Residential/ Domestic	For UFS ≥1,320m^2, 1m^2 per 347m^2 UFS For UFS<1,320m^2, please refer to point 3 below.
Hotel	1m^2 per 347m^2 UFS
Retail/ Commercial/ Clubhouse	For UFS <39,600m^2, 2m^2 per 925m^2 UFS For UFS ≥39,600m^2, 1m^2 per 925m^2 UFS + 43m^2
Non-residential/ Non-domestic buildings other than Retail/ Commercial/ Clubhouse	1m^2 per 925m^2 UFS
Remarks: • UFS = Usable Floor Area • The provision of Refuse Storage & Material Recovery Chamber (RS&MRC) is required under "Schedule" in B(RS&MRC&RC)R. • RS&MRR shall not be included in the RS&MRC space requirement calculation. Additional areas of waste and recycling facilities provided in addition to the statutorily required RS&MRR can be counted. • # Point 3 under Part (b) applies	

2. Refuse storage and material recovery room (RS&MRR) Provision

   i. The provision of refuse storage and material recovery room (RS&MRR) on every floor of a domestic building or the domestic part of a composite building is required under Reg.3A in B(RS&MRC&RC)R.

   ii. For domestic building or composite building on a site of an area ≤500m^2, please refer to item 3 below.

3. Except for the building types mentioned in the Extent of Application of this prerequisite, other building not required to provide RS&MRC and/ or domestic building not required to provide RS&MRR by Building Regulations including those buildings referred to in (b) 1 and (b) 2 (ii) above, should provide an alternative proposal on the provision of waste recycling facilities. Details on the estimated waste streams and quantities from the building to justify its location and the adequate size of such provision shall be submitted. Management plan, accessibility, hygiene and fire protection factors shall also be taken into consideration.

4. For cluster of low-rise domestic houses where no separate waste recycling facility is provided, intermediate waste recycling facility (IWF) shall be provided within 60m walking distance from each house unit. General waste bins and recycling bins should be provided at the IWF, which should be weatherproof with sufficient size, placed at a safe location and comply with relevant government regulations.

5. Mechanical ventilation and air purifying facilities for every RS&MRC is statutorily-required under Reg.12A of B(RS&MRC&RC)R. In addition, odour control measure shall be considered at MRR in accordance with PNAP APP-35. Correspondent assessment is under HWB 5.

(c) Minimum Types of Recyclables to be Collected

1. Metal
2. Plastics
3. Paper/ Cardboard, and
4. Glass

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_P1_00	Submission template for MW P1	✓	✓
MW_P1_01	Recycle & Waste Management Strategy Plan	✓	✓
MW_P1_02	Calculation showing the estimated quantities of expected waste streams	✓	✓
MW_P1_03	Drawings showing the locations of the waste handling facilities	✓	✓
MW_P1_04	Calculation showing the adequacy of the space requirement for the waste handling facilities	✓	✓
MW_P1_05	As-fitted drawings	-	✓
MW_P1_06	Alternative proposal on the provision of waste recycling facilities (if applicable)	✓	✓

Remarks

(a) Additional Information

Buildings Department. Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineer. PNAP No. APP-35 on requirements for Refuse Storage and Material Recovery Chambers, Material Recovery Chambers.

Environmental Protection Department. Waste Data & Statistics. [ONLINE] Available at: http://www.wastereduction.gov.hk/en/assistancewizard/waste_red_sat.htm [Accessed August 2019]

(b) Related Credits

MW 12 Enhanced Waste Handling Facilities
This credit encourages enhanced provisions for recyclables collection, recycling facilities and waste treatment equipment.

HWB 5 Waste Odour Control
This credit addresses the hygiene aspects of waste disposal.

4 Materials and Waste **4.1 Use of Materials**

MW 1 Building Re-use

Extent of Application All buildings

Objective Encourage the *reuse* of major elements of existing building structures, to reduce *demolition waste*, conserve resources and reduce environmental impacts during construction.

Credits Attainable 2 BONUS + 1 additional BONUS

Credit Requirement

Compliance Method 1

1 BONUS credit for the *reuse* of 20% or more (by mass or volume) of existing structures (*sub-structure* and *superstructure*).

2 BONUS credits for the *reuse* of 40% or more (by mass or volume) of existing structures (*sub-structure* and *superstructure*).

For exemplary performance, 1 additional BONUS credit for the *reuse* of 90% or more (by mass or volume) of existing structures (*sub-structure* and *superstructure*).

Alternatively,

Compliance Method 2

1 BONUS credit for the *reuse* of 25% or more (by surface area) of *superstructure* elements (including at least floor, roof decking) & enclosure materials (including at least skin, framing).

2 BONUS credits for the *reuse* of 50% or more (by surface area) of *superstructure* elements (including at least floor, roof decking) & enclosure materials (including at least skin, framing).

For exemplary performance, 1 additional BONUS credit for the *reuse* of 90% or more (by surface area) of *superstructure* elements (including at least floor, roof decking) & enclosure materials (including at least skin, framing).

Assessment

Compliance Method 1

1. Provide all of the following supporting documents:
   - 1.1 Outline the extent of *reused* major building elements from the existing building;
   - 1.2 Include calculations with details of pre and post construction, drawings, and supporting documentation; and
   - 1.3 Demonstrate that the quantity (by mass or volume) of the retained and *reused* portions of the major building elements from the existing building *sub-structure* and *superstructure*, as a percentage of the quantity (by mass or volume) of the major building elements in the new building *sub-structure* and *superstructure*. Credits will be awarded where the prescribed percentage is achieved.
2. Existing major building elements to be *reused* include:
   - 1.4 Sub-structure (including foundation)
   - 1.5 Superstructure

1.6 Enclosure materials (excluding windows, doors and similar assemblies)

Compliance Method 2

1. Provide all of the following supporting documents:

   1.1 Outline the extent of *reused* major building elements from the existing building;

   1.2 Include calculations with details of pre and post construction, drawings, and supporting documentation; and

   1.3 Demonstrate that the quantity (by surface area) of the retained and *reused* portions of the major *superstructure* elements and enclosure materials from the existing building, as a percentage of the quantity (by surface are) of the major *superstructure* elements and enclosure materials in the new building. Credits will be awarded where the prescribed percentage is achieved.

2. Existing major *superstructure* elements and enclosure materials to be *reused* include:

   2.1 Floor,
   2.2 Roof decking,
   2.3 Skin and framing (exclude windows, doors and similar assemblies)

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_01_00	Submission template for MW 1	✓	✓
MW_01_01	Pre and post construction details, structural drawings that demonstrate the re-use of the *sub-structure* and *superstructure* (Compliance Method 1)	✓	✓
MW_01_02	Calculation showing the percentage of *sub-structure* and *superstructure* being *reused* (Compliance Method 1)	✓	✓
MW_01_03	Report summarizing the extent of *reuse*d major building elements from existing building, with structural drawings that support the extent.	✓	-
	Report summarizing the extent of *reuse*d major building elements from existing building, with pre and post construction information, structural drawings that demonstrate the re-use of the structural elements & enclosure materials (Compliance Method 2)	-	✓
MW_01_04	Calculation showing the percentage of structural elements & enclosure materials (Compliance Method 2)	✓	✓

Remarks

(a) **Additional Information**

None

(b) Related Credits

None

4 Materials and Waste 4.1 Use of Materials

MW 2 Modular and Standardised Design

Extent of Application

All buildings except for single one-storey buildings with total floor areas not exceeding 230m^2

Objective

Encourage the increased use of modular and standardised components in building design in order to enhance buildability and to reduce waste.

Credits Attainable

1 + 1 additional BONUS

Credit Requirement

1 credit for designing modular elements which contributed at least 50% (by mass, volume, dollar value or surface area) of the major elements and modules in the project.

For exemplary performance, 1 additional BONUS credit for designing modular elements which contributed 90% or more (by mass, volume, dollar value or surface area) of the major elements and modules in the project.

Assessment

1. Provide all of the following supporting documents:
   - 1.1 Specifications to demonstrate the extent of application of modular and standardised design of the major elements and modules;
   - 1.2 Drawings to highlight the extent of application of modular and standardised design of the major elements and modules; and
   - 1.3 Demonstration of the percentage of major elements and modules that are prescribed modular and standardised design elements and modules.
2. The unit may be mass/ volume/ dollar value/ surface area but shall be consistent throughout the assessment of this credit.
3. Extent of modular and standardised design checklist:

Structural elements	Structural beam system Concrete slab Concrete flooring
Facade elements	External wall Cladding unit Bay window (for *residential buildings*) Utility platform/ balcony (for *residential buildings*)
Architectural/ internal building elements	Internal partition/ wall panels Door sets Staircases

I

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_02_00	Submission template for MW 2	✓	✓
MW_02_01	Specifications that demonstrate the extent of application of modular or standardised design	✓	-

MW_02_02	Structural drawings that demonstrate modular or standardised design	✓	✓
MW_02_03	Calculation showing the percentage of modular or standardised design	✓	✓
MW_02_04	As-built drawings	-	✓

Remarks

(a) Additional Information

International Standard Organization. ISO 1006 Building construction – Modular coordination – Basic module (1983) and ISO 2848 Building Construction – Modular coordination – Principles and rules (1984) recommend that *modular component*s shall be designed to have size of a multiple or subdivision of the basic module.

British Standards Institution. British Standard BS 6750. Specification for Modular coordination in building (1986) provides background on the requirements for modular coordination.

Development Bureau. Standardised Components and Practices gives guidance on accessing and locating standardised components and *modular components* that have been successfully used in construction, and finding out the standardised practices, including standard designs, construction methods, and techniques adopted in the construction industry. This contains a standardisation database of hyperlinks which promotes the wider use of standardised and *modular components* in local construction, with the public sector taking the lead.[ONLINE] Available at: http://www.devb.gov.hk/en/publications_and_press_releases/publications/standardised_components_and_practices/index.html [Accessed August 2019]

(b) **Related Credits**

None

4 Materials and Waste

4.1 Use of Materials

MW 3 Prefabrication

Extent of Application

All buildings

Objective

Encourage prefabrication of building elements in order to reduce wastage of materials and quantities of on-site waste.

Credits Attainable

1 + 3 additional BONUS

Credit Requirement

(a) Structural Elements

1 credit when 10% of the prefabricated structural elements has been manufactured off-site.

1 additional BONUS credit when 20% of the prefabricated structural elements has been manufactured off-site.

Alternatively,

(b) Façade Elements

1 credit when 10% of prefabricated facade elements has been manufactured off-site.

1 additional BONUS credit when 20% of prefabricated facade elements has been manufactured off-site.

Alternatively,

(c) Architectural/ Internal Building Elements

1 credit when 10% of prefabricated architectural/ internal building elements has been manufactured off-site.

1 additional BONUS credit when 20% of prefabricated architectural/ internal building elements has been manufactured off-site..

1 additional BONUS credit for compliance with the requirements listed in above sub-item (a), (b) and (c).

For exemplary performance, 1 additional BONUS credit when 50% or more of the prefabricated elements in sub-item (a) or (b) or (c) has been manufactured off-site.

Assessment

(a) Structural Elements (pre-cast concrete) Checklist

Residential Buildings	***Commercial Buildings***	***Educational Buildings***	***Other Building Types***
•Slabs •Staircases	•Slabs •Staircases	•Slabs •Staircases	•Slabs •Staircases
Remarks: Additional or alternative items may be proposed at discretion of the applicant.			

(b) Facade Elements (pre-cast concrete) Checklist

Residential Buildings	***Commercial Buildings***	***Educational Buildings***	***Other Building Types***
•Façade •Sun-shading fins •Balcony/ utility platform	•Façade •Sun-shading fins	•Façade •Sun-shading fins	•Façade •Sun-shading fins
Remarks: - Additional or alternative items may be proposed at the discretion of the applicant. - Curtain wall/ windows shall be excluded from the assessment			

(c) Architectural/ Internal Building Elements (pre-cast concrete) Checklist

Residential Buildings	***Commercial Buildings***	***Educational Buildings***	***Other Building Types***
•Partition walls •Balustrades/ parapets	•Partition walls •Balustrades/ parapets	•Partition walls •Balustrades/ parapets	•Partition walls •Balustrades/ parapets
Remarks: Additional or alternative items may be proposed at the discretion of the applicant.			

1. To avoid long-distance transportation, the manufacturing factory shall be located within an 800km radius of the HKSAR by road transportation; within a 1,600km radius by rail transportation; or within a 4,000km radius by sea transportation. Travel distances within the HKSAR are ignored in calculation for simplification. Credit compliance to be demonstrated through the submission of contract specifications, drawings and other supporting documents that the quantities (by mass or volume, consistent throughout the assessment of the credit) of those building elements fabricated off-site are in accordance with the Code of Practice for Pre-cast Concrete Construction 2016. [1]

2. The assessment shall take into account the number and quantities of building elements in the building development that was fabricated off-site and credits will be awarded where the assessment criteria have been met. Only off-site prefabricated portion (by mass or volume) to be counted in semi-prefab components for quality control and reduction of on-site waste.

1 Buildings Department. Code of Practice for Pre-cast Concrete Construction 2016. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/code-and-design-manuals/cppcc2016e.pdf [Accessed Aug 2019]

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_03_00	Submission template for MW 3	✓	✓
MW_03_01	Summary table, with element details, quantities, distance between manufacturing factory and the *site*, percentage of pre-fabricated elements (structural elements, façade elements, architectural/ internal building elements) being manufactured off-site	-	✓
MW_03_02	Specifications that demonstrate the extent of application of prefabrication	✓	-
MW_03_03	Drawings that demonstrate the adoption of the prefabrication	✓	✓
MW_03_04	Details of calculation showing the percentage of pre-fabricated concrete components.	-	✓
MW_03_05	Map showing the distance between the manufacturing factory and the *site*	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

MW 9 *Regional Materials*
Prefabricated building elements are manufactured locally so as to reduce the environmental impacts arising from transportation.

4 Materials and Waste **4.1 Use of Materials**

MW 4 Design for Durability and Resilience

Extent of Application All buildings

Objective Encourage material selection and adequate protection of exposed building elements to minimise the frequency of replacement and maximise materials optimisation.

Credits Attainable 1 + 2 BONUS

Credit Requirement

(a) Building Material Selection Appraisal

1 credit for appraisal report demonstrating a proactive approach to evaluate the durability of the building materials with at least 3 of the relevant listed items.

(b) Protecting Vulnerable Parts of the Building from Damage

1 BONUS credit for providing suitable protective measures, or designed features or solutions to prevent damage to vulnerable parts.

(c) Protecting Exposed Parts of the Building from Material Degradation

1 BONUS credit for incorporating appropriate design and specification measures to limit material degradation due to environmental factors.

Assessment

(a) Building Components Selection Appraisal

1. Conduct an appraisal report demonstrating a proactive approach to explain the details in building material selection with suitable durability that minimises the necessary refurbishment or renewal and prevents excessive material use.

2. The report should cover at least 3 items of the following:

   2.1 Timber doorsets (fire rated doors)

   2.2 Panel wall for partitions

   2.3 Cement products (for architectural uses)

   2.4 Tile adhesives

   2.5 Ceramic tiles (floor tiles and wall tiles)

   2.6 Aluminium windows

   2.7 Heat soaked tempered glass

   2.8 Drainage uPVC pipe and fittings

   2.9 Other items may be proposed at discretion of the applicant

3. The building material shall be certified to a specified product certification scheme by a certification body with accreditation of Hong Kong Accreditation Service (HKAS) and issued with an accredited certificate bearing a Hong Kong Certification Body Accreditation Scheme (HKCAS) accreditation symbol or a statement on the certificate.

Alternatively,

4. The building material shall be compared with at least one alternative material in terms of the anticipated service life. Service life refers to the expected period of life which ends when the material or equipment breaks down or loses its required physical functions.

(b) Protecting Vulnerable Parts of the Building from Damage

1. Provide suitable protective measures, or designed features or solutions to prevent damage to vulnerable parts of the internal and external building and landscaping elements. This must include at least 2 items from the following:

   1.1 Protection from the impacts of high pedestrian traffic in main entrances, public areas and thoroughfares (corridors, lifts, stairs, doors)

   1.2 Protection against any internal vehicular or trolley movement within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas

   1.3 Protection against, or prevention from, any potential vehicular collision where vehicular parking and manoeuvring occurs within 1m of the external building façade for all car parking areas and within 2m for all delivery areas.

(c) Protecting Exposed Parts of the Building from Material Degradation

1. Conduct an appraisal report demonstrating a proactive approach to explain the design measures to protect the exposed parts of the building from material degradation due to environmental factors. The report should cover at least 2 applicable building elements from the following, with the applicable environmental factors and material degradation effects.

Applicable Building Elements
• Foundation, substructure, lowest floor, retaining walls • External walls • Roof or balconies • Glazing: windows, skylight • External doors • Railings or balustrades (where exposed to the external environment) • Cladding (where exposed to the external environment) • Staircases or ramps (where exposed to the external environment) • Hard landscaping
Environmental Factors
• Environmental agents, including: - Solar radiation - Temperature variation - Water or moisture - Wind - Rain • Extreme weather conditions, including:

- High wind speeds - Flooding - Driving rain • Biological agents, including: - Vegetation - Pests, insects • Pollutants, including: - Air contaminants - Ground contaminants.
Material Degradation Effects
• Corrosion • Dimensional change, e.g. swelling or shrinkage • Fading or discolouration • Rotting • Leaching • Blistering • Abrasion
Remarks: Additional or alternative items may be proposed at the discretion of the applicant.

Submittals

(a) Building Component Selection Appraisal

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_04_00	Submission template for MW 4	✓	✓
MW_04a_01	Appraisal report on selection of the building material	-	✓
MW_04a_02	Tender documents (e.g. specifications) specifying the use of building materials	✓	-
MW_04a_03	Drawings showing the provisions	✓	✓
MW_04a_04	Certificates, catalogues or information to demonstrate the quality assurance or the service life of the building materials	-	✓

(b) Protecting Vulnerable Parts of the Building from Damage

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_04_00	Submission template for MW 4	✓	✓
MW_04b_01	Appraisal report on protection measures	-	✓
MW_04b_02	Tender documents (e.g. specifications) specifying the protection measures	✓	-
MW_04b_03	Drawings showing the vulnerable areas or parts of the building	✓	✓

(c) Protecting Exposed Parts of the Building from Material Degradation

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_04_00	Submission template for MW 4	✓	✓
MW_04c_01	Drawings confirming the applicable elements	-	✓

MW_04c_02	Report showing the environmental factors and material degradation effects which are considered relevant	✓	-
MW_04c_03	Design and specification measures in place to limit the degradation effects	✓	✓

Remarks

(a) Additional Information

Hong Kong Council for Testing and Certification – Local Product Certification Schemes for Construction Materials [ONLINE] Available at: https://www.hkctc.gov.hk/en/tcsector/ba/construction_product_cert.html_ [Accessed August 2019]

Hong Kong Housing Authority - Construction Product Certification [ONLINE] Available at: http://www.housingauthority.gov.hk/en/business-partnerships/resources/construction-product-certification/index.html [Accessed August 2019]

(b) Related Credits

None

4 Materials and Waste **4.2 Selection of Materials**

MW 5 Sustainable Forest Products

Extent of Application

All buildings, except buildings with an insignificant amount of timber products being adopted (e.g. all timber products used in the building consists of five sets of doors only).

Objective

Encourage the use of timber from well-managed forests.

Credits Attainable

1 + 1 additional BONUS

Credit Requirement

1 credit for demonstrating at least 30% (for residential development) and 50% (for non-residential development) of all the timber and composite timber products used in the project are from sustainable sources/ recycled timber.

For exemplary performance, 1 additional BONUS for demonstrating 90% or more of all the timber and composite timber products used in the project are from sustainable sources/ recycled timber.

Assessment

1. Provide supporting documents quantifying the amount of forest products used are from sustainable source/ recycled (*reused* from other sites) timber, as a percentage of all the timber and composite timber products used. Timber products or accessories of an insignificant amount and not forming part of timber doors, flooring, skirting, wall panels, ceiling systems and built-in furniture can be ignored in the calculation for simplification. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit.

2. The timber should conform to the requirement of sustainable forestry practice guidelines and accredited by recognised organisations, such as the non-profit Forest Stewardship Council (FSC) [1] or the American Forest and Paper Association (AFPA) [2]or Programme for the Endorsement of Forest Certification (PEFC) [3] or “known licensed sources” [4].or “known licensed sources” [5]. The Client shall demonstrate compliance with the specification for timber products with the recommended certifications (e.g. FSC, AFPA or PEFE).

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_05_00	Submission template for MW 5	✓	✓

1 Forest Stewardship Council. [ONLINE] Available at: http://www.fsc.org/ [Accessed August 2019]

2 American Forest and Paper Association. [ONLINE] Available at: http://www.afandpa.org/ [Accessed August 2019]

3 Programme for the Endorsement of Forest Certification. [ONLINE] Available at: https://www.pefc.org/ [Accessed August 2019]

4 Architectural Services Department, General Specifications for Building 2017, Section 13, Carpentry and Joinery. [ONLINE] Available at: https://www.archsd.gov.hk/media/291197/gs2017.pdf [Accessed August 2019]

5 Architectural Services Department, General Specifications for Building 2012, Section 13, Carpentry and Joinery, 13.01.03.

MW_05_01	MW-05-1_Form_r1	✓	✓
MW_05_02	Final summary table showing the product details, suppliers, source of sustainable forest, quantities, percentage of timber products originated from sustainable source.	-	✓
	The summary table shall be prepared and declared by the main contractor.	✓	-
MW_05_03	Specifications specifying the use of sustainable timber	✓	-
MW_05_04	Timber product compliance certificate	-	✓

Remarks

(a) Additional Information

World Wildlife Fund, Guide to Responsible Purchasing of Forest Products provides guidelines, templates and implementation measures to help organisations develop purchasing policies and practices that help conserve forest resources.

Buildings Department PNAP No. ADV-5 gives guidance for alternatives to the use of hardwoods in order to reduce the amount of tropical hardwood timber used in building projects.

(b) Related Credits

IDCM P3 Timber used for Temporary Works

The prerequisite requires no virgin forest products to be used for temporary works during construction.

4 Materials and Waste **4.2 Selection of Materials**

MW 6 Recycled Materials

Extent of Application All Buildings

Objective Promote the use of recycled materials in order to reduce the consumption of virgin resources.

Credits Attainable 1 + 2 additional BONUS

Credit Requirement

(a) Outside Surface Works and Structures

1 credit where at least 10% of all materials used for *site* exterior surface works, structures and features with *recycled content*.

Alternatively,

(b) Building Façade and Structural Components

1 credit where at least 10% of all materials used for facade and structural components are materials with *recycled content*; **OR**

the use of *Pulverised Fuel Ash (PFA)* as a partial cement replacement in concrete that the PFA content is not less than 25%; **OR**

the use of *Ground Granulated Blast-furnace Slag (GGBS)* as a partial cement replacement in concrete that the *GGBS* content is not less than 40%.

Alternatively,

(c) Interior Non-structural Components

1 credit where at least 10% of all materials used for interior non-structural components are materials with *recycled con*tent.

1 additional BONUS credit for compliance with the requirements listed in sub-item (a), (b) and (c).

For exemplary performance, 1 additional BONUS credit where 50% or more of all materials used for sub-item (a) or (b) or (c) are materials with *recycled content*.

Assessment

(a) Outside Surface Works and Structures

1. Provide all of the following supporting documents:

   1.1 List the materials/ items/ products used that contain recycled material (minerals, plastics, etc.)

   1.2 Demonstration for the target percentage of materials/ items/ products with *recycled content* as compared to all used for exterior surfacing works and structures

2. Exterior surfacing works and structures include paths, surfaces for recreational areas, structures such as seating, playground features, etc.

3. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit.

(b) Building Façade and Structural Components

1. Provide all of the following supporting documents:

   1.1 List the materials/ items/ products used that contain recycled materials

   1.2 Demonstration for the target percentage of materials/ items/ products with *recycled content* as compared with all used for facade and structural components

2. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit.

3. Crushed concrete aggregate complying with the quality and grading requirements of British Standard BS EN 12620 [1] or similar for use in concrete for foundations. The fills in foundations and for over-site use of recycled materials should comply with the requirements of BS 6543 [2] or similar specification.

4. Steel and glass which normally consist of *recycled content* will not be considered as materials with *recycled content* for this credit.

(c) Interior Non-structural Components

1. Provide all of the following supporting documents:

   1.1 List the materials/ items/ products used that contain recycled materials

   1.2 Demonstration for the target percentage of materials/ items/ products with *recycled content* as compared with all materials used for interior non-structural components.

2. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_06_00	Submission template for MW 6	✓	✓
MW_06_01	MW-06-1_Form_r1	✓	✓
MW_06_02	MW-06-2_Form_r1	✓	✓
MW_06_03	MW-06-3_Form_r1	✓	✓
MW_06_04	Summary table with product details, suppliers, recycled materials used, quantities, percentage of elements (outside surface works and structure, building façade and structural components, interior	-	✓

1 British Standards Institution. Aggregates for concrete. British Standard BS EN 12620:2002+A1:2008.

2 British Standards Institution. Guide to use of industrial by-products and waste materials in building and civil engineering. British Standard BS 6543: 1985.

	non-structural components) made from recycled materials.		
	The estimation table shall be prepared and declared by the main contractor/ owner.	✓	-
MW_06_05	Specifications specifying the use of recycled materials	✓	-
MW_06_06	Catalogues or information to demonstrate that the outside surface works and structures are made from recycled materials	-	✓
MW_06_07	As-fitted drawings	-	✓

Remarks

(a) Additional Information

A list of Recycled Materials for Construction Industry is available from the Environmental Protection Department.

Buildings Department PNAP APP-129 on Use of Recycled Aggregates in Concrete sets out the technical guidelines for using recycled aggregates in prescribed mixed concrete of specified grade strength of 20P and designed mixed concrete of specified grade strengths of 25D to 35D.

CIC & HKCI's study on PFA. [ONLINE] Available at: http://www.hongkongci.org/wp-content/uploads/2016/06/Better-Utiilzation-of-Ultimate-Strength-Gain-of-Concrete-with-Pozzolanic-Materials-for-Sustainable-Development-of-Construction-Works-in-HK-Ir-Prof.-Albert-K.-H.-Kwan.pdf [Accessed August 2019]

CEDD study on *GGBS*. [ONLINE] Available at: http://www.devb.gov.hk/filemanager/en/content_763/Part%203%20-%20H%20D%20Wong%20&%20J%20Y%20W%20Mak.pdf [Accessed August 2019]

British Standards Institution. Aggregates for concrete. British Standard BS EN 12620:2002+A1:2008

British Standards Institution. Guide to use of industrial by-products and waste materials in building and civil engineering.
British Standard BS 6543: 1985.

(b) Related Credits

None

4 Materials and Waste **4.2 Selection of Materials**

MW 7 Ozone Depleting Substances

Extent of Application All Buildings

Objective Reduce the release of harmful ozone-depleting substances into the atmosphere.

Credits Attainable 2

Credit Requirement

(a) Refrigerants

1 credit for the use of refrigerants with a value less than or equal to the threshold of the combined contribution to ozone depletion and *global warming potentials* using the specified equation.

(b) Ozone Depleting Materials

1 credit for the use of products in the building fabric and services that avoid using ozone depleting substances in their manufacture, composition or use.

Assessment

(a) Refrigerants

1. The air-conditioning and refrigeration equipment shall fulfil the following equation which determines a maximum threshold for the combined contributions to ozone depletion and *global warming potentials*:

$$LCGWP + LCODP \times 10^5 \leq 13$$

LCGWP = [GWPr x (Lr x Life + Mr) x Rc] / Life

LCODP = [ODPr x (Lr x Life + Mr) x Rc] / Life

LCGWP = Lifecycle *Global Warming Potential* (kg CO2 /kw -Yr)

LCODP = Lifecycle Ozone Depletion Potential (kg CFC 11/kw-Yr)

GWPr = *Global Warming Potential* of Refrigerant (0 to 12,000 kg CO2/kg r)

ODPr = Ozone Depletion Potential of Refrigerant (0 to 0.2 kg CFC11/kg r)

Lr = Refrigerant Leakage Rate (0.5% to 2.0%; default of 2% unless otherwise demonstrated)

Mr = End-of-life Refrigerant Loss (2% to 10%; default of 10% unless otherwise demonstrated)

Rc = Refrigerant Charge

Life = Equipment Life (10 years; default based on equipment type as listed in table below, unless otherwise demonstrated)

Equipment	**Default Equipment Life**
Window air-conditioner, heat pump	10 years
Unitary, split, packaged air-conditioner, package heat pump	15 years
Reciprocating and scroll compressor, reciprocating chiller	20 years

Absorption chiller	23 years
Water-cooled packaged air-conditioner	24 years
Centrifugal chiller	25 years

2. For systems with different types of equipment, a weighted average of all the air-conditioning and refrigeration equipment shall be calculated using the following equation:

$$\lceil \Sigma (LCGWP + LCODP \times 10^5) \times Qunit \rceil / Qtotal \leq$$

Qunit = Gross ARI rated cooling capacity of an individual air-conditioning or refrigeration unit (kW)

Qtotal = Total gross ARI rate cooling capacity of all air-conditioning or refrigeration (kW)

3. Small air-conditioning units, defined as those containing less than 0.23 kg of refrigerant, and other equipment, such as standard refrigerators, small water coolers and any other cooling equipment that contains less than 0.23 kg of refrigerant, can be excluded from this assessment.

4. Provide calculation endorsed by locally qualified professional who has at least 3 years of post-qualification experience in mechanical/ BS discipline giving details of the air-conditioning and refrigeration equipment installed; and demonstrating that the *global warming potential* and ozone depletion potential of the refrigerants used in equipment meets the specified requirement. Reference shall be made to refrigerant suppliers and/or equipment manufacturer's data, etc.

(b) Ozone Depleting Materials

1. Provide a full description and specifications of all major thermal insulation and fire-retardant materials specified in roof constructions, walls, chilled water pipes, refrigerant pipes, ductwork, advising the presence or otherwise of ozone depleting agents.

2. Where there is any doubt as to the ozone depletion potential of a material or product, details shall be ascertained from the supplier. Credit will be awarded where demonstration of reasonable effort has been made to avoid the use of products that have significant ozone depletion potential.

Submittals

(a) Refrigerants

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_07_00	Submission template for MW 7	✓	✓
MW_07a_01	Specifications specifying the use of refrigerants	✓	-
MW_07a_02	Summary table with equipment details, refrigerant employed, *ozone depleting potential* and *global warming potential*	✓	✓
MW_07a_03	Endorsed calculations showing the *global warming potential* and ozone depletion potential of the refrigerants	✓	✓

MW_07a_04	Equipment schedule of HVAC&R equipment showing the refrigerants employed	-	✓
MW_07a_05	Catalogues of HVAC&R equipment showing the refrigerants employed	-	✓
MW_07a_06	Catalogues of refrigerants or statement from manufacturer demonstrating that the products are free from CFC and HCFC	-	✓

(b) Ozone Depleting Materials

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_07_00	Submission template for MW 7	✓	✓
MW_07b_01	Specifications specifying the use of insulation materials	✓	-
MW_07b_02	Endorsed summary table with insulation material details, manufacturer, blowing agent and fire retardant	✓	✓
MW_07b_03	Catalogues of insulation materials or statement from manufacturer demonstrating that the products are free from CFC and HCFC	-	✓

Remarks

(a) Additional Information

The Montreal Protocol has scheduled the phasing out of controlled substances, including chemicals containing chlorine and bromine used as refrigerants, solvents, foam blowing agents, aerosol propellants, fire suppressants, and for other purposes.

Ozone Layer Protection Ordinance (Cap. 403) gives effect to Hong Kong's international obligations to control the manufacture, import and export of ozone depleting substances.

Ozone Layer Protection (Controlled Refrigerants) Regulation requires the conservation of controlled refrigerants used in large scale installations and motor vehicles.

Ozone Layer Protection (Product Containing Scheduled Substances) (Import Banning) (Amendment) Regulation passed in 2009 extends the banning of the import of controlled products (including refrigeration and air-conditioning equipment, aerosol products such as metered dosed inhalers, insulation panel and pre-polymer) containing chlorofluorocarbons (CFCs) and halons to those containing other scheduled substances including *hydrochloroflurocarbons* (HCFCs) by phases.

All products containing HCFCs, except dichlorotrifluoroethane (HCFC-123) have been banned since 1 January 2015. It is targeted to ban all products containing HCFCs starting from 1 January 2020.

The Amendment Regulation also bans the import of CFC-containing metered dosed inhalers and fire extinguishers containing HCFCs and bromochloromethane (BCM) from 1 January 2010.
Given that CFCs and HCFCs have been banned, except HCFC-123, HFCs offer near-zero ODP but some have comparatively high GWPs.

Refrigerant	ODP[1]	GWP[1]
Hydrofluorocarbons		
HFC-23	~0	12240
HFC-32	~0	650
HFC-134a	~0	1320
HFC-152a	~0	140
HFC-402A	~0	1680
HFC-404A	~0	3900
HFC-407C	~0	1700
HFC-410A	~0	1890
HFC-413A	~0	1774
HFC-507A	~0	3900
Hydrochlorofluorocarbons		
HCFC-123	0.02	76

[1] – Sources:
i. IPCC Second Assessment Report;
ii. "World Resources Institute (2005), World Business Council for Sustainable Development";
iii. U.S. Environmental Protection Agency.

The U.S. Environmental Protection Agency provides information on suitable substitutes for ozone depleting substances, including refrigerants for various types of air-conditioning and refrigeration equipment, fire suppression, blowing agents, solvents, etc.

CIBSE GN01 outlines the hazards of using these refrigerants and provides design guidance for refrigeration systems, thermal insulation and fire protection systems.

ASHRAE Guideline 3-1996. Reducing Emission of Halogenated Refrigerants in Refrigeration and AS recommends practices and procedures that will reduce inadvertent release of halogenated refrigerants. The practices and procedures in this guideline cover emission reduction of halogenated hydrocarbon and halogenated ether refrigerants:

(i) from stationary refrigeration, air-conditioning, and heat pump equipment and systems; and
(ii) during manufacture, installation, testing, operation, maintenance, and disposal of equipment and systems.

(b) Related Credits

None

4 Materials and Waste **4.2 Selection of Materials**

MW 8 ***Regional Materials***

Extent of Application All buildings

Objective Encourage the use of materials originated locally so as to reduce the environmental impacts arising from transportation.

Credits Attainable 1+ 2 additional BONUS

Credit Requirement 1 credit for the use of *regional materials* meeting prescribed requirement, which contribute at least 10% of all building materials used in the project.

1 additional BONUS credits for the use of *regional materials* meeting prescribed requirement, which contribute at least 20% of all building materials used in the project.

For exemplary performance, additional BONUS credit for the use of *regional materials* meeting prescribed requirement, which contribute 50% or above of all building materials used in the project.

Assessment

1. Provide all of the following supporting documents:
   - 1.1 List of the materials satisfying the requirements;
   - 1.2 Quantification for the value of materials originated locally in percentage of the total value of the materials used;
   - 1.3 Supporting documents from the suppliers listing the name of the manufacturer; and
   - 1.4 Demonstration for the point of raw materials and manufacture within the prescribed radius of the HKSAR.
2. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit.
3. Raw materials (constituents) used for making the claimed building materials shall fulfil the assessment requirements.
4. In-situ concrete, which is unlikely imported outside the region, will not be considered for this credit. The quantity of in-situ concrete shall be excluded from the calculation of the total building materials for this credit.
5. Mechanical and electrical systems components are excluded in the calculation. Plumbing products however may be included at the discretion of the project team.
6. *Reused* and salvaged material such as furniture may also be included. The location from which they were salvaged may be used as the point of manufacture.
7. The point of raw materials and manufacture shall be located within an 800km radius of the HKSAR by road transportation; within a 1,600km radius by rail transportation; or within a 4,000km radius by sea transportation.

The 800km radius should radiate from the default coordinates of HKSAR. For simplicity, road travel distances within HKSAR are excluded in the calculation.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_08_00	Submission template for MW 8	✓	✓
MW_08_01	Estimated summary table [MW-08_Form_r1] declared by the contractor/ owner.	✓	-
	Endorsed summary table [MW-08-1_Form_r1] by contractor.	-	✓
MW_08_02	Specifications specifying the use of regionally manufactured materials	✓	-
MW_08_03	Maps showing the point of raw materials and the manufacture, and the distance from the HKSAR	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

4 Materials and Waste **4.2 Green Product/ Materials**

MW 9 Use of Green Products

Extent of Application All Buildings

Objective Encourage the use of green products that have low environmental impacts.

Credits Attainable 2 + 3 additional BONUS + 1 BONUS

Credit Requirement **(a) Certified Green Products**

1 credit for having at least 5% certified green products in one (1) of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components).

2 credit for having at least 5% certified green products in two (2) of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components).

1 additional BONUS credit for having at least 5% of certified green products under Construction Industry Council (CIC) Green Product Certification, Carbon Labelling Scheme/ HKGBC Green Product Accreditation and Standard (HK G-Pass) in one (1) of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components).

For exemplary performance, additional BONUS credit for having at least 25% of certified green products under CIC Green Product Certification, CIC Carbon Labelling Scheme/ HK G-PASS in one (1) of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components).

(b) Rapidly Renewable Materials

1 BONUS credit for demonstrating 5% of all building materials/ products of interior non-structural components in the project are *rapidly renewable materials*.

For exemplary performance, additional BONUS credit for demonstrating 25% of all building materials/ products of interior non-structural components in the project are *rapidly renewable materials*.

Assessment **(a) Certified Green Products**

1. <u>Outside Surface Works</u>

1.1 Use of certified green products contributing to at least 5% of all materials as listed below.

Outside surface works	i. Pavement Block ii. Stone (Natural/ Artificial) iii. Paint & Coating iv. Alternative elements proposed by the applicant.

1.2 Provide all of the following supporting documents:

1.2.1 Demonstrate the percentage calculation (by mass, volume, quantity, area or dollar value) of all the items including certified green products

1.2.2 Include a summary table listing the product type, manufacturer, certification body, calculation and reference source; and

1.2.3 Certificate(s) of the green products;

1.3 For certified green products as specified in CIC Green Product Certification are deemed to be included in the calculation.

1.4 For any green products, which have been certified under other internationally recognised schemes, the applicant shall refer to the Worldwide Recognised Green Building Product Certifications and Standards under HKGBC's Eco-Product Directory (http://epdir.hkgbc.org.hk/textdisplay.php?serial=32) or provide the product's technical information with justification for BSL's consideration.

2. <u>Building Façade and Structures</u>

2.1 Use of certified green products contributing to at least 5% of all materials as listed below.

Building Facade and Structures	i. Cement ii. Concrete iii. Reinforcing bar iv. Structural steel v. Extruded aluminum product vi. Glazing vii. Alternative elements proposed by the applicant.

2.2 Provide all of the following supporting documents:

2.2.1 Demonstrate the percentage calculation (by mass, volume, quantity, area or dollar value) of all the items including certified green products

2.2.2 Include a summary table listing the product type, manufacturer, certification body, calculation and reference source;

2.2.3 Certificate(s) of the green products; and

2.2.4 Record photographs

2.3 For certified green products as specified in CIC Green Product Certification are deemed to be included in the calculation.

2.4 For any green products, which have been certified under other internationally recognised schemes, the applicant shall refer to the Worldwide Recognised Green Building Product Certifications and Standards under HKGBC's Eco-Product Directory (http://epdir.hkgbc.org.hk/textdisplay.php?serial=32) or provide the product's technical information with justification for BSL's consideration.

3. <u>Interior Non-structural Components</u>

3.1 Use of certified green products contributing to at least 5% of any 5 items as listed below.

Interior Non-structural Components	i. Panel board ii. Ceramic tile iii. Plant-based fibre composite iv. Furniture v. Stone (Natural/ Artificial)

	vi. Wall covering vii. Paint & coating viii. Adhesive & sealant ix. Block for internal partition x. Synthetic carpet xi. Thermal insulation xii. Alternative elements proposed by the applicant.

3.2 Provide all of the following supporting documents:

2.2.1 Demonstrate the percentage calculation (by mass, volume, quantity, area or dollar value) of all the items including certified green products

2.2.2 Include a summary table listing the product type, manufacturer, certification body, calculation and reference source;

2.2.3 Certificate(s) of the green products; and

2.2.4 Record photographs

3.3 For certified green products as specified in CIC Green Product Certification are deemed to be included in the calculation.

3.4 For any green products, which have been certified under other internationally recognised schemes, the applicant shall refer to the Worldwide Recognised Green Building Product Certifications and Standards under HKGBC's Eco-Product Directory (http://epdir.hkgbc.org.hk/textdisplay.php?serial=32) or provide the product's technical information with justification for BSL's consideration.

4. <u>Building Services Components</u>

4.1 Use of certified green products contributing to at least 5% of all materials under either (a), (b) or (c) categories as listed below.

Building Services Components	(a) Lighting & electrical installation	i. LED lighting ii. CFL iii. Electronic ballast iv. Cable & wire v. Alternative elements proposed by the applicant.
	(b) Air-conditioning systems	i. Chiller ii. VRF split type system iii. AHU iv. FCU v. Cooling tower vi. Alternative elements proposed by the applicant.
	(c) Plumbing & drainage	i. Water pump ii. Sanitary wares-ceramic product iii. Alternative elements proposed by the applicant.

4.2 Provide all of the following supporting document:

4.2.1 Demonstrate the percentage calculation (by mass, volume, quantity, area or dollar value) of all the items including certified green products

4.2.2 Include a summary table listing the product type, manufacturer, certification body, calculation and reference source;

4.2.3 Certificate(s) of the green products; and

4.2.4 Record photographs

4.3 For certified green products as specified in CIC Sustainable Product Certification are deemed to be included in the calculation.

4.4 For any green products, which have been certified under other internationally recognised schemes, the applicant shall refer to the of Worldwide Recognised Green Building Product Certifications and Standards under HKGBC's Eco-Product Directory (http://epdir.hkgbc.org.hk/textdisplay.php?serial=32) or provide the product's technical information with justification for BSL's consideration.

5. Rapidly Renewable Materials

5.1 Use of at least 5% of all building materials/ products of interior non-structural components under the following categories are *rapidly renewable materials*, such as bamboo, cork, natural linoleum, soy bean composite, strawboard, sunflower seed and wheatboard.

Interior Non-structural Components	i. Flooring ii. Panel/ partitions iii. Cabinetry/ built-in furniture iv. Insulation v. Alternative elements proposed by the applicant.

5.2 Provide all of the following supporting documents:

2.2.1 Demonstrate the percentage calculation (by mass, volume, quantity, area or dollar's value) of all the items including *rapidly renewable materials*;

2.2.2 Include a summary table listing the product type, rapidly renewable material content, manufacturer, calculation and reference source;

2.2.3 Supporting documents of *rapidly renewable materials*; and

2.2.4 Record photographs

5.3 No material specified shall present a fire hazard when installed.

Submittals

(a) Certified Green Products

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_09_00	Submission template for MW 9	✓	✓
MW_09a_01	Estimated table with product type, manufacturer, certification body, quantities declared by the main contractor/ owner.	✓	-
	The summary table shall be prepared and endorsed by the main contractor.	-	✓
MW_09a_02	Specifications specifying the use of green products	✓	-
MW_09a_04	Drawings showing the provision	-	✓
MW_09a_05	Certificate(s) of the green products	-	✓

(a) Rapidly Renewable Materials

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_09_00	Submission template for MA 9	✓	✓
MW_09b_01	Estimated table with product type, rapidly renewable material content, manufacturer, quantities declared by the main contractor/ owner.	✓	-
	The summary table shall be prepared and declared by the main contractor.	-	✓
MW_09b_02	Specifications specifying the *rapidly renewable materials*	✓	-
MW_09b_03	Drawings showing the provision	-	✓
MW_09b_05	Supporting documents of *rapidly renewable materials*	-	✓

Remarks

(a) Additional Information

HKGBC's Eco-Product Directory [ONLINE] Available at: http://epdir.hkgbc.org.hk/textdisplay.php?serial=32 [Accessed August 2019]

CIC Green Product Certification [ONLINE] Available at: http://cicgpc.hkgbc.org.hk/ [Accessed August 2019]

HKGBC Green Product Accreditation and Standards - HK G-PASS [ONLINE] Available at: http://www.cic.hk/eng/main/zcb/carbon_labelling_scheme/ [Accessed August 2019]

(b) Related Credits

None

4 Materials and Waste **4.3 Selection of Materials**

MW 10 Life Cycle Assessment

Extent of Application All buildings

Objective Encourage the design of structural elements and choice of materials that results in lower *embodied energy*

Credits Attainable 1

Credit Requirement 1 credit for demonstrating the *embodied energy* in the major elements of the building structure of the building has been studied and optimised through a Life Cycle Assessment (LCA).

Assessment

1. Demonstrate the reduced environmental effects by conducting a Life Cycle Assessment (LCA) on a baseline case, justified by the applicant, and the proposed case. The LCA should be conducted during the design stage

2. The LCA should cover only the elements and materials used in the building foundations, walls, primary and secondary structures and building facade, and does not include the building services system.

3. The service life of the baseline and proposed cases should be the same and at least of 50 years. The same software tools and data sets should be used to evaluate both the baseline building and the proposed building, and report all the listed impact categories. Data sets must be compliant with ISO 14044. In lieu to these requirements, the LCA tool developed by EMSD can also be used.

4. Select at least three of the following impact categories for reduction:
   - 4.1 *Global warming potential* (greenhouse gases), in CO_2e;
   - 4.2 Depletion of the stratospheric ozone layer, in kg CFC-11;
   - 4.3 Acidification of land and water sources, in moles H^+ or kg SO_2;
   - 4.4 Eutrophication, in kg nitrogen or kg phosphate;
   - 4.5 Formation of tropospheric ozone, in kg NO_x or kg ethene; and
   - 4.6 Depletion of non-renewable energy resources, in MJ.

5. Prepare an LCA report, including the following contents with a minimum of 6 A4 pages:
   - 5.1 Quantity of the building materials
   - 5.2 Assumptions made
   - 5.3 Methodologies
   - 5.4 Screenshots of input parameters
   - 5.5 Results
   - 5.6 Conclusions

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_10_00	Submission template for MW 10	✓	✓
MW_10_01	LCA report	✓	✓

Remarks

(a) Additional Information

None.

(b) Related Credits

None.

4 Materials and Waste **4.3 Waste Reduction**

MWA 11 Adaptability and Deconstruction

Extent of Application All Buildings

Objective Encourage the design of building interior elements and building services components that allow modifications to space layout, and to reduce waste during churning, refurbishment and deconstruction.

Credits Attainable 1 +1 additional BONUS

Credit Requirement

(a) Spatial Adaptability

1 credit for designs providing spatial flexibility that can adapt spaces for different uses and allows for expansion to permit additional spatial requirements to be accommodated.

Alternatively,

(b) Flexible Engineering Services

1 credit for flexible design of services that can adapt to changes of layout and use.

Alternatively,

(c) Structural Adaptability

1 credit for designs providing flexibility through the use of building structural systems which allow for change in future use and is coordinated with interior planning modules.

1 additional BONUS credit for compliance with requirements listed in sub-items (a), (b) and (c).

Assessment

(a) Spatial Adaptability

1. Provide a report presenting evidence as to how and the extent to which building adaptability and deconstruction is provided. The report shall include drawings and documents including building plans and detailed specifications together with elaboration and justification of specific design strategies that provide for the intended outcome.

2. Where it can be demonstrated that applicable good practices in respect of Spatial Adaptability have been adopted whenever feasible and at least 20% for residential development and 70% for non-residential development of the listed items in the checklist could be achieved, the credit shall be awarded.

Spatial Adaptability	*Residential Buildings*	*Commercial Buildings*	*Other Building Types*
Use of adaptable floor plans, including large grids that can be subdivided, etc.	[●]	●	●
Spaces designed for a loose fit rather than tight fit;	[●]	●	●

Inclusion of multifunctional spaces;	[●]	●	●
Design that allows interior fitting-out to use modular and prefabricated components;	[●]	●	●
Spaces designed such that minimum disruption will be caused to occupants due to physical change;	[●]	●	●
Easy relocation of partition walls that causes minimum damage to flooring or ceiling systems;	●	●	●
Partition walls are fully salvageable;	●	●	●
Separating long-lived components from short-lived components to\ reduce the complexity of deconstruction and churning so as to facilitate the collection process for recycling; and	[●]	●	●
Use of interior partitions that are demountable, reusable and recyclable, etc.	●	●	●
Remarks: - ASTM provides guidance for various types of buildings and uses [1, 2]. - Additions to the list may be proposed at the discretion of the applicant [●] This item only applicable to clubhouse/ amenity facilities of the residential development			

(b) Flexible Engineering Services

1. Provide a report presenting evidence as to how and the extent to which building adaptability and deconstruction is provided. The report shall include drawings and documents including building plans and detailed specifications together with elaboration and justification of specific design strategies that provide for the intended outcome.

2. Where it can be demonstrated that applicable good practices in respect of Flexible Engineering Services have been adopted whenever feasible and at least 20% for residential development and 70% for non-residential development of the listed items in the checklist could be achieved, the credit shall be awarded.

1 ASTM International. Designation E1692-95a Standard Classification for Serviceability of an Office for Change and Churn by Occupants.

2 ASTM International. Designation E1679-13 Standard Practice for Setting the Requirements for the Serviceability of a Building or Building-Related Facility and for Determining What Serviceability is Provided or Proposed.

Flexible Engineering Services	*Residential Buildings*	Commercial Buildings	*Other Building Types*
Design that allows interior fitting-out to use modular and prefabricated components;	[●]	●	●
Luminaires, including electrical connection and mechanical fixing, are easily relocated within ceiling grid or uplighters are used;	[●]	●	●
Air diffusers on flexible ducts can be relocated at minimum cost with minimum disruption to occupants;	[●]	●	●
Exhaust air ducts for special exhausts are easy to install, and space and capacity are available in ceiling and duct shafts;	[●]	●	●
Pre-wired horizontal distribution systems in ceilings or floors, with spare capacity and easy access to accommodate change of workplace layouts; and	-	●	●
Reducing the use of embedded infrastructure for power, data and HVAC systems, etc.	[●]	●	●
Remarks: - Additions to the list may be proposed at the discretion of the applicant [●] This item only applicable to clubhouse/ amenity facilities of the residential development			

(c) Structural Adaptability

1. Provide a report presenting evidence as to how and the extent to which building adaptability and deconstruction is provided. The report shall include drawings and documents including building plans and detailed specifications together with elaboration and justification of specific design strategies that provide for the intended outcome.

2. Where it can be demonstrated that applicable good practices in respect of Structural Adaptability have been adopted whenever feasible and at least 20% for residential development and 70% for non-residential development of the listed items in the checklist could be achieved, the credit shall be awarded.

Structural Adaptability	*Residential Buildings*	Commercial Buildings	Other Building Types
Foundations allow for potential vertical expansion of the building;	-	●	●
Installation of isolation joints or other features avoid the potential for differential settlements and for progressive collapse due to accidental loading;	-	●	●
Reliance on a central core for lateral load resistance that allows for local modifications to the structure while maintaining complete structural integrity;	[●]	●	●
Wide structural grids	[●]	●	●
Lower floors allow for heavier live load;	[●]	●	●
Sufficient height to lower floors to enable a range of uses;	[●]	●	●
Building envelope is independent of the structure	[●]	●	●
Versatile envelope capable of accommodating changes to the interior space plan;	[●]	●	●
Means of access to the exterior wall system from inside the building and from outside;	[●]	●	●
Structural floor system that accommodates a number of mechanical and electrical service distribution schemes based on different occupancies; and	-	●	●
Provision of more than the minimum spatial areas and floor heights, etc.	[●]	●	●
Remarks: - Reference may be made to various publications [3] - Additions to the list may be proposed at the discretion of the applicant			

3 International Energy Agency. Annex 31. Energy-Related Environmental Impact of Buildings. 2005. [ONLINE] Available at: http://www.iisbe.org/annex31/index.html [Accessed August 2019]

[●] This item only applicable to clubhouse/ amenity facilities of the residential development

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_11_00	Submission template for MW 11	✓	✓
MW_11_01	MW-11-1_Form_r1	✓	✓
MW_11_02	MW-11-2_Form_r1	✓	✓
MW_11_03	MW-11-3_Form_r1	✓	✓
MW_11_04	Summary table, with spatial adaptability/ flexible engineering service/ structural adaptability strategies applied and percentage of checklist's requirement fulfilled	✓	✓
MW_11_05	Specifications specifying the application of spatial adaptability/ flexible engineering service/ structural adaptability strategy features	✓	-
MW_11_06	Detail explanation to fulfil checklist's criteria	✓	✓
MW_11_07	Drawing demonstrate the checklist's requirement fulfilled	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

4 Materials and Waste **4.3 Waste Reduction**

MW 12 Enhanced Waste Handling Facilities

Extent of Application

All buildings except one-single family domestic building with not more than 3 floors, or domestic parts of a composite building for one-single family with not more than 3 floors, or a building not normally occupied or for transient stay (e.g. pump house, sewage treatment plant, carpark building).
Part (b) is applicable only when Municipal Solid Waste Charging Scheme is activated.

Objective

Encourage integrated waste management for operational reduction at source, effective sorting and collection within the *site* and recycling/ reuse of waste.

Credits Attainable

2 + 2 BONUS

Credit Requirement

(a) Additional Recyclables Collection

1 credit for the provision of facilities for collection, sorting, storage and disposal of 2 other recyclable streams in addition to those described in MW P1.

(b) Additional Facility Provisions to Enable enhanced Municipal Solid Waste (MSW) Charing Scheme

1 credit for additional facilities for collection, sorting, storage and disposal of recyclables in addition to those described in MW P1 and MW12 part (a).

(c) Waste Treatment Equipment

1 BONUS for providing at least one set of waste treatment equipment.

(d) Alternatives to Recycling Facilities

1 BONUS for provide alternative means of waste collection systems.

Assessment

(a) Additional Recyclables Collection

1. Provide a report that demonstrates the adequacy of two (2) additional recyclables, in addition to prescribed recyclables in MW P1, to be collected, such as food waste, organic landscape waste, and other (fluorescent light tubes, electronic products etc.).

(b) Additional Recycling Facility Provisions to Enable Municipal Solid Waste (MSW) Charging Scheme

1. Provide a report that includes the following:

   1.1 Proposal of additional facility that enables MSW Charging Scheme;

   1.2 The proposal should indicate the solid waste disposal rate, target reduction rate, proposed features and the management methodology.

   1.3 Demonstrate how the municipal solid waste disposal rate can be reduced by the proposal. Target reduction for 10% in weight (kg) or size (m3).

   1.4 Drawing is required to indicate the additional facility for enabling municipal solid waste management.

1.5 Detail documents (e.g. specification) of the additional recycling/ design features for enabling the MSW charging scheme.

1.6 The location and design of the facility should consider accessibility of building users, and operation and maintenance of the recycling facilities, cleaning staff/ contractors and for waste recycling and collection companies.

(c) Waste Treatment Equipment

1. Where the consistent generation in volume of the appropriate operational waste streams is likely to exist, e.g. large amounts of packaging or compostable waste generated by the building's use and operation, the following facilities are provided for 5% waste reduction in size (m3):

1.1 Static waste compactors or balers; situated in a service area or dedicated waste management space

1.2 Vessels for composting suitable organic waste resulting from the building's daily operation and use; OR adequate space for storing segregated food waste and compostable organic material prior to collection and delivery to an alternative composting facility

1.3 Where organic waste is to be stored or composted on *site*, a water outlet is provided adjacent to or within the facility for cleaning and hygiene purposes.

(d) Alternatives to Recycling Facilities

1. Automated waste collection systems and separate chutes for different waste types are accepted as a form of compliance as long as a management plan is in place, which can either be public (local authority) or private and requirements for separation are met.

Submittals

(a) Additional Recyclables Collection

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_12_00	Submission template for MW 12	✓	✓
MW_12a_01	Operational Waste Management Plan	✓	✓
MW_12a_02	Drawings showing the locations of all waste handling facilities with indications of additional recyclable collections	✓	✓
MW_12a_03	Calculation showing the capacity and special provision required for additional recyclable collections facilities.	✓	✓
MW_12a_04	As-fitted drawings	-	✓

(b) Additional Recycling Facility Provisions to Enabling Municipal Solid Waste (MSW) Charging Scheme

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_12_00	Submission template for MW 12	✓	✓
MW_12b_01	Operational Waste Management Plan	✓	✓
MW_12b_02	Drawings showing the locations of all waste handling facilities with indications of	✓	✓

	the additional recycling facility provision to enable MSW charging		
MW_12b_03	Calculation showing the capacity and special provision required to enable MSW Charging Scheme.	✓	✓
MW_12b_04	Drawings demonstrating the additional recycling facility provision to enable the MSW charging, and indicate the design that improve the accessibility of building users, and operation and maintenance of the recycling facilities	✓	✓
MW_12b_05	As-fitted drawings	-	✓

(c) Waste Treatment Equipment

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_12_00	Submission template for MW 12	✓	✓
MW_12c_01	Operational Waste Management Plan	✓	✓
MW_12c_02	Drawings showing the locations of all waste handling facilities with indications of the waste processing facilities	✓	✓
MW_12c_03	Calculation to justify the waste processing facilities achieve the credit required target	✓	✓
MW_12c_04	Catalogues/ information of the waste processing facilities	-	✓
MW_12c_05	As-fitted drawings	-	✓

(d) Alternatives to Recycling Facilities

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
MW_12_00	Submission template for MW 12	✓	✓
MW_12d_01	Report of Operational Waste Management Plan	✓	✓
MW_12d_02	Drawings showing the locations of all waste handling facilities with indications of the alternative recycling facilities	✓	✓
MW_12d_03	Calculation showing the adequacy of the space requirement for the alternative recycling facilities	✓	✓
MW_12d_04	As-fitted drawings	-	✓

Remarks

(a) Additional Information

Buildings Department. Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineer. PNAP No. APP-35 on requirements for Refuse Storage and Material Recovery Chambers, Material Recovery Chambers.
Environmental Protection Department. Waste Data & Statistics. [ONLINE] Available at: http://www.wastereduction.gov.hk/en/assistancewizard/waste_red_sat.htm [Accessed August 2019]

(b) Related Credits

MW P1 Waste Recycling Facilities
This prerequisite stipulates the minimum requirements for waste recycling facilities.

HWB 6 Waste Disposal Facilities
This credit addresses the hygiene aspects of waste disposal.

5	**Energy Use**	**5.P Prerequisite** **5.1 Energy Use Reduction and Control** **5.2 Renewable and Alternative Energy Systems** **5.3 Energy Efficient Equipment**
	Introduction	Electricity generation accounts for around 60% of the total CO_2 emissions from energy use in Hong Kong. Buildings account for 90% of our electricity consumption. Ensuring buildings are designed for good energy performance is a key factor to the conservation of energy. Power stations operate under licenses issued by the Director of Environmental Protection Department, requiring operators to employ the best practicable means to control the emissions to acceptable levels. However, there is a growth in demand which leads to an increasing power generation, transmission and distribution capacity, because of the use of air- conditioning where the buildings are responsible for much of the peak load in summer. Demand side management can reduce the rate of expansion of supply-side capacity.
5.P	**Prerequisite**	**EU P1 Minimum Energy Performance**
	Background	BEAM provides incentives to achieve energy performance better than the minimum requirements of building energy codes. Therefore, compliance with the up-to-date Building Energy Codes (BEC) is the mandatory requirement governing the energy performance of building services installations. This is taken as the energy performance prerequisite for BEAM certification.
5.1	**Energy Use Reduction and Control**	**EU 1 Low Carbon Passive Design** **EU 2 Reduction of CO_2 Emissions** **EU 3 Peak Electricity Demand Reduction** **EU 4 Metering and Monitoring**
	Background	The estimation of annual energy use and maximum electricity demand take into account the design improvements to the building envelope and the efficiency of building services systems including air-conditioning, lighting systems, electrical installations and equipment etc. It shall cover all the aspects of energy use in buildings. BEAM Plus gives credit to additional measures that address further improvement in the building energy efficiency. Passive building design allows buildings to respond to the local climate and reduce the reliance on active means to satisfy human comfort, and therefore reduces energy consumption and the associated carbon dioxide emissions. This is particularly important for *residential building* and BEAM Plus has developed an alternative path to assess passive elements for *residential buildings*. Through effective planning and architectural design, it is possible to improve building energy efficiency. As such, this section also assesses various strategies including building *orientation*, layout plan and *external shading* devices etc. Both **prescriptive path** and **performance path** are developed for EU 1, EU 2 and EU 3. Applicants can apply <u>either</u> path to suit the project's specific characteristics and externalities.
5.2	**Renewable and Alternative Energy Systems**	**EU 5 Renewable and Alternative Energy Systems**
	Background	If energy consumption continues to increase at existing levels, projected carbon dioxide emissions generated by the year 2030 are expected to grow by more than 50% from the level in 2005. Effective use of renewable energy will reduce Hong Kong's reliance on fossil fuels and also our greenhouse gas emissions arising from the use of fossil fuels. Although the large-scale application of renewable energy in buildings does not exist in Hong Kong, its wider use should be promoted in the interest of

sustainable development. BEAM Plus credits award those meaningful installations that provide environmental benefits. The criteria for assessment have been set with reference to the percentage of the energy use in the assessed building that will be replaced by renewable sources. Furthermore, no distinction will be made on the selected means such as solar hot water systems, building integrated photovoltaic panels or wind turbines, etc for substituting electricity or fuel by renewable energy. Hence, different or a combination of systems and equipment may be incorporated into a building.

5.3 Energy Efficient Equipment

EU 6 Air-Conditioning Units
EU 7 Clothes Drying Facilities
EU 8 Energy Efficient Appliances

Background

BEAM Plus gives credit to the designs that enhance the performance of equipment such as air-conditioning units. Likewise, the provisions of facilities/ equipment that improve energy performance are also encouraged. Provision of clothes drying facilities is a good practice for the unique high-rise and high-density urban context of Hong Kong. With the introduction of the Energy Efficiency Labelling Scheme by EMSD, it becomes easier for the developers to select energy efficient appliances in the market.

5	**Energy Use**	**5.P**	**Prerequisite**
		EU P1	**Minimum Energy Performance**

Extent of Application

All buildings

Objective

To establish the minimum level of energy performance for the building services systems

Credits Attenable

Prerequisite

Credit Requirement

Demonstrate performance improvement against the latest edition of Building Energy Code (BEC).

For BEC Governing Building Types:

Refer to the **latest** edition of BEC [1] to demonstrate that performance improvement is achieved in **both** of the following building services systems provided by the project owner:

1) Improve 2% of code specified minimum coefficient of performance (COP) for Air-conditioning equipment unit; and

2) Reduce 3% of code specified maximum allowable lighting power density for lighting installation.

For Non-BEC Governing Building Types:

All Non-BEC governing building types and spaces are required to demonstrate their **compliance** with the **latest** BEC (Refer to Certificate of Compliance. Registration – COCR submission) on:

1) Air-conditioning equipment efficiency (full load COP); and

2) Lighting power density for listed space type in the code.

For building consist of BEC and non-BEC Governing Building or Space type:

All requirements of compliance listed in this credit are required.

Assessment

For BEC Governing Building Types:

1) Air-conditioning Equipment

1.1. Improve 2% for each air-conditioning equipment corresponding minimum coefficient of performance (COP) at full load and specific standard rating condition given in the latest BEC [1].

1.2. Improve 2% efficiency improvement for each room air-conditioners (i.e. single package window type and wall mounted split type) by using Energy Efficiency Grade 2 COP as the basis under the scope of the latest edition of Mandatory Energy Efficiency Labelling Scheme (MEELS) under Energy Efficiency (Labelling of Products) Ordinance (Cap. 598), using cooling seasonal performance factor (CSPF), Fcsp.

1 Electrical and Mechanical Services Department, Code of Practice for Energy Efficiency of Building Services Installation [ONLINE] available at: http://www.beeo.emsd.gov.hk/en/mibec_beeo_codtechguidelines.html [Assessed August 2019]

1.3. Project using district cooling system and project without any air-conditioning installation (or not newly install an air-conditioning system) are not assessed under this criterion.

2) Indoor Lighting System

2.1. Reduce 3% indoor lighting power density (LPD) of lighting installation in whole building by area-weighted method# compared with the latest edition of BEC.

$$\#\ Design\ Case: \left(\frac{\sum[\text{LPD (Area A)} \times \text{ Area A} + \text{LPD (Area B)} \times \text{ Area B} + \cdots]}{\sum[\text{Area A} + \text{Area B} + \cdots]}\right)$$

$$BEC\ Case: \left(\frac{\sum[\text{BEC LPD (Area A)} \times \text{ Area A} + \text{BEC LPD (Area B)} \times \text{ Area B} + \cdots]}{\sum[\text{Area A} + \text{Area B} + \cdots]}\right)$$

$$Lighting\ power\ reduction\ percentage = \left(1 - \frac{Design\ case}{BEC\ Case}\right) \times 100\%$$

LPD requirements for this prerequisite follows the latest edition of BEC. Exclude the lighting installations that are stated in the latest edition of BEC Technical Guideline [2].

For Non- BEC Governing Building Types:

3) Air-conditioning System

3.1. For spaces that are not governed by the latest BEC based on Cap. 610 Schedule 1 & 2, rated COP of the air conditioning equipment should comply with the minimum efficiency requirement stipulated in the code (For both full load and 75% load for VSD equipment).

3.2. The performance of the selected air conditioning unit types should refer to the corresponding equipment COP tables stipulated in the latest BEC.

3.3. Room air-conditioners (included single package window type and wall mounted split type) under the scope of the latest edition of Mandatory Energy Efficiency Labelling Scheme (MEELS), Energy Efficiency (Labelling of Products) Ordinance (Cap. 598) should achieve equipment efficiency equivalent to the Energy Efficiency Grade 2 or above, using cooling seasonal performance factor (CSPF), Fcsp.

3.4. Project using district cooling system and project without any air-conditioning installation (or not newly install with any air-conditioning system) are not assessed under this criteria.

4) Indoor Lighting Systems

4.1. For indoor areas that are not governed by the BEC based on Cap. 610 Schedule 1 & 2, LPD must comply with the maximum allowable values of the listed space type listed in the **latest** BEC.

4.2. For space that without a listed space type suitable for calculation from the BEC code, LPD must be the same as the design value.

2 Electrical and Mechanical Services Department, Technical Guidelines on Building Energy Code 2018 Edition (TG-BEC 2018) [ONLINE] available at: https://www.emsd.gov.hk/beeo/en/pee/BEC_2018.pdf [Accessed Aug 2019]

4.3. LPD requirements for this prerequisite follows the **latest** edition of BEC. Exclude the lighting installations that are stated in the latest edition of BEC Technical Guideline.

For building consist of both BEC and non- BEC Governing Building Types:

Comply with all requirements.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_P1_00	BEAM Plus NB submission template for EU P1	✓	✓
EU_P1_01	EU-P1-1_Form	✓	✓
EU_P1_02	Air-conditioning system equipment schedule, air-side and water-side schematic drawings highlighting all the air-conditioning equipment	✓	✓
EU_P1_03	Air-conditioning equipment and lighting specifications	✓	
EU_P1_04	BEC COCR	-	✓
	OR Catalogue of Air-conditioning equipment highlighting the COP at full load Lighting schedule with luminaire	-	✓
EU_P1_06	Layout Drawing highlighting the space type	✓	✓
EU_P1_07	Space area schedule	✓	✓

Remarks

(a) Additional Information

Electrical and Mechanical Services Department, Code of Practice on Energy Labelling of Products [ONLINE] available at:

https://www.emsd.gov.hk/energylabel/en/doc/2018%20CoP%20(English).pdf [Assessed August 2019]

(b) Related Credits

None

5 Energy Use **5.1 Energy Use Reduction and Control**

EU 1 Low Carbon Passive Design

Extent of Application All buildings

Objective Passive building design allows buildings to respond to the local climate; reducing the reliance on active means to meet human comfort. This in turn reduces energy consumption and its associated carbon dioxide emissions.

Credits Attainable 6

Credit Requirement Passive designs that can reduce building HVAC load, facilitate natural ventilation and maximise daylight will be rewarded in this credit under **either** prescriptive path **or** performance path.

Option 1: Prescriptive Path

4 Credits for incorporating any 4 of the passive design strategies listed below, 1 credit for each strategy:

1) Optimum Spatial Planning
2) External Overhang (fix/ movable)
3) Vegetated Building Envelope
4) Cross Ventilation Provision (normally occupied space)
5) Cross Ventilation Provision (not normally occupied space)
6) Daylighting Provision

Option 2: Performance Path

HVAC Load Reduction

1) Built Form and *orientation*

1 credit for reducing building envelope load from a hypothetic case with at least 22.5° difference in *orientation* with justification by simulation.

2) Optimum Spatial Planning

1 credit for demonstrating consideration of optimum spatial planning to enhance energy conservation with justification by simulation.

3) *External Shading* Devices

1 credit for the provision of fixed or movable *external shading* devices, in the form of vertical or horizontal sun shading feature with justification by simulation.

4) Vegetated Building Envelope

1 credit for the provision of vegetated building envelope with justification by calculation.

Natural Ventilation

5) Space Layout for Natural Ventilation

1 credit for demonstrating that project space (both normally occupied space and not normally occupied space) is designed to facilitate the utilisation of natural ventilation with justification by simulation.

Daylight

6) Space Layout for Daylight Penetration

1 credit for demonstrating that the space is well-lit by daylight and reduce occupants' dependency on artificial lighting with justification by simulation method.

Assessment

Option 1: Prescriptive Path

Prepare a **passive building design report** with calculation, building elevations and drawings to demonstrate the compliance of adopting four (4) selected strategies.

1) Optimum Spatial Planning

Demonstrate the space planning complying with the following requirements:

1.1 For Non-*open planned design*:

Demonstrate at least 20% of external wall of the building to be occupied by non-conditioned space for buildings where the developer/owner has direct influence over the interior fit-out work for 50% or more of the *occupied space*

1.2 For *Open planned design*

Demonstrate at least 5% of external wall of the building to be occupied by non-conditioned space for buildings where developer/owner has direct influence over the interior fit-out work for less than 50% of the *occupied space*,

To document this strategy, the passive building design report should include the following information:

a) Building floor layout with indication on complied area;

b) Measurement of the perimeter length of the typical floor layout;

c) Measurement of the non-conditioned space external wall length;

d) Calculation of non-conditioned space external wall area; and

e) Summary table showing the percentage calculation.

2) Fixed or Movable Overhangs

Demonstrate fixed or moveable overhangs are provided for project:

2.1 Incorporated overhangs that is >0.3 of window height on *south orientated facade*

To document this strategy, the passive building design report should include the following information:

a) Facade design drawings with highlighted overhangs

b) Drawings demonstrating that the length of overhangs from facade zone is >0.3 of window height.

3) Vegetated Building Envelope

Demonstrate greenery are provided for project envelop:

3.1 Incorporate greenery for 50% roof of condition spaces; or Incorporate vertical greenery for 5% of external wall area for building condition spaces.

3.2 Demonstrate that the area of vegetation is at least 50% of the roof area. Roof of non-conditioned area (e.g. mechanical plant rooms) do not count towards the total roof area; **OR**

Demonstrate that the area of vegetation is at least 5% of the facade area. Facade of non-conditioned area (e.g. mechanical plant rooms) do not count towards the total facade area.

3.3 Only permanent planter is considered as vegetation area.

To document this strategy, the passive building design report should include the following information:

a) Drawings demonstrating the area of vegetation on the roof area (or external wall area);

b) Drawings demonstrating the roof area of conditioned space (or the external wall area of conditioned space);

c) Calculation demonstrating the percentage of compliance;

d) Demonstration of reduction in U-value when compare with the project roof material (or external wall material); and

e) Maintenance contract or undertaking statement from project owner that landscape maintenance personnel/company will be employed for the maintenance of building envelope vegetation.

4) Cross Ventilation provision

Demonstrate each normally occupied space (i.e. habitable space for *residential building*) in project is cross ventilated:

4.1 Provide cross ventilation for each *normally occupied space* of the building with reference to the cross-ventilation requirement stipulated in the latest edition of the Guidelines on Design and Construction Requirements for Energy Efficiency of *Residential Buildings* [1] (For 2014 edition, refer to Part 3.2 Cross Ventilation Requirement OR ASHRAE 62.1:2010 section 6.4.

To document this strategy, the passive building design report should include the following information:

a) Drawings of typical floors (or typical spaces design sections) showing the openable windows location and the cross-ventilation path;

b) Drawings illustrating natural ventilation assessment for re-entrant; and

1 Buildings Department, Guidelines on Design and Construction Requirements for Energy Efficiency of Residential Buildings [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/code-and-design-manuals/Guidelines_DCREERB2014e.pdf [Accessed Aug 2019]

c) Calculation for demonstrating the compliance of minimum openable window area to floor area.

5) Public Space Natural Ventilation

5.1 Provide cross ventilation for each not normally occupied space (e.g. corridor, entrance lobby) of the building with reference to the cross-ventilation requirement stipulated in the latest edition of the Guidelines on ASHRAE 62.1:2010 section 6.4

To document this strategy, the passive building design report should include the following information:

a) Drawings of typical floors (or typical spaces design sections) showing the opening location and the cross-ventilation path;

b) Drawings illustrating natural ventilation assessment

c) Calculation for demonstrating the compliance of minimum openable area to space area.

6) Daylighting Provision

Demonstrate each normally occupied space is daylit:

6.1 Provide window for each *normally occupied space* with each window height > 50% of the corresponding normally occupied space depth.

To document this strategy, the passive building design report should include the following information:

a) Drawings of typical floors sections (or typical spaces design sections);

b) Drawings highlighting the height of windows;

c) Drawings highlighting the depth of normally occupied space; and

d) Calculation demonstrating the percentage of compliance.

Option 2: Performance Path

Prepare a **passive building design report** to demonstrate selected passive design strategies achievement with numerical supporting.

1) Built Form and *Orientation*

1.1 Conduct a building total energy analysis to demonstrate that the design building has incorporated a better build form and *orientation*. Evaluation is carried out by rotating the design building. The selected baseline condition (hypothetic case) should be at least 22.5^{o} different from the designed building in *orientation*. A passive building design report should be provided to document the analysis and result.

To document this strategy, a passive building design report should include the following information:

a) A summary of simulation result;

b) Baseline case building energy consumption;

c) Design case building energy consumption;

d) Demonstration the *orientation* angle difference between hypothetic and design case; and

e) Hourly data (i.e. 8,760 hours) of building energy consumption for both the baseline case and the design case should be appended.

The simulation program used for energy modelling should meet the following criteria. Compliance review for below criteria is required except those already accepted for performance based on Building Energy Code (BEC) by EMSD.

a) Capable to perform hourly simulation (8,760 hours per year);

b) Capable to provide hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat setpoints, and HVAC system operation;

c) Capable to model 10 or more thermal zones;

d) Capable to model and simulate the thermal behaviour of a building and the interaction of its building fabric, air-conditioning, lighting and other relevant energy consuming equipment and systems;

e) Capable to perform design load calculations to determine the required air-conditioning equipment capacities and air and water flow rates for both the design case and baseline case building;

f) Capable to model part-load performance curves for mechanical equipment;

g) Capable to model capacity and efficiency correction curves for mechanical heating and cooling equipment; and

h) Capable to model air-side economizers with integrated control

2) Optimum Spatial Planning

2.1 Demonstrate at least a 20% reduction in façade irradiation gain for *not normally occupied space* and non-conditioned space.

To document this strategy, the passive building design report should include the following information:

a) Annual solar irradiation on each building elevation;

b) Table summarizing external wall area of non-conditioned space on each *orientation* of building elevation; and

c) Calculation demonstrating the design case compliance in irradiation gain reduction

$$\frac{\sum Facade\ irradiation\ of\ non-conditioned\ facade\ area}{Overall\ Facade\ irradiation} \geq 20\%$$

3) Fixed or Movable Horizontal / Vertical E*xternal Shading* Devices

3.1 Demonstrate the provision of *external shading* devices in reducing direct solar irradiation entering the building interior. Any architectural features that shade the building surfaces from direct sunlight are considered as shading devices.

3.2 Conduct an external solar irradiation simulation to demonstrate that the annual solar irradiation on the facade is 2% lower than the baseline (hypothetic) case without a shading device.

To document this strategy, the passive building design report should include the following information:

a) Simulation result of solar irradiation on each building elevation for both design case and hypothetic case; and

b) Drawings illustrating the solar shading design.

4) Vegetated Building Envelope

4.1 Demonstrate that U-value of the roof area is reduced by 50% by vegetation. Roof of non-conditioned area (e.g. mechanical plant rooms) does not count into the total roof area; OR

4.2 Demonstrate that the area of vegetation on facade contribute 5% reduction on the U-value of facade. Facade of non-conditioned area (e.g. mechanical plant rooms) does not count into the total facade area.

4.3 Only permanent plantation is considered as vegetation area.

To document this strategy, the passive building design report should include the following information:

a) Drawings that demonstrate the area of vegetation on the roof area (or external wall area);

b) Drawings that demonstrate the roof area of conditioned space (or the external wall area of conditioned space);

c) Calculation for demonstrating the percentage of compliance;

d) Calculation for demonstrating a reduction in U-value when compare to the project roof material (or external wall material); and

e) Maintenance contract or undertaking statement from project owner that landscape maintenance personnel/ company will be employed for the maintenance of building envelope vegetation.

5) Space Layout for Natural Ventilation

5.1 Demonstrate that at least 50% of openings and operable areas in each normally *occupied space* has an average incoming/outgoing velocity of 0.2 m/s

5.2 Demonstration that at least 20% of normally *occupied space*, in terms of floor area, has achieved a wind velocity of 0.2 m/s at 1.2m level above the finished floor.

5.3 A *CFD* simulation should be conducted in accordance with the AVA methodology and assessment area of the simulation model

outlined in Technical Circular No.1/06 [2] to obtain the external wind pressures at the centre of the opening area. Another model that simulates the indoor flow pattern 1.2m level above the finished floor shall also be conducted using the external wind pressures computed by previous *CFD* model.

5.4 For buildings with 3 stories above grade or more, at least 3 typical stories (covering high, mid and low levels of buildings) with similar interior layout should be selected and studied for multi-storey building. For buildings with less than 3 stories, the simulation should cover all floors.

5.5 For normally occupied space in a building with *site* environmental problems identified by authorities (e.g. poor air quality, poor acoustics condition) justification report with evidences should be provided to substantiate the non-practicality of providing operable windows for the identified normally occupied space. Thus, demonstrating this credit part is not applicable for that identified space. Only project with 100% occupied space identified as non-practical is allowed to apply not applicable (N/A) in this credit part.

To document this strategy, the passive building design report should include the following information:

a) The derived incoming/ outgoing velocity at the opening under 1 out of the 3 most prevailing wind directions in summer; and

b) Calculation of the Area-Weighted Average Wind Velocity (AAWV) for the complied space.

6) Space Layout for Daylight

6.1 Demonstrate that 25% of normally *occupied space* achieves spatial Daylight Autonomy300/25% (sDA300/25%). In other words, at least 25% of the area can receive at least 300 lux of sunlight for at least 25% of operating hours each year.

6.2 Compliance with the assessment criteria by demonstrating through daylight simulation satisfying the below requirements:

a) *Normally occupied spaces* shall be assessed (including *normally occupied spaces* without window);

b) Internal doors within a unit are assumed to be fully opened;

c) Calculation grids shall be no more than 0.6m^2;

d) Assessment plane shall be placed at 0.8m above F.F.L. horizontally;

e) Assessment area shall cover typical floors of the lowest, topmost, middle level of each building within the *site* boundary. All *normally occupied spaces* shall be assessed if the project building has no typical floor;

2 Housing, Planning And Lands Bureau Technical Circular No. 1/06 [ONLINE] Available at: https://www.devb.gov.hk/filemanager/en/content_679/hplb-etwb-tc-01-06.pdf [Accessed August 2019]

f) Annual sky file referencing a local climate file, such as an EnergyPlus weather format data file (*.epw), shall be used for sky model;

g) The assessment shall cover hours between 8a.m. to 6p.m. local clock time, for a full calendar year, from January 1 to December 31;

h) Overall external reflectance of an average of 0.2 for building (include the project development, unless provide other supporting materials) and 0.2 for ground;

i) Internal wall, floor, ceiling reflectance can make reference to Table A1.12 in CIBSE - LG10/14 Lighting Guide 10: Daylighting - a Guide for Designers - LG10 [3]. If the finishes in the space is not completed, use the following default surface reflectance: 0.8 for ceiling, 0.2 for floors, and 0.5 for walls. The entire floor plate, except for the core is assumed to be normally *occupied space*;

j) Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department;

k) The surrounding building and large structures should be included in the simulation model. The surrounding area should 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 building geometry can be simplified as blocks; and

l) 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. Where smaller terrain area is desired, the Applicant should propose a terrain area with justification and the terrain area should be surrounded by a wall with a height same as the average height of the surrounding buildings.

To document this strategy, the passive building design report should include the following information:

a) The industrial guidance/publications for arriving the adopted design criteria for the project;

b) Software validation report;

c) Simulation results of the spaces which have fulfilled the daylight illuminance requirements;

d) Calculation for demonstrating the percentage of compliance; and

e) Input and output report generated by software.

3 CIBSE - LG10/14 Lighting Guide 10: Daylighting - a Guide for Designers - LG10

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_1_00	BEAM Plus NB submission template for EU 1	✓	✓
EU_1_01	Passive building design report	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

5 Energy Use **5.1 Energy Use Reduction and Control**

EU 2 Reduction of CO_2 Emissions

Extent of Application All buildings

Objective Reduce the consumption of non-renewable energy and the associated carbon dioxide (CO_2) emissions to the atmosphere.

Credits Attainable 10 + 5 BONUS

Credit Requirement Select one of the compliance paths described below.

Option 1 – Performance Path (1-10 Credits + 5 Bonus)

Demonstrate a percentage of reduction on annual CO_2 emission of the proposed building performance compared with the baseline case performance.

1 to 10 credits for annual CO_2 emission reduction by the following saving percentages:

Credit(s)	Percentage of reduction of annual CO_2 emission / %
1	1%
2	3%
3	5%
4	7%
5	9%
6	11%
7	13%
8	15%
9	17%
10	19%
10 + 1B	21%
10 + 2B	23%
10 + 3B	25%
10 + 4B	27%
10 + 5B	29%

Option 2 – Prescriptive Path (1-7 Credits)

Demonstrate a prescriptive compliance in below listed item. *Residential buildings* and non-*residential buildings* should follow different path.
For building consist of both residential and non-residential parts, demonstrate the compliance for all requirements as listed for both residential and non-residential targeted credit score in all path.

1) Passive Building Design Enhancement

1.1 <u>Building Envelope</u>

a) *Residential buildings* & Residents' Recreational Facilities (RRF)

Credit	OTTV / RTTV Requirement Improvement [1]
0.5	$RTTV_{wall}$ Reduced by 5% $OTTV_{RRF,tower}$ (if applicable) Reduced by 5% $OTTV_{RRF,podium}$ (if applicable) Reduced by 20%
1	$RTTV_{wall}$ Reduced by 10% $RTTV_{roof}$ Reduced by 50% $OTTV_{RRF,tower}$ (if applicable) Reduced by 10% $OTTV_{RRF,podium}$ (if applicable) Reduced by 40%

b) All non-*residential buildings*

Credit	OTTV Requirement Improvement [2]
0.5	$OTTV_{tower}$ Reduced by 5% $OTTV_{podium}$ (if applicable) Reduced by 20%
1	$OTTV_{tower}$ Reduced by 10% $OTTV_{podium}$ (if applicable) Reduced by 40%

1.2 <u>Natural Ventilation</u>

a) Residential buildings

Credit	Performance Improvement
1	20% of normally *occupied space (habitable space)* satisfy the ventilation requirements
2	40% of normally *occupied space (habitable space)* satisfy the ventilation requirements

b) All non-*residential buildings*

Credit	Performance Improvement
1	a) Net free unobstructed area of permanently open to openable openings is equivalent to 9.5% of the net occupied floor area. b) Interior room on occupied floor without direct openings to outdoors is ventilated through adjoining rooms, the opening between rooms shall be permanently unobstructed and have a free area of not less than 8% of the area of the interior room nor less than 2.3m^2.
2	a) Net free unobstructed area of permanently open to openable openings is equivalent to 12.5% of the net occupied floor area. b) Interior room on occupied floor without direct openings to outdoors is ventilated through adjoining rooms, the opening between rooms shall be permanently unobstructed and have a free area of not less than 8% of the area of the interior room nor less than 2.3m^2.

1 Buildings Department - PNAP APP-156 - Design and Construction Requirements for Energy Efficiency of Residential Buildings; Buildings Department - Guideline on Design and Construction Requirements for Energy Efficiency of Residential Buildings 2014

2 Buildings Department - PNAP APP-67 – Energy Efficiency of Buildings, Building (Energy Efficiency) Regulation; Code of Practice for Overall Thermal Transfer Value in Buildings 1995

2) Active System Design Improvement

Demonstrate further performance improvement as compared with the **Building Energy Codes (BEC) 2018** [3]

2.1 For each air-conditioning equipment:

Credit	Performance Improvement of minimum coefficient of performance (COP) at full load
1	3%
2	6%

2.2 Lighting System

Lighting power of lighting installation in whole building by area-weighted method as compared with the BEC 2018 code [3]:

Credit	Performance Improvement of lighting power
0.5	5%
1	10%

2.3 Lift and escalator installation (N/A for building with No Lift & Escalators)

Credit	Performance Improvement
1	20% reduction from the maximum allowable electrical power

Assessment

OPTION 1 – PERFORMANCE PATH

Whole building energy simulation should be carried out in a prescribed methodology as listed below in order to quantify the potential savings due to energy saving measures and improvements over the relevant baseline model.

Simulation Software

Simulation program used for energy modelling should meet the following criteria:

1) Tested with industry standard methods: ANSI/ASHRAE Standard 140-2007 or equivalent.

2) Capable to perform hourly analysis (i.e. 8,760 hours per year);

3) Provide hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat setpoints, and HVAC system operation;

4) Capable to model 10 or more thermal zones;

5) Capable to simulate the thermal behaviour of a building and the interaction of its building fabric, air-conditioning, interior lighting and other relevant energy consuming equipment and systems;

3 Code of Practise for Energy Efficiency of Building Services Installation – Electrical and Mechanical Services Department HKSAR, 2018

6) Capable to perform design load calculations to determine the required air-conditioning equipment capacities and air and water flow rates for both the proposed building and baseline building;

7) Capable to model part-load performance curves for mechanical equipment;

8) Capable to model capacity and efficiency correction curves for mechanical heating and cooling equipment; and

9) Capable to model air-side economizers with integrated control

Baseline and Proposed Model Set-up

Develop the corresponding baseline building performance according to modelling set up guideline in Appendix 9.2 for different building types.

Exceptional Calculation Methods (ECM)

When no simulation program can adequately model a design, materials or device, an ECM can be used to demonstrate above-standard performance. Its adoption is subject to the justification (submitted by the Applicant) of its underlying principles, quantitative & qualitative techniques, assumptions etc. in detail.

Any claim of non-regulated load saving or strategies that lead to a different between proposed and baseline model is required to submit a narrative and to provide with ECM calculation.

ECM is allowed to create a representation of that element. If the methodology of approximation has not been previously published in any technical circular or FAQ, it is the responsibility of the applicant to submit a narrative explanation describing the simulation methodology and providing the calculations for the energy savings if necessary.

On-site Renewable Energy

On-site renewable energy generation is included in the proposed case calculation to further reduce the whole building CO_2 emission. By providing annual energy generation estimation details in the proposed case, the percentage reduction of CO_2 emission is accounted by the percentage of reduction from baseline CO_2 emission.

Equivalent Carbon Dioxide Emissions

Electricity: 0.7kg CO_2 per kWh electricity consumed [4]
Town gas: 3.141 kg CO_2 per unit of town gas consumed (1 unit of town gas = 48 mega-joules consumed

Building Energy Report

The content should include the followings:

1) Executive summary

   1.1 Energy saving measures and management opportunities (EMOs) summary

4 Environmental Protection Department. Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, Residential or Institutional Purposes) in Hong Kong, 2010 https://www.climateready.gov.hk/files/pdf/Guidelines_English_2010.pdf

1.2 CO_2 emission and energy consumption reduction as compared with baseline

2) Introduction

2.1 Methodology of energy performance assessment

2.2 Project information

3) Description of EMOs

4) Modelling Parameters

4.1 Operating schedule

4.2 Input parameters summary table with reference

5) Results and discussion

5.1 Summarise the CO_2 emission reduction in percentage (%)

5.2 Provide baseline and proposed case energy breakdown diagrams

6) Conclusions

6.1 Conclude the major reasons for achieving CO_2 emission reduction

The report should be endorsed by a locally qualified professional who has at least 8-year of relevant experience in building energy modelling.

OPTION 2 – PRESCRIPTIVE PATH

Prepare a summary report to demonstrate the compliance of each category below:

1) Passive Building Design Enhancement

1.1 Building Envelope

Residential Buildings & Residents' Recreational Facilities (RRF)	Provide $RTTV_{wall}$ & $RTTV_{roof}$ calculation and $OTTV_{RRF,tower}$ & $OTTV_{RRF,podium}$ calculation (if applicable) to demonstrate the envelope performance improvement with reference to the latest statutory requirement.
All non-*residential buildings*	Provide $OTTV_{tower}$ & $OTTV_{podium}$ calculation to demonstrate the envelope performance improvement with reference to the latest statutory requirement.

1.2 Natural Ventilation

Residential Buildings & Residents' Recreational Facilities (RRF)	*Residential Buildings* Demonstrate the required normally *occupied space (habitable space)* area in each residential flat layout. The provided guidance in appendix 9.2 can only be applied to single floor. Layout of multi-floor unit should be reviewed per each level. If a flat is designed without internal partitions between normally

	occupied space (habitable space) and other spaces, applicant must demonstrate compliance with typical partitions layout to represent the intended design for occupancy habitation. Provide descriptions, mark-up on the normally *occupied space (habitable space)* layout plan and summary tables of total area compliance according to the detailed credit requirement stated in Appendix 9.2. Detailed requirements of credit compliance are provided in Appendix 9.2. <u>Residential Recreational facilities (RRF)</u> Recreational facilities in *residential building* should follow requirement for "All non-*residential buildings*".
All non-*residential buildings*	Provide sufficient permanent openings by demonstrating the compliance of following requirements on location and size of ventilation openings: 1 Net free unobstructed area of permanently open to openable openings is equivalent to 9.5% or 12.5% of the net occupied floor area. 2 Interior room on occupied floor without direct openings to outdoors is ventilated through adjoining rooms, the opening between rooms shall be permanently unobstructed (Door between rooms are deemed as permanently opening) and have a free area of not less than 8% of the area of the interior room nor less than 2.3m^2. Provide mark-up on layout plan highlighting permanent openings on envelope and interior zone. Provide calculation of required natural ventilated openings area and the equivalent net occupied floor area in order to demonstrate the credit compliance.

2) Active System Design Improvement

For BEC Governing Building Types:

2.1 <u>Air-conditioning equipment:</u>

Provide summary table of COP improvement in percentage (%) for **each** air-conditioning equipment as compared with the

corresponding minimum COP at full load at specific standard FT rating condition specified under Section 6.12 of BEC 2018 [5]

For room air-conditioners (i.e. single package window type and wall mounted split type), the system performance should be compared with the scope of the Mandatory Energy Efficiency Labelling Scheme (MEELS) under Energy Efficiency (Labelling of Products) Ordinance (Cap. 598).

For assessment consistency, the following table provides the approximated equivalent COP table that converted with reference to the Code of Practice on Energy Labelling of Products 2018 [6] and BEC technical guidelines [7]. For assessment purpose, the equivalent COP value will be used as the baseline for all single packaged type and wall-mount split type equipment:

Type of air-conditioners	Equivalent COP
Single Package Type (Categories 1 - 2)	2.74
Split Type (Categories 3 – 4)	3.43

Project using district cooling system and project without any air-conditioning installation (or not newly install with any air-conditioning system) are not assess under this criteria.

2.2 <u>Lighting System:</u>

Provide summary table of lighting power reduction in percentage (%) for whole building lighting installation by area-weighted method# compared with Section 5.4 of BEC 2018 [8] (i.e. including carpark lighting system).

$$\#\ Design\ Case: \left(\frac{\sum[\text{LPD (Area A)} \times \text{ Area A} + \text{LPD (Area B)} \times \text{ Area B} + \cdots]}{\sum[\text{Area A} + \text{Area B} + \cdots]}\right)$$

$$BEC\ Case: \left(\frac{\sum[\text{BEC LPD (Area A)} \times \text{ Area A} + \text{BEC LPD (Area B)} \times \text{ Area B} + \cdot\cdot}{\sum[\text{Area A} + \text{Area B} + \cdots]}\right.$$

$$Lighting\ power\ reduction\ percentage = \left(1 - \frac{Design\ case}{BEC\ Case}\right) \times 100\%$$

Lighting power density (LPD) for baseline calculation should follow BEC 2018 Section 5.4.

For spaces that are not governed by the code, LPD baseline should be developed per Appendix 9.2, *Interior General Lighting* System section, Baseline case column.

5 Code of Practise for Energy Efficiency of Building Services Installation – Electrical and Mechanical Services Department HKSAR, 2018

6 Code of Practice on Energy Labelling of Products - Electrical and Mechanical Services Department HKSAR, 2018

7 Technical Guidelines on Code of Practice for Energy Efficiency of Building Services Installation – Electrical and Mechanical Services Department HKSAR, 2018

8 Code of Practice for Energy Efficiency of Building Services Installation – Electrical and Mechanical Services Department HKSAR, 2018

Exclude those lighting installations as specified in BEC TG-2018 [9] Section 5.1.2.in the calculation.

2.3 <u>Lift and escalator installation:</u>

If there is no lift and escalators installation within the project *site*, this criteria is not applicable.

With reference to Section 8 of BEC 2018 [8], provide summary table on the maximum allowable electrical power reduction of lift and escalator installation.

For non-BEC Governing Building Types:

1) Air-conditioning system

For spaces that are not governed by the BEC 2018 based on Cap. 610 Schedule 1 & 2, it is required to demonstrate a COP improvement in percentage (%) for all the Rated COP of each AC equipment performance for spaces that are not governed by the BEC 2018 based on Cap. 610 Schedule 1 & 2 is required to demonstrate the COP improvement in percentage (%) for each air-conditioning equipment compared with the corresponding minimum coefficient of performance (COP) at full load at specific standard rating condition given from the code requirement under Section 6.12 of BEC 2018 [10].

For project connecting to a district cooling system, or project without an air-conditioning system (or newly install an air-conditioning system) is not covered in this criteria.

2) Lighting System:

Provide summary table of lighting power reduction in percentage (%) for whole building lighting installation by area-weighted method compared with the relevant space type as identified in Section 5.4 of BEC 2018. (i.e. including carpark lighting system)

$$\#\ Design\ Case: \left(\frac{\sum[\text{LPD (Area A)} \times \text{ Area A} + \text{LPD (Area B)} \times \text{ Area B} + \cdots]}{\sum[\text{Area A} + \text{Area B} + \cdots]}\right)$$

$$BEC\ Case: \left(\frac{\sum[\text{BEC LPD (Area A)} \times \text{ Area A} + \text{BEC LPD (Area B)} \times \text{ Area B} + \cdot\cdot}{\sum[\text{Area A} + \text{Area B} + \cdots]}\right.$$

$$Lighting\ power\ reduction\ percentage = \left(1 - \frac{Design\ case}{BEC\ Case}\right) \times 100\%$$

Lighting power density (LPD) for baseline calculation should follow BEC 2018 Section 5.4.

For spaces that are not governed by the code, LPD baseline should be developed per Appendix 9.2, *Interior General Lighting* System section, Baseline case column.

Lighting installations in BEC TG-2018 clauses 5.1.2 are excluded for calculation.

9 Technical Guidelines on Code of Practise for Energy Efficiency of Building Services Installation – Electrical and Mechanical Services Department HKSAR, 2018

10 Code of Practice for Energy Efficiency of Building Services Installation – Electrical and Mechanical Services Department HKSAR, 2018

3) Lift and escalator installation:

If there is no lift and escalators installation within the project *site*, this credit is not applicable.

Refer to Section 8 of BEC 2018, provide summary table on the maximum allowable electrical power reduction of lift and escalator installation.

The report should be endorsed by a locally qualified professional who has at least 5-year of relevant experience in green building services system design.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
Option 1 – Performance Path			
EU_2(Path1)_00	BEAM Plus NB submission template for EU 2 Path 1	✓	✓
EU_2(Path1)_01	EU-2-1 Form	✓	✓
EU_2(Path1)_02	Endorsed Building Performance Assessment Report	✓	✓
EU_2(Path1)_03	CV of the professional as per requirements in the assessment	✓	✓
EU_2(Path1)_04	Building Energy Report	✓	✓
EU_2(Path1)_05	Input and Output Simulation report which is generated from simulation software	✓	✓
EU_2(Path1)_06	Supporting documents for input, based on project development status, including: i. OTTV/ RTTV calculation sheet based on the requirements of Buildings Department [11] for baseline and proposed case ii. Indoor design criteria from project team highlighting indoor thermal condition, occupancy density, fresh air flow rate requirement, internal load, equipment load and ventilation rate iii. Indoor design criteria from project team highlighting indoor thermal condition, occupancy density, fresh air flow rate requirement, internal load, equipment load and ventilation rate iv. System and equipment specification a) All selected air-conditioning equipment highlighting COP, cooling/ heating capacity and flow rate as	✓	✓

11 Buildings Department - Guideline on Design and Construction Requirements for Energy Efficiency of Residential Buildings 2014; PNAP APP-156 - Design and Construction Requirements for Energy Efficiency of Residential Buildings; PNAP APP-67 – Energy Efficiency of Buildings, Building (Energy Efficiency) Regulation; Code of Practice for Overall Thermal Transfer Value in Buildings 1995

	well as energy recovery appliance b) All selected lift and escalator highlighting capacity, motor power and energy saving control system c) All selected water heater (if applicable) highlighting installed power v. Pre-input calculation for modelling, including: a) Simplified Fan Power input b) Lighting Power Density		
Option 2 – Prescriptive Path			
EU_2(Path2)_00	BEAM Plus NB submission template for EU 2 Path 2	✓	✓
EU_2(Path2)_01	EU-2-2 Form	✓	✓
EU_2(Path2)_03	Endorsed Prescriptive approach summary report	✓	✓
EU_2(Path2)_04	CV of the professional as per requirements in the assessment	✓	✓
EU_2(Path2)_05	Supporting documents for report calculation, based on project development status, including: i. RTTV / OTTV calculation sheet based on the requirements of Buildings Department [12] and the corresponding improvement ii. Air-conditioning equipment specifications with COP at full load iii. Lighting Power density improvement calculation iv. Lighting schedule highlighting installed luminaires types v. Representative Lighting Layout drawing vi. Lift and escalator reduction calculation vii. Lift and escalator location markup on drawing plan viii. Lift and escalator specification	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

12 Buildings Department - Guideline on Design and Construction Requirements for Energy Efficiency of Residential Buildings 2014; PNAP APP-156 - Design and Construction Requirements for Energy Efficiency of Residential Buildings; PNAP APP-67 – Energy Efficiency of Buildings, Building (Energy Efficiency) Regulation; Code of Practice for Overall Thermal Transfer Value in Buildings 1995

5 Energy Use **5.1 Energy Use Reduction & Control**

EU 3 Peak Electricity Demand Reduction

Extent of Application All buildings

Objective Encourage energy conservation and methods to reduce peak electricity demand.

Credits Attainable 3

Credit Requirement

Option 1 – Based on EU2 Performance Path:

1 to 3 credits for peak electricity demand reduction by the following saving percentage:

Credit	Percentage of reduction of peak electricity demand / %
1	5%
2	10%
3	15%

Option 2 – Based on EU2 Prescriptive Path:

1 credit for EU3 when 4 credit points in EU2 (prescriptive path) is achieved.

2 credits for EU3 when 7 credit points in EU2 (prescriptive path) is achieved

Assessment

Option 1 – Based on EU2 Performance Path:

Use the same whole building energy analysis of baseline and proposed case buildings in EU2 Path 1 (Performance Path) and provide Building Peak Electricity Demand report that must be certified by a locally qualified professional with building energy modelling experience.

The Building Peak Electricity Demand report should include the following contents:

1) Introduction

   1.1 Methodology of energy performance assessment

   1.2 Project information

2) Description of Energy Conservation Measures (ECMs)

3) Modelling Parameters

   3.1 Operating schedule

   3.2 Input parameters summary table

4) Results and discussion

4.1 Provide monthly profile for peak electricity demand in both baseline and proposed cases

4.2 Identify the month with the highest electricity demand throughout a year in the baseline case

4.3 Identify the month with the highest electricity demand throughout a year the proposed case

4.4 Calculate the percentage reduction of the peak electricity demand

$$\left(1 - \frac{\text{Proposed case peak electicity demand (kW)}}{\text{Baseline case peak electricity demand (kW)}}\right) \text{x } 100\%$$

The peak electricity demands in the baseline case and the proposed case used for the percentage calculation do not have to take place in the same month.

The report should be endorsed by a locally qualified professional who has at least 8-year of relevant experience in building energy modelling.

Option 2 – Based on EU2 Prescriptive Path:

Demonstrate a minimum 4-credit achievement in EU2 (prescriptive path) and provide EU3 achievement summary report that must be certified by a locally qualified professional with building energy modelling experience.

The EU3 achievement summary report should include the following contents:

1) Introduction
2) Achievement of EU2 Path 2
3) Credits achievement in EU3

The report should be endorsed by a locally qualified professional who has at least 8-year of relevant experience in building energy modelling.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
Option 1 – Performance Path			
EU_03(Path1)_00	BEAM Plus NB submission template for EU 3	✓	✓
EU_03(Path1)_01	Endorsed Building Peak Electricity Demand report	✓	✓

EU_03(Path1)_02	Input and Output Simulation report which is generated from simulation software	✓	✓
EU_03(Path1)_03	Supporting documents for input, based on project development status, including: vi. OTTV/ RTTV calculation sheet based on the requirements of Buildings Department [1] for baseline and proposed case vii. Indoor design criteria from project team highlighting indoor thermal condition, occupancy density, fresh air flow rate requirement, internal load, equipment load and ventilation rate viii. Indoor design criteria from project team highlighting indoor thermal condition, occupancy density, fresh air flow rate requirement, internal load, equipment load and ventilation rate ix. System and equipment specification d)All selected air-conditioning equipment highlighting COP, cooling/ heating capacity and flow rate as well as energy recovery appliance e)All selected lift and escalator highlighting capacity, motor power and energy saving control system f) All selected water heater (if applicable) highlighting installed power x. Pre-input calculation for modelling, including: c) Simplified Fan Power input Lighting Power Density	✓	✓
EU_03(Path1)_04	CV of the professional as per requirements in the assessment	✓	✓
Option 2 – Prescriptive Path			
EU_03(Path2)_00	BEAM Plus NB submission template for EU 3	✓	✓

1 Buildings Department - Guideline on Design and Construction Requirements for Energy Efficiency of Residential Buildings 2014; PNAP APP-156 - Design and Construction Requirements for Energy Efficiency of Residential Buildings; PNAP APP-67 – Energy Efficiency of Buildings, Building (Energy Efficiency) Regulation; Code of Practice for Overall Thermal Transfer Value in Buildings 1995

EU_03(Path2)_01	Endorsed EU3 achievement summary with indication of EU2 prescriptive approach achievement	✓	✓
EU_03(Path2)_02	CV of the professional as per requirements in the assessment	✓	✓
EU_03(Path2)_03	Endorsed prescriptive approach summary report in EU2	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

Refer to EU 2 Reduction of CO_2 Emissions

5 Energy Use **5.1 Energy Use Reduction and Control**

EU 4 Metering and Monitoring

Extent of Application All Non-*residential buildings* and common area of *residential buildings*

Objective Enable building operators to measure, monitor and develop measures to improve the performance of the building's engineering systems

Credits Attainable 1 + 2 BONUS

Credit Requirement

a) Fundamental Metering and Monitoring

1 credit for providing **energy** monitoring system for equipment and systems in spaces.

1 BONUS for providing **performance auditing** monitoring system for equipment and systems in spaces.

b) Metering for Tenanted Area

1 BONUS for allows monitoring provision of tenants' energy consumption

Assessment

a) Fundamental Metering and Monitoring

Metering Coverage

Energy monitoring provision covers the energy consumption (both electricity and gas) of the equipment, unit in (kWh)

Performance Auditing monitoring provision covers the system capacity ratings and operating characteristics. The corresponding metering coverage should refer to the following requirements:

1.1 For all common area of *Residential Buildings*

1.1.1 Provide a energy monitoring provision for future facility management to review occasionally the below end-use energy consumption:

a) Each equipment in HVAC system

b) Lighting and small power system

c) Each Lift & Escalator

d) Each equipment in Plumbing and Drainage system

1.2 For Non-*Residential Buildings*, with reference to EMSD Code of Practice for Building Energy Audit 2018 [1]:

1.2.1 Provide energy monitoring system for all following installations in landlord's controlled area, where present in the project. Terminal unit is not in the assessment scope.

1 Code of Practice for Building Energy Audit – Electrical and Mechanical Services Department HKSAR, 2018

a) Each equipment in HVAC water-side system (chiller plant, heating plant & heat rejection plant);

b) Each equipment in HVAC air-side system (Air handling unit); and

c) Each equipment in Fresh Air system (Primary air unit);

d) Each gas equipment in cooling or heating plant (e.g. Absorption chiller plant, centralized boiler plant)

e) Each equipment in plumbing and drainage system energy consumption

1.2.2 Provide energy monitoring system for all the following end-use in landlord‘s controlled area (Allow a minimum one single meter for each end-use):

a) Variable refrigerant volume air-conditioner energy consumption;

b) Car park ventilation system energy consumption

c) Lift system energy consumption;

d) Escalator system energy consumption;

e) Lighting and receptacle power energy consumption;

Requirements of monitoring coverage are summarized as below:

Table EU4-1:

System (if applicable)		**Energy monitoring**	**Performance Auditing**
Outdoor Condition		• N/A	• Air Temperature (°C) • Humidity (RH) • Daylight (Lux)
HVAC System	Each Equipment in HVAC (Water Side) - Chillers - Heat pumps - Pumps	• Electricity (kW and kWh)	• Supply & Return Water temperature (°C) • Water Flow rate (m^3/s)

	- Heat Rejection		• Water Pressure (Pa) • Capacity Rating
	Each Equipment in HVAC (Water Side) - Absorption Chiller - Boiler	• Fuel (kW and kWh)	• Supply & Return Water temperature (^oC) • Water Flow rate (m^3/s) • Water Pressure (Pa) • Capacity Rating
	Each Equipment in HVAC (Air Side) - Primary Air/ Air handling Unit Fans - Ventilation Fans	• Electricity (kW and kWh)	• Supply & Return Air temperature (^oC) • Flow rate (m3/s) • Pressure (Pa)
	VRV and Unitary System	• Electricity (kW and kWh)	• N/A
	Exhaust System - Carpark Exhaust Ventilation - Toilet Exhaust Ventilation (>2.5kW each)	• Electricity (kW and kWh)	• CO / NOx concentration level (if applicable) • Flow rate (m^3/s) (Jet Fan is excluded) • Pressure head (m) (Jet Fan is excluded)
Lighting System	Lighting and receptacle system	• Electricity (kW and kWh)	• N/A
Plumbing and Drainage System	Each equipment in Plumbing and Drainage	• Electricity (kW and kWh)	• N/A
Lift and Escalators System	Each Lift and Escalators	• Electricity (kW and kWh)	• N/A
		1 Credit	**1 BONUS**

Monitoring provision Requirement (Datapoint, Sensors or Meters)

1) Electricity metering should comply with BS EN [2] accuracy class 1 or equivalent.

2) Sensors for performance sub-metering should meet the minimum accuracy requirements in ASHRAE Standard 114 [3] or similar equivalent.

Interval and Recording

1) Monitoring record should be at intervals of one hour or less and capable to record the item as required.

2) For residential development, all data recorded monitoring systems should be collected monthly and be kept for at least 36 months.

3) For all non-residential development, all data recorded by the sub-metering system and monitoring system should be transferred to a Building Management System (BMS) or other data collection system. The BMS or other data collection system should have sufficient capacity to store for at least 36 months.

b) Metering for Tenanted Area

Only buildings with tenanted areas can attempt this BONUS.

Demonstrate compliance by selecting one of the following paths for <u>all</u> tenanted area:

<u>Compliance path 1: Landlord to Install monitoring provision</u>

In all tenanted areas, allows separate monitoring of electricity use by:

1) HVAC system;

2) Lighting; and

3) Small power

<u>Compliance path 2: Tenants to install monitoring provision</u>

Provide contractually binding lease document signed by both the project owner and the tenants which explicitly state the requirements of obtaining electricity usage data from the tenant's meters. The tenant's meters should separately monitor HVAC system, lighting and small power and should also be able to provide record at intervals of one hour or less and capable to record both electricity consumption (in kWh) and electricity demand (in kW and kVA).

For both path, the monitoring provision should provide record at intervals of one hour or less and capable to record both electricity consumption (in kWh) and electricity demand (in kW and kVA).

2 British Standard BS EN 60521:1995. Class 0.5, 1 and 2 alternating-current watthour meters.

3 ASHRAE. Standard 114-1986: Energy Management Control Systems Instrumentation, American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., USA. 1987.

All data recorded should be transferred to a Building Management System (BMS) or other forms of data collection facilities. The BMS or data collection facilities should have sufficient capacity to store for at least 36 months.

OR

A contractually binding lease document, with reference to HKGBC Green Tenancy Driver [4], is required to establish to ensure data could be shared between project owner and tenants, which explicitly state:

1) The Aim of improving the environmental performance of the building thereof the cost reduction and indoor quality

2) The requirements of obtaining electricity usage data from the tenant

3) Data and relevant information to be share between Landlord and Tenants are to be kept confidential unless for the purpose of management of the building

4) Landlord and Tenant are agreed to work collaboratively in setting up a Green Tenancy Committee (GTC)

5) Responsibility of the GTC at minimum:
    a) Sharing the building operation data
    b) Review the environmental performance of the premise
    c) Setting up a Green Office Tenancy Plan with annual sustainability targets
    d) Review the target and progress periodically

Submittals

(a) Fundamental Metering and Monitoring

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_4(a)_00	BEAM Plus NB submission template for EU 4a	✓	✓
EU_4(a)_01	Electrical schematics highlighting all locations of metering	✓	✓
EU_4(a)_02	Control diagrams of central chiller plant monitoring system	✓	✓
EU_4(a)_03	Specifications of all metering and measurement equipment	✓	✓
	Catalogues of all metering and measurement equipment	-	✓
EU_4(a)_04	Specifications of BMS or data collection facilities	✓	✓

4 HKGBC, Green Tenancy Driver for office Buildings https://www.hkgbc.org.hk/eng/got.aspx

	Catalogues of BMS or data collection facilities	-	✓
EU_4(a)_05	Schematic drawings and point schedule of BMS or data collection facilities	✓	✓
EU_4(a)_06	Test and commissioning records	-	✓
EU_4(a)_07	Operation manual	-	✓

(b) Metering for Tenanted Area

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_4(b)_01	BEAM Plus NB submission template for EU 4b (compliance path 1 and 2)	✓	✓
EU_4(b)_02	Electrical schematics highlighting all locations of metering (compliance path 1)	✓	✓
EU_4(b)_03	Specifications of all metering and measurement equipment (compliance path 1)	✓	✓
	Catalogues of all metering and measurement equipment (compliance path 1)	-	✓
EU_4(b)_04	Specifications of BMS or data collection facilities (compliance path 1)	✓	✓
	Catalogues of BMS or data collection facilities (compliance path 1)	-	✓
EU_4(b)_05	Schematic drawings and point schedule of BMS or data collection facilities (compliance path 1)	✓	✓
EU_4(b)_06	Test and commissioning records (compliance path 1)	-	✓
EU_4(b)_07	Operation manual (compliance path 1)	-	✓
EU_4(b)_08	Contractually binding lease document (compliance path 1 and 2)	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

IDM 15 Interface for Metering

IDM 17 Occupant Engagement Platform

While this credit assesses the electricity consumption metering and monitoring system in the building, IDM 15 and IDM 17 encourages processing the data collected to useful information for facility managers' and occupants' use.

5 Energy Use **5.2 Renewable and Alternative Energy Generation**

EU 5 Renewable and Alternative Energy Systems

Extent of Application All buildings

Objective Encourage the wider application of renewable energy sources in buildings.

Credits Attainable 5 + 5 additional BONUS

Credit Requirement

(a) Solar Energy Feasibility Study

1 credit for evaluating the building roof's potential for harnessing solar energy.

(b) On-site Renewable Energy Application

1 to 5 credits plus 5 additional BOUNS for using on-site renewable energy systems to offset annual building energy consumption.

Credit	Percentage of annual building energy consumption
1	0.2%
2	0.4%
3	0.6%
4	0.8%
5	1%
1B	1.2%
2B	1.4%
3B	1.6%
4B	1.8%
5B	2%

Assessment

(a) Solar Energy Feasibility Study

Conduct a feasibility study to evaluate the potential of standalone and building-integrated installation in harnessing solar energy including photovoltaic and solar water heating. The feasibility study report should include the following contents in around 10 A4 pages which should suffice for the purpose (however, the 10 A4 pages is not a straight limit):

1 Consideration of PV, BIPV or Solar thermal potential installation

1.1 Number of potential surfaces

1.2 Potential surfaces area

1.3 Height variation between roofs

1.4 Potential shading from the surroundings including trees and adjacent buildings

1.5 Potential shading from on-site building services equipment

1.6 Other (proposed)

2 Technical generation potential of solar energy

2.1 Expected solar peak capacity

2.2 Expected annual yield

2.3 Project building energy use intensity (Default value could be used if EU 2 Performance path is not attempted) and the estimated percentage of reduction

3 Economics of solar energy

3.1 Upfront installation costs

3.2 Anticipated maintenance cost

3.3 Anticipated annual electricity bills

3.4 Anticipated cost saving

3.5 Payback period

4 Conclusions

4.1 Conclude whether the harnessing of solar energy is feasible for the project

5 *Roll-out plan* (if concluded to be feasible)

5.1 Propose access and safety measures if solar energy is to be harnessed

5.2 Propose recommendations to refine the roof design to maximise the usable roof space for M&E equipment

The feasibility should be endorsed by a locally qualified professional who has at least 3 years of relevant experience in renewable energy.

Note that the feasibility study imposes no obligation for implementation but encourages consideration of solar energy harnessing.

(b) Renewable Energy Application

Calculate the percentage of *annual building energy* consumption obtained from all the on-site renewable energy sources with reference to the design value calculated in EU 2 Reduction of CO_2 emissions.

$$\frac{\text{Annual energy generated by Onsite renewable energy systems (kWh)}}{\text{Annual energy use (kWh)}}$$

The calculation of annual energy provided by the on-site renewable energy systems should take into account of the followings:

1) Diurnal and seasonal variations in the external environmental conditions; and

2) Energy used and lost by the renewable energy systems should be discounted from the systems output

The annual energy use figure should be derived from the design case as stated in EU 2. The tenant's electrical loads, which are not controlled or influenced by the applicant, should be excluded from the annual energy use.

For systems that generate energy from on-site renewable sources, the energy generated should count into the "annual energy generated by on-site renewable energy systems" in the above equation. This excludes any energy used as process load.

For systems that provide services directly from on-site renewable sources, which will otherwise use fuel or electricity to produce those services, the equivalent amount of electricity to produce those services should count into the "annual energy generated by on-site renewable energy systems" in the above equation.

Projects adopting EU 2 prescriptive path can pursue the credit by providing an estimation endorsed by a locally qualified professional who has at least 3 years of relevant experience in renewable energy, based on the reference figure in Table EU5-1.

Examples of renewable energy systems accepted in this credit include:

1) Solar photovoltaic (PV) System
2) Solar water heating system
3) Wind power system
4) Bio-gas heating / electricity generation
5) Biofuel

Project building energy use could make reference the following default figures if EU2 Performance path is not attempted [1],

Table EU5-1

#	Building Type	Total Energy use kWh/m^2	Controlled by Applicant
1	Office	222	40%
2	Enclosed and strip malls	268	50%
3	Retail shop	180	50%

1 Commercial Buildings Energy Consumption Survey (CBECS) Building energy intensity Data

4	Educational	166	100%
5	Other	334	100%

Submittals

(a) Solar Energy Feasibility Study

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_5(a)_00	BEAM Plus NB submission template for EU 5	✓	✓
EU_5(a)_01	Endorsed Feasibility study report	✓	-
EU_5(a)_02	CV of the professional as per requirements in the assessment	✓	-

(b) Renewable Energy Application

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_5(b)_00	BEAM Plus NB submission template for EU 5	✓	✓
EU_5(b)_01	Specifications of on-site renewable energy system	✓	-
	Catalogue of on-site renewable energy system	-	✓
EU_5(b)_02	Elevation and layout plan highlighting the location of each on-site renewable energy system	✓	✓
EU_5(b)_03	Schematic diagram of each renewable energy system	✓	✓
EU_5(b)_04	Endorsed calculation of annual yield of each on-site renewable energy system and assumptions	✓	✓
EU_5(b)_05	Endorsed Calculation of percentage of annual building energy consumption obtained from on-site renewable energy sources	✓	✓
EU_5(b)_06	Test and commissioning report of on-site renewable energy system	-	✓

EU_5(b)_07	CV of the professional as per requirements in the assessment	✓	✓

Remarks

(a) Additional Information

EMSD – HK RE Net

http://re.emsd.gov.hk/english/gen/overview/over_intro.html

EMSD – Energy Land

http://www.energyland.emsd.gov.hk/en/energy/energy_use/application.html

EMSD – New & Renewable Energy

http://www.emsd.gov.hk/en/energy_efficiency/new_renewable_energy/GovHK – Renewable Energy

http://www.gov.hk/en/residents/environment/energy/renewableenergy.htm

Scheme of Control

Hongkong Electric Co. Ltd. and HK Electric Investments Ltd.(PDF version) (1 January 2019 to 31 December 2033)
http://www.enb.gov.hk/sites/default/files/en/node66/new_HKE_SCA_eng.pdf

CLP Power Hong Kong Ltd. and Castle Peak Power Company Ltd.(PDF version) (1 October 2018 to 31 December 2033)
http://www.enb.gov.hk/sites/default/files/en/node66/new_CLP_SCA_eng.pdf

(b) Related Credits

EU 1 Low Carbon Passive Design

EU 2 Reduction of CO_2 Emissions

BEAM Plus appreciates comprehensive energy saving measures. Thorough consideration of passive design, active design and renewable energy will help buildings achieve significant reduction in energy consumption.

5 Energy Use **5.3 Energy Efficient Equipment**

EU 6 Air-Conditioning Units

Extent of Application All buildings using window or split-type air conditioners.

Objective To ensure that the installation of air-conditioning units is able to provide near optimum performance.

Credits Attainable 2

Credit Requirement

a) Compliance with Manufacturer's Recommendation

1 credit for complying with manufacturer's recommended installation positions for optimal heat rejection.

b) Performance Verification

1 credit for demonstrating the operating temperatures of all window type, split-type or packaged type air-conditioning units do not exceed manufacturer's recommendation for the specified COP in the manufacturer's technical specifications via computational simulation techniques.

Assessment

a) Compliance with Manufacturer's Recommendation

1 <u>For projects installing AC unit</u>

1.1 Demonstrate that all air-conditioning units, including window type and split type, fulfil the manufacturer's recommended installation positions for optimal heat rejection (not maintenance access space provision). The minimum separation criteria for the following shall be met:

a. Separation from wall;

b. Separation with other units; and

c. Separation from wall at air-intake side.

1.2 Demonstrate that all installations comply with the refrigerant equivalent pipe-length of manufacturer's requirement for the specified COP in the manufacturer's technical specifications:

2 <u>For projects providing AC platform but AC unit is not installed</u>

1.2 Demonstrate that all air-conditioning platforms are capable to fulfil at least <u>3 manufacturers'</u> recommended installation requirements for optimal heat rejection (not maintenance access space requirement). The minimum separation criteria for the following shall be met:

a. Separation from wall;

b. Separation with other units; and

c. Separation from wall at air-intake side.

1.3 Demonstrate that all provisional installation point (AC platform) locations comply with at least 3 manufacturers' refrigerant equivalent pipe-length of manufactures' requirement for the specified COP in the manufacturers' technical specifications:

b) Performance Verification

Demonstrate, using Computational Fluid Dynamics (*CFD*), that all air-conditioning units do not exceed the manufacturer's recommended operative temperature.

For outdoor installations, make the following assumptions:

1) All wall surfaces are flat and air-tight;
2) Outdoor dry bulb temperature of 35°C;
3) No external wind effect; air is driven purely by buoyancy effect;
4) The effect of solar radiation is negligible; and
5) Air-conditioning units operate at full rated capacity.
6) Summer wind condition

Prepare a simulation report including the following content:

1) Objectives;
2) Building layout;
3) Information of air-conditioner installations including brand, model, dimension, cooling capacity (kW) and installed locations;
4) Modelling methodology;
5) Modelling assumptions;
6) Screen shots of all input parameters;
7) Results including temperature of all air-conditioning units; and
8) Conclusions.

The simulation report should be endorsed by a locally qualified professional with at least 3 years of relevant experience in *CFD* simulation.

Submittals

a) Compliance with Manufacturer's Recommendation

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_6(a)_00	BEAM Plus NB submission template for EU 6a	✓	✓
EU_6(a)_01	Equipment schedules of window and/or split-type air-conditioners	✓	✓
EU_6(a)_02	Schematics showing the location of window and/or split-type air-conditioners	✓	-
EU_6(a)_03	Specifications of air-conditioning units	✓	✓
EU_6(a)_04	Representing manufacture information used to demonstrate the AC platform justification	-	✓
EU_6(a)_05	Layout plans showing the location of window and/or split-type air-conditioners platforms to illustrate that the 3 separation criteria listed can be met	✓	✓
EU_6(a)_06	Catalogue of air-conditioning units	-	✓
EU_6(a)_07	Manufacturer's installation details for the 3 separation criteria listed above	-	✓

b) Performance Verification

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_6(b)_00	BEAM Plus NB submission template for EU 6b	✓	✓
EU_6(b)_01	Simulation report	✓	✓
EU_6(b)_02	CV of the professional as per requirements in the assessment	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

5 Energy Use **5.3 Energy Efficient Equipment**

EU 7 Clothes Drying Facilities

Extent of Application *Residential buildings*

Objective Encourage wider use of natural means in lieu of gas or electricity for clothes drying purposes.

Credits Attainable 1 + 1 BONUS

Credit Requirement

(a) Provision of clothes drying facilities

1 credit for providing permanent clothes drying facilities provision for all residential units under suitable location conditions.

(b) Demonstration of Effectiveness

1 BONUS for demonstrating the effectiveness of permanent clothes drying facilities via computational analysis.

Assessment

(a) Provision of Clothes Drying Facilities

Fulfil below requirements for each permanent clothes drying facilities provision for each dwelling unit:

1. Permanent clothes drying facilities provision that are protected from water droplets and debris falling from higher levels; and

2. Permanent clothes drying facilities provision that are not adversely affected by air pollutants, including smoke, fumes and pollutants emitted from water heaters, cooking exhausts, discharges from air-conditioning units. The facilities provision is required to be located 0.5m horizontal distance away from air-conditioning units and 1.5m horizontal distance away from kitchen exhausts.

(b) Demonstration of Effectiveness

Prepare a computational analysis report with the following contents:

1 Description of the surrounding environment;

2 Building *orientation*;

3 Locations of drying facilities;

4 Methodology of study not limited to the software tools used, assumptions, calculation methods and screenshots of input parameters; and

5 Demonstration of the drying facilities effectiveness by meeting one of the below requirements.

5.1 <u>Sunlight</u>

1 Hours, with 5-minute reporting interval, of direct solar exposure in winter solstice (冬至日)

5.2 Wind

Minimum wind velocity of 0.5m/s. Winter prevailing wind with the highest wind frequency should be used.

The simulation report should be endorsed by a locally qualified professional with 3 years of relevant experience in *CFD* simulation.

Submittals

1. Provision of Clothes Drying Facilities

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_7(a)_00	BEAM Plus NB submission template for EU 7a	✓	✓
EU_7(a)_01	Layout plans to show location of clothes drying facilities with respect to air conditioning plant	✓	✓
EU_7(a)_02	Layout plans to show location of clothes drying facilities with respect to kitchen vents	✓	✓
EU_7(a)_03	Section to demonstrate the falling protections for the cloth drying facilities	✓	✓
EU_7(a)_04	A formal letter of instruction from the developer to require clothes drying facilities	✓	✓
EU_7(a)_05	On-site photo records of installed clothes drying facilities	-	✓

2. Demonstration of Effectiveness

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_7(b)_00	BEAM Plus NB submission template for EU 7b	✓	✓
EU_7(b)_01	CV of the professional as per requirements in the assessment	✓	✓
EU_7(b)_02	Endorsed computational analysis report	✓	✓
EU_7(b)_03	On-site photo records of installed clothes drying facilities	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

5 Energy Use	**5.3**	**Energy Efficient Equipment**
	EU 8	**Energy Efficient Appliances**

Extent of Application

Residential buildings and hotel.

Objective

Encourage the wider use of energy efficient appliances.

Credits Attainable

2

Credit Requirement

1 credit when 60% of total rated power of appliances are certified energy efficient products.

2 credit when 80% of total rated power of appliances are certified energy efficient products.

Assessment

This credit assesses only the appliances provided by the developer.

The electrical appliances covered in this credit include the following items covered by the EMSD Energy Efficiency Labelling [per January 2017 version [1]. In other words, only appliances which are governed by the EMSD Energy Efficiency Labelling will be included in the denominator for percentage calculation.

1) Refrigerating appliances
2) Washing machines
3) Dehumidifiers
4) Electric clothes dryers
5) Electric storage water heaters
6) Television sets
7) Electric rice-cookers
8) Electronic ballasts
9) Induction cookers
10) Microwave ovens
11) Photocopiers
12) Fax machines
13) Multifunction devices
14) Printers
15) LCD monitors
16) Computers
17) Hot / cold bottled water dispensers

Provide a schedule of all electrical appliances including the location, quantity, model and the rated power.

1 Hong Kong Voluntary Energy Efficiency Labelling Scheme (EELS) website [ONLINE] Available at: http://www.emsd.gov.hk/en/energy_efficiency/voluntary_energy_efficiency_labelling_scheme/how_to_apply/index.html [Accessed August 2019]

The appliances should achieve Grade 1 under the Energy Efficiency Labelling scheme [2,3] or USEPA Energy Star Rated [4] or certified under an equivalent labelling scheme.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
EU_08_00	Submission Template	✓	✓
EU_08_01	Schedule of all electrical appliances	✓	✓
EU_08_02	Specifications that demonstrated the control of purchasing energy efficient label for the project	✓	-
EU_08_03	Catalogues of all electrical appliances highlighting the compliance Energy Efficiency Labelling or USEPA Energy Star	-	✓
EU_08_04	Electrical schematic drawing (s) highlighting all electrical efficient appliances	✓	✓
EU_08_05	Justification report for the equivalent label used in the assessment	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

2 Mandatory Energy Efficiency Labelling Scheme [ONLINE] Available at: http://www.emsd.gov.hk/en/energy_efficiency/mandatory_energy_efficiency_labelling_scheme/ [Accessed August 2019]

3 Voluntary Energy Efficiency Labelling Scheme[ONLINE] Available at: http://www.emsd.gov.hk/en/energy_efficiency/voluntary_energy_efficiency_labelling_scheme/ [Accessed August 2019]

4 US Environmental Protection Agency. Energy Star Qualified Products[ONLINE] Available at: https://www.energystar.gov/ [Accessed August 2019]

6	**Water Use**	**6.P**	**Prerequisite**
		6.1	**Water Conservation**
		6.2	**Effluent**
		6.3	**Water Harvesting / Recycling**

Introduction

Water is known to be in scarce supply in many parts of the world. Globally, water shortage is already a major issue. Hong Kong has been enjoying a reliable and economic supply of most of its fresh water needs from the Mainland.

However, with increased industrialisation of Guangdong Province there is likely to be greater competition for water supply in the pearl river region, meaning that water conservation may become a significant issue for Hong Kong in the future. Hong Kong should look into ways to improve the utilisation and conservation of water resources.

6.P Prerequisite — **WU P1 Minimum Water Saving Performance**

Background

In Hong Kong, WSD ensures that the quality of drinking water provided to customers complies fully with the Hong Kong Drinking Water Standards, currently being the corresponding guideline values or provisional guideline values in the fourth edition of the World Health Organization's Guidelines for Drinking-water Quality published in 2011 (WHO Guidelines). Drinking water quality, however, can be affected by the condition of a building's inside service. To safeguard tap water quality, property owners and building managers are advised to carry out proper maintenance of inside service and regular cleaning of water storage tanks. While water quality satisfying WSD's requirement is the mandatory requirement, water conservation is another focus area under water category.

6.1	**Water Conservation**	**WU 1**	**Annual Water Use**
		WU 2	**Water Efficient Irrigation**
		WU 3	**Water Efficient Appliances**
		WU 4	**Water Leakage Detection**
		WU 5	**Twin Tank System**
		WU 6	**Cooling Tower Water**

Background

Despite the continued decline in industrial water consumption there is an annual trend of rising consumption due to increasing domestic consumption. Based on projected population growth, the domestic and service uses, being the key components of our fresh water consumption, are expected to increase. Industrial use, for the same period, is expected to drop because of further decline in water intensive industries. Fresh Water Cooling Tower Scheme (FWCT Scheme) will contribute to consumption by the non-domestic sector.

Water from the Dongjiang River in Guangdong continues to be Hong Kong's main source of supply and accounting for about 70-80 percent of Hong Kong's needs. Hong Kong has limited options to reduce dependency on the Mainland, where water resources are becoming increasingly limited.

There is opportunity to reduce potable water use through better design, management and user awareness.

6.2 Effluent **WU 7 Effluent Discharge to Foul Sewers**

Background While 80% of users in Hong Kong are supplied with seawater for flushing purposes, there are environmental impacts associated with the treatment and delivery of seawater, and the load imposed on municipal sewage treatment plants. Measures taken to reduce volumes of effluent flows have significant environmental benefits.

6.3 Water Harvesting and Recycling **WU 8 Water Harvesting and Recycling**

Background There are opportunities to recycle used water and rain water in order to reduce the use of potable water. Additional benefits of potable water conservation can reduce energy use on transport and treatment of raw water.

6	**Water Use**	**6.P**	**Prerequisite**
		WU P1	**Minimum Water Saving Performance**

Extent of Application All buildings

Objective Reduce the consumption of potable water through the application of water saving devices with proven performance.

Credits Attainable Prerequisite

Credit Requirement Demonstrate that the use of water efficient flow devices leads to an estimated annual saving of 10%.

Assessment Prepare a Potable Water Use Report which should include the following contents:

1) Schedule including the types of fixture with the location and number of each type of fixture
2) Calculation of potable water use following the guidance below
3) Percentage of annual potable water saving

The calculation of potable water use should be based on the following methodology:

1) Users

Specify the number of users, male to female ratio according to the sanitary fitment schedule in the project General Building Plan. If no sanitary fitment schedule is available, use the assumed occupancy ($9m^2$/person) and male to female ratio (1:1).

For projects with accessible toilets, bathrooms and the like, it can be assumed that the rate of users with disability is 8.1% and the non-accessible toilets, bathrooms and the like are used by the remaining 91.9% of the dedicated users [1]

The same number of users should be applied to both the baseline case and the project design case.

2) Operational Days

Specify the number of operational days per annum. Alternatively, assume full year operation (365 days).

The same operational days should be applied to both the baseline case and the project design case.

3) Number of Use, Product Flow Rate and Duration of Use

Establish a baseline case for water consumption by the assumptions outlined in the following table. The calculation should only consider the listed fixtures.

1 Hong Kong Monthly Digest of Statistics (January 2015) Feature Article – Persons with Disabilities and Chronic Diseases in Hong Kong. [ONLINE] Available at: http://www.statistics.gov.hk/pub/B71501FB2015XXXXB0100.pdf. [Accessed August 2019]

Fixture Type	Flow Rate (L/min)	Operation Time (sec)	Number of Use per Occupant per day
Shower (hotel and residential)	12	300	1
Shower (all buildings other than hotel and residential)	12	300	0.1
Non-mixing Type Water Taps (bathrooms and toilets)	4	10	5
Mixing Type Water Taps (bathrooms and toilets)	7	10	5

Establish the project design case and identify the fixture flowrate at 5bar:

If automatic controls such as proximity sensors are used in the project to reduce the operation time, product catalogues are required to substantiate the performance.

The same number of use should be applied to both the baseline case and the project design case.

4) Annual Potable Water Percentage Saving

Add up the total annual potable water use for both baseline and design. The annual potable water percentage saving can be calculated as follow:

$$1 - \frac{\text{Annual potable water use (design)}}{\text{Annual potable water use (baseline)}} \times 100\%$$

For non-*residential buildings*, any fixtures (other than commercial kitchen fixtures) that is not considered in the calculation should demonstrate that the water taps are rated grade 1 by the WSD voluntary Water Efficiency Labelling Scheme.

For *residential buildings*, demonstrate that the water taps in kitchen is rated grade 1 or 2 [2] by the WSD voluntary Water Efficiency Labelling Scheme.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_P1_00	BEAM Plus NB submission template for WU P1	✓	✓
WU_P1_01	WU-P1-1_Form	✓	✓
WU_P1_02	WU-P1-2_Form	✓	✓
WU_P1_03	General Building Plan (GBP) highlighting the sanitary fitting schedule and the male to female ratio	✓	✓
WU_P1_04	Schematic drawing(s) and plumbing layout drawings, highlighting the tanks, pump(s), PRV(s), flow controllers, mPD level, operating pressure per floor, primary piping routes	✓	✓
WU_P1_05	Calculation summary of potable water	✓	✓
WU_P1_06	Specifications of each type of fixture counted in the calculation, including the to substantiate the flow rate values used in the design case	✓	-
WU_P1_07	Catalogues of each type of fixture counted in the calculation, including the flow rate curve and resultant flow rate to substantiate the flow rate values used in design case	-	✓

Remarks

(a) Additional Information

Section 4.1.2 and Appendix VII of 'Guide to Application for Water Supply' and Section 7.3 and 7.4 of 'Technical Requirements for Plumbing Works in Buildings'. [ONLINE] Available at: https://www.wsd.gov.hk/filemanager/en/content_1805/guide-to-application-for-water-supply-e.pdf [August 2018 version]

https://www.wsd.gov.hk/filemanager/en/content_1804/technical-requirements-for-plumbing-works-in-buildings-e.pdf

2 Water Supplies Department - Voluntary Water Efficiency Labelling Scheme. 2017. [ONLINE] Available at: https://www.wsd.gov.hk/en/plumbing-engineering/water-efficiency-labelling-scheme/index.html [Accessed Aug 2019].

[August 2018 version]

(b) Related Credits

WU 1 Annual Water Use awards further achievement in potable water saving.

6 Water Use **6.1 Water Conservation**

WU 1 Annual Water Use

Extent of Application All buildings

Objective To reduce the consumption of potable water through the application of water saving devices that have proven performance and reliability.

Credits Attainable 3 + 1 additional BONUS

Credit Requirement

(a) Further Potable Water Saving

1 to 3 credits for annual water saving by using water efficient flow devices.

Credit(s)	Estimated annual water saving / %
1	20%
2	25%
3	30%

(b) Exemplary Potable Water Saving

1 additional BONUS credit for demonstrating that the use of water efficient flow devices leads to an estimated annual saving of 40%.

Assessment Assessment follows WU P1 Minimum Water Saving Performance.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_01_00	BEAM Plus NB submission template for WU 1	✓	✓
WU_01_01	WU-1-1_Form	✓	✓
WU_01_02	General Building Plan (GBP) highlighting the sanitary fitting schedule and the male to female ratio	✓	✓
WU_01_03	Plumbing schematic drawing (s) and plumbing layout drawings, highlighting the tanks, pump(s), PRV(s), flow controllers, mPD level, operating pressure per floor, primary piping routes	✓	✓
WU_01_04	Calculation summary of potable water	✓	✓
WU_01_05	Specifications of each type of fixture counted in the calculation, including	✓	

	the flow rate curve and working pressures to substantiate the flow rate values used in design case		
WU_01_06	Catalogues of each type of fixture counted in the calculation, including the flow rate curve and working pressure to substantiate the flow rate values used in design case	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

6 Water Use **6.1 Water Conservation**

WU 2 Water Efficient Irrigation

Extent of Application All buildings with permanent greenery and permanent irrigation system.

Objective Reduce the reliance on potable water for irrigation.

Credits Attainable 2 + 1 additional BONUS

Credit Requirement 1 to 2 credits for reducing potable water consumption for irrigation in comparison with the baseline.

Credit(s)	Percentage of reduction of potable water consumption for irrigation
1	25%
2	50%
2 + 1 additional BONUS	100%

Assessment Specify the area of each landscape type making up the total area of greenery in the project. For each landscape type, calculate the annual irrigation demand using the following formula.

$$\mathrm{ID} = \sum_{\text{January}}^{\text{December}} \frac{\mathrm{ET} \times \mathrm{K_L} \times \mathrm{A} \times \mathrm{CE}}{\mathrm{IE}}$$

ID : Annual irrigation demand satisfied by using potable water (L)

ET : Monthly reference evapotranspiration (mm)

K_L : Landscape coefficient of the landscape type

A : Area of the landscape type (m^2)

CE : Efficiency of controller serving the landscape type

IE : Efficiency of irrigation method serving the landscape type

In theory the reference evapotranspiration is correlated to crop coefficient. For calculation, the reference evapotranspiration can be assumed to be equivalent to potential evapotranspiration. The potential evapotranspiration can be found on the Hong Kong Observatory website [1].

Landscape coefficient indicates the volume of water lost via evapotranspiration and is dependent on landscape species, planting density and microclimate factor. For the ease of assessment, the calculation of landscape coefficient is simplified and listed in manual for calculation reference.

Justification is needed for any proposed value.

1 HKO - Monthly Sea Surface Temperature Recorded at North Point and Waglan Island and Monthly Total Evaporation and Potential Evapotranspiration Recorded at King's Park between 1961-1990

Refer to the below table for landscape coefficient. Vertical greenery type should refer to the same table per plant type:

Refer to the below table for irrigation method.

Landscape type	Landscape coefficient (K_L)
Tree	0.5
Shrubs	0.5
Groundcovers	0.5
Mixed (Trees + Shrubs + Groundcovers)	0.6
Turfgrass	0.7
Adaptive Species (No irrigation require)	0

Irrigation method	Irrigation efficiency (IE)
Manual	0.5
Drip – Standard	0.7
Drip – Pressure compensated	0.9
Fixed Spray	0.65
Micro Spray	0.7
Rotor	0.7

Calculate the total Irrigation demand that uses potable water in both baseline and project design cases by the above formula. Sum up the calculated ID(s) for all landscape types. The irrigation demand should cover all permanent greenery in the project. For private garden not under the control of the building management, irrigation demand for the design case should be assumed the same as the baseline case.

1) **Baseline**

The composition of landscape type making up the permanent greenery in the project should be the same as design case.

Assume all landscape types are irrigated manually (i.e. IE = 0.5) and no controller is used (i.e. CE = 1).

Assume no *reused* or recycled water is used.

2) Design

Specify the irrigation method and controller (if used) for each landscape type and calculate the ID correspondingly.

If controllers, including weather-based and moisture sensor-based, are used, the CE should be supported by manufacturer's documentation.

If harvested rainwater or recycled grey water is used to replace potable water for irrigation, the corresponding annual amount of replaced water can be deducted from the irrigation demand. The calculation method of the amount of harvested rainwater and recycled grey water should be consistent with WU 8.

Demonstrate sufficient collection tank (or retention pond) capacity:

2.1 Harvested rainwater: 10 days or more [2] of the month with the peak rainfall (assume 30 days in a month).

2.2 Recycled grey water: 8-10 hours

The percentage reduction in annual irrigation demand that uses potable water can be calculated as follow:

$$1 - \frac{\text{ID (design)}}{\text{ID (baseline)}} \times 100\%$$

Alternatively, if self-sustained plants are used to form all permanent greenery, which do not require irrigation beyond their establishment period (maximum two years), provide justification to explain why no irrigation will be required based on local rainfall and plants' water demands. The justification should be endorsed by a professional landscape architect or ecologist. Two credits can be attained.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_02_00	BEAM Plus NB submission template for WU 2	✓	✓
WU_02_01	WU-2-1_Form	✓	✓
WU_02_02	Calculation of demand of potable water for irrigation in both baseline and project design cases and percentage reduction as detailed in the credit assessment	✓	✓

2 Water Supplies Department, Technical Specifications on Grey water reuse and Rainwater Harvesting [ONLINE] Available at: https://www.wsd.gov.hk/filemanager/en/content_1459/technical_spec_grey_water_reuse_rainwater_harvest.pdf Accessed 05 Aug 2019].

WU_02_03	Greenery plan including the total greenery area (distinguish between communal greenery and private garden if applicable) and an area break-down according to irrigation method or controller used	✓	✓
WU_02_04	Calculation demonstrating sufficient tank (or retention pond) storage capacity	✓	✓
WU_02_05	Plumbing schematic drawing (s) and plumbing layout drawings, highlighting the rainwater harvesting system and the grey water recycling system (if applicable)	✓	✓
WU_02_06	Specifications of controllers (if applicable)	✓	-
WU_02_07	Catalogues of controllers (if applicable)	-	✓
WU_02_08	Justification report for self-sustain plants that require no irrigation beyond their establishment period (Alternative approach)	✓	✓

Remarks

(a) Additional information

None

(b) Related credits

Calculation method of amount of harvested rainwater and recycled grey water should be consistent with WU 8.

6 Water Use **6.1 Water Conservation**

WU 3 Water Efficient Appliances

Extent of Application *Residential buildings*.

Objective Encourage the wider use of water efficient appliances.

Credits Attainable 1

Credit Requirement 1 credit for installing water efficient appliances that achieve Grade 1 under the WSD's Water Efficiency Labelling Scheme.

Assessment This credit assesses only those appliances provided by the developer. No credits will be awarded if no appliances are provided by the developer.

Washing machine should be provided in all residential units and it should be of at least Grade 1 under the WSD Water Efficiency Labelling Scheme (WELS) [1] or other equivalent international scheme. If equivalent international scheme is adopted, justification is required to demonstrate the appliances, certified by a recognised standard, can achieve the same performance as the WELS Grade 1 label.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_03_00	BEAM Plus NB submission template for WU 3	✓	✓
WU_03_01	WU-3-1_Form	✓	✓
WU_03_02	Evidence to demonstrate the appliances certified by a recognised standard, can achieve the same performance as the WELS Grade 1 label	✓	✓

Remarks

(a) Additional Information

Water Supplies Department – Voluntary Water Efficiency Labelling Scheme. 2017. [ONLINE] Available at: https://www.wsd.gov.hk/en/plumbing-engineering/water-efficiency-labelling-scheme/index.html [Accessed Aug 2019].

(b) Related Credits

None

1 Water Supplies Department – Voluntary Water Efficiency Labelling Scheme. 2017. [ONLINE] Available at: https://www.wsd.gov.hk/en/plumbing-engineering/water-efficiency-labelling-scheme/index.html [Accessed Aug 2019].

6 Water Use **6.1 Water Conservation**

WU 4 Water Leakage Detection

Extent of Application All buildings with potable water tank rooms.

Objective To identify water leakage once detected for the arrangement of maintenance work.

Credits Attainable 1

Credit Requirement 1 credit for installing water leakage detection systems in all municipal potable water tank rooms.

Assessment Demonstrate that water leakage detection systems are installed in all municipal potable water tank rooms, including rooms comprising potable water tank, , irrigation tank and cleansing water tank, and flush water tank if using fresh water for flushing.

Water tank rooms, which consists of only non-potable water tank and/ or fire services tank, are not assessed.

Water tank rooms which have multiple water tanks should have at least one leakage detection system.

The detection systems should have the capability to automatically alert the operator or the security guard and identify the room with leakage when leakage occurs.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_04_00	BEAM Plus NB submission template for WU 4	✓	✓
WU_04_01	WU-4-1_Form	✓	✓
WU_04_02	Plumbing schematic drawing(s) and plumbing layout drawings, highlighting the provisions of water leakage detection systems in all water tank rooms	✓	✓
WU_04_03	Commissioning data of water leakage detection systems in all water tank rooms	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

6 Water Use **6.1 Water Conservation**

WU 5 Twin Tank System

Extent of Application All buildings and buildings with centralised/ shared tank that is outside the assessment boundary

Objective To reduce the water wastage during the maintenance or cleaning of the water tanks and provide an uninterrupted potable and flush water supply to building users.

Credits Attainable 1

Credit Requirement 1 credit for providing twin tank for potable water supply system and flushing water supply system.

Assessment Twin tanks are installed for potable and flushing supply water systems for all buildings in the assessment boundary.

Two compartment tank and two separate identical tanks are accepted as twin tank.

Each compartment / tank of the twin-tank shall be equipped with:

1) A duplicated set of inlet, outlet and associated overflow and drainage pipeworks;
2) A stop valve at the inlet of each tank compartment to ensure that water will not get into the compartment when it is being cleaned; and
3) An automatic pump control switch at the downstream side of each sump pump to protect the up-feed system particularly when the stop valve for the tank compartment is closed.

Submittals

Supporting Documents *Please provide below softcopies with filename prefix as indicated on leftmost column*		**PA**	**FA**
WU_5_00	BEAM Plus NB submission template for WU 5	✓	✓
WU_5_01	WU-5-1_Form	✓	✓
WU_5_02	Plumbing schematic drawing (s) and plumbing layout drawings, highlighting the provisions of the twin tank system for potable water and flush water systems	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

6 Water Use

6.1 Water Conservation

WU 6 Cooling Tower Water

Extent of Application

All buildings equipped with cooling tower using potable water as makeup water.

Objective

To reduce potable water consumption for cooling tower makeup.

Credits Attainable

1

Credit Requirement

1 credit for achieving 7 or more cycles of concentration with acceptable water quality.

Assessment

The ratio between the concentration of dissolved solids in the cooling tower and the make-up water should be 7 or more. Demonstrate that the corresponding make-up water pumps can provide sufficient flow rate and pressure to sustain the specified cycle of concentration.

All cooling tower using potable water within the assessment boundary should comply with this requirement.

Submit cooling tower water treatment proposal developed in accordance to the latest EMSD Code of Practice for Fresh Water Cooling Tower [1] to demonstrate minimum cycles of concentration of 7 or more is designed and adopted.

After project completion, submit EMSD Form EE CT3 [2] regarding the cooling water sampling results and the associated water sampling test report to substantiate satisfactory cooling water quality.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_06_00	BEAM Plus NB submission template for WU 6	✓	✓
WU_06_01	WU-6-1_Form	✓	✓
WU_06_02	Water treatment proposal highlighting the design cycles of concentration	-	✓
WU_06_03	Specifications of cooling tower, water treatment equipment and make-up water pumps	✓	

1 Electrical and Mechanical Services Department – Code of Practice for Fresh Water Cooling Towers CoP (FWCT). [ONLINE] Available at: http://www.emsd.gov.hk/en/energy_efficiency/fwct_scheme/publications/index.html. [Accessed August 2019]

2 Electrical and Mechanical Services Department – Fresh Water Cooling Towers Scheme Summary of Operational Information for Cooling Tower Installation. [ONLINE] Available at: http://www.emsd.gov.hk/filemanager/en/content_1058/EMSD_EE_CT3_eng.pdf. [Accessed August 2019]

WU_06_04	Catalogues of cooling tower, water treatment equipment and make-up water pumps	-	✓
WU_06_05	EMSD Form EE CT3 and associated water sampling test report	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

6 Water Use **6.2 Effluent**

WU 7 Effluent Discharge to Foul Sewers

Extent of Application All buildings

Objective To reduce the volumes of sewage discharged from buildings thereby reducing burdens on municipal sewage services and treatment facilities.

Credits Attainable 1

Credit Requirement 1 credit for demonstrating a reduction in annual sewage volumes by 20% or more.

Assessment The **flushing water use report** should include all the following contents:

1) Schedule including the types of fixture, location, number of occupants, daily usage and flushing volumes.

2) Flushing water use calculation following the below guidance

3) Annual effluent discharge reduction percentage

Flushing water use calculation should be based on the followings:

1) Occupancy

Specify the number of users, male to female ratio according to the sanitary fitment schedule in the project General Building Plan. If no sanitary fitment schedule is available, use the assumed occupancy ($9m^2$/person) and male to female ratio (1:1).

For projects with accessible toilets, bathrooms and the like, it can be assumed that the rate of users with disability is 8.1% and the non-accessible toilets, bathrooms and the like are used by the remaining 91.9% of the dedicated users [1].

The same number of users should apply to both the baseline case and the project design case.

2) Operational days

Specify the number of operational days per annum. Alternatively, assume a full year operation (i.e. 365 days).

The same operational days should apply to both the baseline case and the project design case.

3) Number of use

The same number of use should apply to both the baseline case and the project design case.

1 Hong Kong Monthly Digest of Statistics (January 2015) Feature Article – Persons with Disabilities and Chronic Diseases in Hong Kong. [ONLINE] Available at: http://www.statistics.gov.hk/pub/B71501FB2015XXXXB0100.pdf. [Accessed August 2019]

Fixture type	Number of use per day
Male WC Single Flush (non-residential)	1
Male WC Dual Flush (non-residential)	1 full flush volume
Female WC Single Flush (non-residential)	5
Urinal	4
Female WC Dual Flush (non-residential)	1 full and 4 low volume
Single Flush WC (Residential)	5
Dual Flush WC (Residential)	1 full and 4 low volume

4) Flushing Volume

Based on the above, establish a baseline case for flushing water consumption by the following assumptions. While dual flush WC is used, a single flush WC baseline can be adopted.

Fixture type	Flushing volume (L / flush)
Single Flush WC	6.5
Urinal	2.5

Establish the flushing water consumption for the project design case based on the flushing volumes shown in the catalogues and specifications. Note that no pressure calculation is required if worse case condition is considered in reduction calculation.

5) Annual Effluent Discharge Reduction Percentage

The annual flushing water percentage saving can be calculated as follows:

$$1 - \frac{\text{Annual flushing water use (design)}}{\text{Annual flushing water use (baseline)}} \times 100\%$$

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_07_00	BEAM Plus NB submission template for WU 7	✓	✓

WU_07_01	WU-7-1_Form	✓	✓
WU_07_02	General Building Plan (GBP) sanitary fitting schedule and male to female ratio	✓	✓
WU_07_03	Plumbing schematic drawing (s) and plumbing layout drawings, highlighting tanks, pump(s), PRV(s), flow controllers, mPD level, primary piping routes	✓	✓
WU_07_04	BD standard drainage schematic drawing(s) and drainage layout drawings, highlighting the sanitary fitment	✓	✓
WU_07_05	Flushing water use report	✓	✓
WU_07_06	Specifications of each type of fixture illustrating the flush volume per flush	✓	-
WU_07_07	Catalogues of each type of fixture illustrating the flush volume per flush	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

6 Water Use **6.3 Water Harvesting and Recycling**

WU 8 Water Harvesting and Recycling

Extent of Application All buildings

Objective To encourage harvesting of rainwater and recycling of grey water in order to reduce consumption of potable water.

Credits Attainable 2 + 1 BONUS

Credit Requirement

(a) Harvested Rainwater

1 credit for harvesting of rainwater that achieve a reduction of 5% or more in the consumption of potable water.

(b) Recycled Grey Water

1 credit for recycled grey water that achieve a reduction of 5% or more in the consumption of potable water.

(c) Exemplary Water Recycling

1 BONUS credit where harvested rainwater, recycled grey water or a combination of both leads to a reduction of 10% or more in the consumption of potable water.

Assessment

(a) Harvested Rainwater

1.1 <u>Calculation of the monthly harvested rainwater yield</u>

Accepted rainwater sources are from roofs, permeable paving, non-permeable paving and surface runoff from grass and landscaped areas [1]. For each source, calculate the monthly harvested rainwater yield throughout the year using the below formula.

$$Y_r = A_c \text{ x } R_m \text{ x } C_r$$

Yr is the monthly average rainwater yield (litre/month)
Ac is the collection area (m2)
Rm is the monthly mean of rainfall in Hong Kong between 1981-2010 (mm) [2]
Cr is the run-off coefficient

If an in-line filter is installed to the rainwater collection system, a filter efficiency, Nf, should be incorporated into the above equation, which can be assumed to be 0.9.

1 Water Supplies Department – Technical Specifications On Grey Water Reuse And Rainwater Harvesting (1st Edition) May 2015 .[ONLINE] Available at: https://www.wsd.gov.hk/filemanager/en/content_1459/technical_spec_grey_water_reuse_rainwater_harvest.pdf [Accessed Aug 2019].

2 Hong Kong Observatory – Monthly Meteorological Normals for Hong Kong. 2017. [ONLINE] Available at: http://www.hko.gov.hk/cis/normal/1981_2010/normals_e.htm [Accessed August 2019].

Surfaces run off coefficients are provided in manual. Provide supplier's product catalogue to substantiate if other values are used.

Surfaces/ substrates	***Runoff coefficients***
Water bodies	1
Flat roof/ road/ hardscape with impervious construction	0.85
Flat roof covered with pebbles	0.65
Green roof (soil depth of at least 300mm)	0.35
Earth-covered (soil depth not more than 500mm) basement	0.35
Pervious paving and construction (maximum slope of porous pavement surface to a gradient of 1:20; the minimum *permeability coefficient* under 15℃ for permeable paving / construction should be 1.0 x 10-2 cm/s)	0.25
At-grade softscape	0.15
Earth-covered (soil depth more than 500mm) basement	0.15

Note:

1) The above information has made reference to the design guides for stormwater management/runoff control GB50014 and DB11/685 of PRC.

2) Alternative *runoff coefficients* may be proposed and justified by applicants which is subject to approval.

1.2 <u>Calculation of the monthly demand for harvested rainwater</u>

Calculate the monthly demand for harvested rainwater throughout the year which includes only the activities which otherwise would need to consume potable water but is then replaced by harvested rainwater in the project.

Accepted activities include flushing, irrigation volume of water consume by manual irrigation is excluded from the calculation), water features, car washing, external cleaning, fire-fighting and industrial processes.

1.3 Comparison of yield and demand

Compare the total yield and the total demand, month by month, to calculate the amount of potable water replaced by harvested rainwater.

For months when the yield exceeds the demand (i.e. surplus), the amount of replaced potable water is equivalent to the demand. For months when the demand exceeds the yield (i.e. shortage), the amount of replaced potable water is equivalent to the yield.

1.4 Calculation of the annual amount of potable water replaced by harvested rainwater

Add up the replaced water throughout the year to show the annual amount. This is the nominator for the calculation of percentage reduction.

1.5 Calculation of the percentage reduction in potable water use replaced by harvested rainwater

The denominator should at least include the annual potable water use for irrigation and flushing (figures should be consistent with WU 1 design case and WU 2 design case, excluding manual irrigation; *reused* and recycled water are not considered in the calculation.), and, only if harvested rainwater is used for the activity, the annual potable water use for water features, car washing, external cleaning, fire-fighting and industrial processes.

1.6 Sufficient tank storage capacity

Demonstrate the collection tank(s) (or retention pond) has sufficient capacity.

Harvested rainwater: 10 days or more [3] of the month with the peak rainfall (assume 30 days in a month).

1.7 Water quality standards

Demonstrate the harvested rainwater, after treatment, meet the recommended water quality standards prescribed in in the WSD Technical Specifications [4].

3 Water Supplies Department, Technical Specifications on Grey water reuse and Rainwater Harvesting [ONLINE] Available at: http://www.wsd.gov.hk/filemanager/en/content_1081/technical_spec_grey_water_reuse_rainwater_harvest.pdf [Accessed 05 July 2017].

4 Water Supplies Department – Technical Specifications On Grey Water Reuse And Rainwater Harvesting (1st Edition) May 2015. [ONLINE] Available at: http://www.wsd.gov.hk/filemanager/en/content_1081/technical_spec_grey_water_reuse_rainwater_harvest.pdf. [Accessed 05 July 2017].

(b) Recycled Grey Water

2.1 Calculation of the monthly recycled greywater yield

Accepted grey water sources are wash basins, baths, showers, dishwashers, laundry machines, kitchen sinks, cooling tower bleed-off water and air conditioning condense [5].

Follow the calculation method specified in Section 3.4 in WSD Technical Specifications On Grey Water *Reuse* And Rainwater Harvesting [7]. Provide further calculation for air conditioning condense.

2.2 Calculation of the monthly demand for recycled greywater yield

Calculate the monthly demand for recycled grey water throughout the year which includes only the activities which originally would have used potable water but is then replaced by recycled greywater in the project.

Accepted activities include flushing, irrigation (excluding manual irrigation), water features, car washing, external cleaning, fire-fighting and industrial processes.

2.3 Comparison of yield and demand

Compare the yield and the demand, month by month, to calculate the amount of potable water replaced by recycled greywater.

For months when the yield exceeds the demand (i.e. surplus), the amount of replaced potable water is equivalent to the demand. For months when the demand exceeds the yield (i.e. shortage), the amount of replaced potable water is equivalent to the yield.

2.4 Calculation of the annual amount of potable water replaced by recycled greywater

Add up the replaced water throughout the year to show the annual amount. This is the nominator for the calculation of percentage reduction.

2.5 Calculation of the percentage reduction in potable water use replaced by recycled greywater

The denominator should at least include the annual potable water use for irrigation and flushing. The figures should be consistent to: WU 2 design case, excluding manual irrigation, and should be consistent to WU 1 design case, without deducting any *reused* / recycled water. Only if recycled greywater is used for the activity, the annual potable water use

5 Water Supplies Department – Technical Specifications On Grey Water Reuse And Rainwater Harvesting (1st Edition) May 2015. [ONLINE] Available at: https://www.wsd.gov.hk/filemanager/en/content_1459/technical_spec_grey_water_reuse_rainwater_harvest.pdf [Accessed Aug 2019].

for water features, car washing, external cleaning, fire-fighting and industrial processes.

2.6 Sufficient tank storage capacity

Demonstrate the collection tank(s) has sufficient capacity.

Recycled grey water: 8-10 hours

2.7 Water quality standards

Demonstrate the recycled grey water, after treatment, meet the recommended water quality standards prescribed in Table 1-1 in the WSD Technical Specifications [6].

(c) Exemplary Water Recycling

In additional to the requirements stipulated in parts (a) and (b), demonstrate that harvested rainwater, recycled grey water or a combination of both leads to a reduction of 10% or more in the consumption of potable water.

6 Water Supplies Department, Technical Specifications on Grey water reuse and Rainwater Harvesting [ONLINE] Available at: https://www.wsd.gov.hk/filemanager/en/content_1459/technical_spec_grey_water_reuse_rainwater_harvest.pdf Accessed Aug 2019].

Submittals

(a) Harvested Rainwater

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_8a_00	BEAM Plus NB submission template for WU 8a	✓	✓
WU_8a_01	WU-8-1_Form	✓	✓
WU_8a_02	WU-8-2_Form	✓	✓
WU_8a_03	Calculation of reduction in demand of potable water from rainwater harvesting system	✓	✓
WU_8a_04	Landscape plan including the total landscape area (distinguish between communal greenery and private garden if applicable) and area break-down according to irrigation method or controller used	✓	✓
WU_8a_05	Catchment area plan including area break-down, type of surface and surface coefficient adopted	✓	✓
WU_8a_06	Plumbing schematic drawing (s) and plumbing layout drawings	✓	✓
WU_8a_07	Rainwater harvesting system schematic drawing(s)	✓	✓
WU_8a_08	Commissioning data of rainwater systems	-	✓
WU_8a_09	Water quality measurement protocol	✓	✓
WU_8a_010	Water quality measurement report	-	✓

(b) Recycled Grey Water

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_8b_00	BEAM Plus NB submission template for WU 8b	✓	✓
WU_8b_01	WU-8-3_Form	✓	✓

WU_8b_02	WU-8-4_Form	✓	✓
WU_8b_03	Calculation of reduction in demand of potable water from grey water system	✓	✓
WU_8b_04	Plumbing schematic drawing (s) and plumbing layout drawings, highlighting the grey water recycling system	✓	✓
WU_8b_05	Commissioning data of grey water systems	-	✓
WU_8b_06	Water quality measurement protocol	✓	✓
WU_8b_07	Water quality measurement report	-	✓

(c) Exemplary Water Recycling

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
WU_8c_00	BEAM Plus NB submission template for WU 8c	✓	✓
WU_8c_01	WU-8-1_Form	✓	✓
WU_8c_02	WU-8-2_Form	✓	✓
WU_8c_03	WU-8-3_Form	✓	✓
WU_8c_04	WU-8-4_Form	✓	✓
WU_8c_05	Calculation of reduction in demand of potable water from rainwater harvesting system	✓	✓
WU_8c_06	Landscape plan including the total landscape area (distinguish between communal greenery and private garden if applicable) and area break-down according to irrigation method or controller used	✓	✓
WU_8c_07	Catchment area plan including area break-down, type of surface and surface coefficient adopted	✓	✓
WU_8c_08	Calculation of reduction in demand of potable water from grey water system	✓	✓
WU_8c_09	Plumbing schematic drawing (s) and plumbing layout drawings, highlighting the rainwater harvesting	✓	✓

	system and the grey water recycling system (if applicable)		
WU_8c_10	Commissioning data of rainwater and grey water systems	-	✓
WU_8c_11	Water quality measurement protocol	✓	✓
WU_8c_12	Water quality measurement report	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

Calculation method of amount of potable water should be consistent with WU 1

Calculation method of amount of irrigation demand should be consistent with WU 2.

7	**Health and Wellbeing**	**7.P**	**Prerequisite**
		7.1	**Design for Green Living**
		7.2	**Inclusive Design**
		7.3	**Indoor Environmental Quality**

Introduction

This section of BEAM Plus considers the broader perspectives of sustainable buildings as well as the building occupants' health and wellbeing. The broader sustainable issues include provisions of hygiene and amenities maintenance provided in the building, which have impact on the quality of working and living environments. Indoor environmental quality (IEQ) includes indoor air quality and ventilation provisions that safeguard health. Considerations of these issues, as well as thermal comfort, lighting, acoustics and noise, impact on well-being, comfort and productivity.

7.P Prerequisite

HWB P1 Minimum Ventilation Performance

Background

This requirement ensures that ventilation systems of the premises have been designed according to recognised procedures to provide a minimum ventilation of sufficient quality and quantity.

7.1 Design for Green Living

HWB 1 Healthy and Active Living

HWB 2 Biophilic Design

Background

Biophilic design provides users constant interaction with living things and natural surroundings to nurture the innate human-nature connection and to address human psychological need to be around life and life-like processes. Design features and amenities, e.g. pedestrian amenities and stairs promotion, can facilitate more healthy and active living.

7.2 Inclusive Design

HWB 3 Inclusive Design

Background

Designs that allow users to enjoy spaces safely, easily and with dignity, and ensure efficient services to meet their needs, etc. They enhance the quality and efficiency of built environments and thereby ensure buildings to be more sustainable.

7.3 Indoor Environmental Quality

HWB 4 Enhanced Ventilation

HWB 5 Waste Odour Control

HWB 6 Acoustic and Noise

HWB 7 Indoor Vibration

HWB 8 Indoor Air Quality

HWB 9 Thermal Comfort

HWB 10 Artificial Lighting

HWB 11 Daylight

HWB 12 Biological Contamination

Given that on average people in Hong Kong spend around 85% of their time indoors, indoor environmental conditions have a significant impact on

the quality of life. Buildings should provide safe, healthy, convenient and efficient indoor spaces. Poor indoor environments in commercial and institutional buildings can impact on productivity and may pose health risks to users. The design, management, operation and maintenance of buildings should seek to provide a good quality indoor environment, but with optimum use of energy and other resources.

7	**Health and Wellbeing**	**7.P**	**Prerequisite**

HWB P1 Minimum Ventilation Performance

Extent of Application

All buildings

Objective

Assess the quality of on-site outdoor air and demonstrate that a minimum quantity of outdoor air is supplied to all normally occupied spaces in the project in order to safeguard the health and comfort of building users.

Credits Attainable

Prerequisite

Credit Requirement

(a) Measure outdoor air pollutants on-site prior to building design to understand the *site* conditions.

(b) Demonstrate the project is in compliance with the minimum ventilation quantity with respective to its designed ventilation mode.

Assessment

(a) On-site Outdoor Air Quality

Engage an IAQ certified issuing body [1] to measure the quality of outdoor air. Measurements should be taken for the following outdoor air pollutants:

1) Carbon monoxide (CO)
2) Nitrogen dioxide (NO_2)
3) Ozone (O_3); and
4) Respirable suspended particulates (PM_{10})

Report from accredited inspection bodies for indoor air quality inspection is acceptable.

<u>One sample</u> should be taken at the centre of the *site*. If emission sources, which are under operation by the time the measurement is taken, are present in the immediate surroundings of the project *site*, additional samples should be taking at locations facing the sources. The examples of emission sources can be found in the EPD's website [2].

Representative locations are acceptable if there is accessibility issue. 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

1 IAQ Certificate Issuing Body Accreditation [ONLINE] Available at https://www.iaq.gov.hk/en/iaq-certification-scheme/certificate-issuing-body-accreditation.aspx [Accessed Aug 2019].

2 Environmental Protection Department – Hong Kong Air Pollutant Emission Inventory, 2017. [ONLINE] Available at: http://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission_inve.html [Accessed August 2019].

information only. The measurement results should be acknowledged receipt by the representative of the project owner.

Parameter	8-hour average acceptance limit [3]
Carbon monoxide (CO)	<7,000 μg/m^3 or <6.1 ppmv
Nitrogen dioxide (NO_2)	<150 μg/m^3 or <80 ppbv Plus [1-hour] <200 μg/m^3 or <106 ppbv
Ozone (O_3)	<120 μg/m^3 or <61 ppbv
Respirable suspended particulate (PM_{10})	<100 μg/m^3

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 time-slots) is also accepted.

(b) Minimum ventilation

Prepare a schedule of all spaces present in the building. Categorise the spaces into normally occupied, not normally occupied and unoccupied according to the space type matrix in Appendix 9 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>Mechanical Ventilation Spaces</u>

Provide a report demonstrating compliance with the minimum ventilation rate stipulated in ASHRAE Standard 62.1-2016 [4] in all *normally occupied spaces*.

2. <u>Natural Ventilation Spaces</u>

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

3 Environmental Protection Department – IAQ Certification Scheme. [ONLINE] Available at: http://www.iaq.gov.hk/en/iaq-certification-scheme.aspx [Accessed in August 2019

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

Prescriptive path

For *residential buildings*:

For *normally occupied spaces*, the total area of the windows / primary openings provided in each space is not less than 7% of the floor area of the space. Refer to Cap. 123F Building (Planning) Regulations [5] for the requirements for windows or PNAP APP 130 [6] for the definition of primary openings.

If acoustic window is implemented, full window area could be accounted in the calculation.

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 non-*residential buildings*:

Provide a report demonstrating compliance with section 6.4 Natural Ventilation Procedure stipulated in ASHRAE Standard 62.1-2016 in all *normally occupied spaces*.

Performance path – for project cannot achieve through prescriptive method

For *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) in Building (Planning) Regulation is 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].

5 Building (Planning) Regulations Cap, 123. Hong Kong e-Legislation. [ONLINE] Available at: https://www.elegislation.gov.hk/hk/cap123F [Accessed August 2019].

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 Aug 2019].

7 Site Wind Availability System. 2017. [ONLINE] Available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html. [Accessed August 2019].

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.

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];

ii. 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:

1) Summary of naturally ventilated spaces highlighting compliance

2) All assumptions made

3) Methodology

4) 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.

Submittals

(a) On-site Outdoor Air Quality

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_P1a_00	BEAM Plus NB submission template for HWB P1a	✓	✓
HWB_P1a_01	HWB-P1-1_Form	✓	✓

9 Lands Department - Survey and Mapping Office - GIS Projects Section. 2017. Survey and Mapping Office - GIS Projects Section. [ONLINE] Available at: http://www.landsd.gov.hk/mapping/en/lic/lic_gis.htm. [Accessed August 2019].

HWB_P1a_02	Rectifying plan describing the design of air purification strategies if air quality is not achieved	✓	-
HWB_P1a_03	HKIAS endorsed report showing measurements of all required outdoor air pollutants	✓	-

(b) Minimum Ventilation

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_P01_00	BEAM Plus NB submission template for HWB P1b	✓	✓
HWB_P01_01	HWB-P1-2_Form	✓	✓
HWB_P01b_02	Schedule of all spaces present in the building	✓	✓
HWB_P01b_03	Report demonstrating compliance with the minimum ventilation rate stipulated in ASHRAE Standard 62.1-2016 in all mechanically ventilated *normally occupied spaces*	✓	✓
HWB_P01b_04	MVAC fan schedule, air side schematics	✓	✓
HWB_P01b_05	MVAC layout plan	-	✓
HWB_P01b_06	Floor plan highlighting primary openings location that provided in all naturally ventilated normally occupied rooms (applicable to natural ventilation prescriptive path only)	✓	✓
HWB_P01b_07	Window Schedule and primary openings information that provided in all naturally ventilated normally occupied rooms (applicable to natural ventilation prescriptive path only)	✓	✓
HWB_P01b_08	Calculation of ratio of the total area of the primary openings provided in the room to the floor area of the room (applicable to	✓	✓

	natural ventilation prescriptive path only)		
HWB_P01b_09	Natural ventilation report (applicable to natural ventilation performance path only)	✓	✓
HWB_P01b_10	CV of the professional as per requirements in the assessment (for performance path only)	✓	✓

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.html. [Accessed August 2019].

(b) Related Credits

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 selecting 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.

7 Health and Wellbeing 7.1 Design for Green Living

HWB 1 Healthy and Active Living

Extent of Application Indoor / semi-outdoor communal areas of building development.

Objective To encourage designing building environment for healthy and active living by improving living and / or working experience of building users and integrating physical activities in the design for an active lifestyle.

Credits Attainable 1 BONUS

Credit Requirement 1 BONUS credit for scoring at least 3 items of all applicable design measures for healthy and active living.

Assessment Provide a report demonstrating compliance of at least 3 of all relevant applicable design measures for healthy and active living as listed below, item (1) to (4):

<u>Improving living and / or working experience of communal use by building occupants</u>

1) Integration of public art in indoor communal areas at the building main entrance and core circulation lobbies at main access level to have at least one artwork respectively. The public artwork should be of scale reasonably proportional to space/ venue it locates. A narrative or infographics of the art piece should also be available for users and visitors.

<u>Integrating physical activities in the design for an active lifestyle</u>

2) Install way-finding signage and/ or info graphics at point-of-decision to encourage stair use (at least one at the building main entrance and all core circulation lobbies with lift provisions).
3) Install at least one (1) circulation stair in communal area meeting the following requirements:
   - Riser to be not more than 150mm and tread to be at least 300mm;
   - Individual flight of stair not to exceed 1800mm nor a total of more than 12 risers;
   - Placed visually before lifts upon entering the building main entrance,
   - Connecting at least three (3) storeys; and
   - Stair width to be at least 1350mm.
4) Install at least one (1) provision for physical activities in communal areas, for example exercise stations, jogging tracks, cycling etc.

Additional or alternative design features may be included. Justification on achievement in credit objectives should be demonstrated. Such proposed design feature will be taken as one of the total applicable design measures in denominator calculation.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_01_00	BEAM Plus NB submission template for HWB 1	✓	✓
HWB_01_01	Summary table, with design measures and/or amenity features provided, percentage achieved	✓	✓
HWB_01_02	Specifications of the design measures	✓	-
HWB_01_03	Drawings showing design measures and/or amenity features	✓	✓
HWB_01_04	Report showing justifications and details for each design measures and/or amenity features provided	-	✓
HWB_01_05	Catalogues/ information of design measures provided OR Photograph	-	✓

Remarks

(a) Additional Information

None.

(b) Related Credits

SS 1 Pedestrian-oriented and Low Carbon Transport

The related credit promotes providing cycling facilities within the *Site* and integrating with the public cycling network if a public cycling network exists or has been planned nearby. Changing/ shower facilities for non-*residential building*s are required to achieve the credit.

SS 2 Neighbourhood Amenities

The related credit encourages building developments to have adequate amenities for its users within or in the vicinity of the *Site*. When relevant amenities are counted in SS 2a, they would not be applicable for HWB 2.

7 Health and Wellbeing **7.1 Design for Green Living**

HWB 2 Biophilic Design

Extent of Application All buildings

Objective To encourage building occupants to have constant interaction with living things and natural surroundings to nurture the innate human-nature connection and to address human psychological need to be around life and life-like processes.

Credits Attainable 1 BONUS + 1 additional BONUS

Credit Requirement 1 BONUS credit for demonstrating visual connection with nature and/ or *biophilic design* features at an assessment space with Visual Quality Score of 2 or above.

1 additional BONUS credit for demonstrating visual connection with nature and/ or *biophilic design* features at an assessment space with Visual Quality Score of 3 or above.

Assessment

1. Visual Quality (VQ) can be described by identifying the inherent characteristics and attributes of the surrounding environment. This includes the identification of elements that have both positive and negative contributions.
2. The Visual Quality Study under this credit should address the visual connection with nature and/or *biophilic design* features at an assessment space meeting the following requirements.
3. The assessment space chosen shall be a *normally occupied space* with highest occupancy within the development. If *biophilic design* is not practical for the *normally occupied space* with the highest occupancy due to particular operational requirements, the Applicant can provide evidence to justify the difficulty and propose the use of the *normally occupied space* of the second highest occupancy for the assessment.
4. A demarcation plan of the *normally occupied spaces* for assessment and the justification of the highest occupancy within the development based on relevant building codes shall be provided.
5. Images taken from the viewpoints should be analysed based on a weighting factor of 1 to 5 to indicate the quality of the view. The weighting factors are listed in the following table:

Table HWB 2-1

Weighting factor	Representation	Visual connection to nature and/ or *biophilic design* features
5	Outstanding	Natural terrain; waterfront; extensive outdoor greenery with deciduous trees, seasonal flowers and/or native plants providing local fauna, including birds and butterflies with appropriate food sources and habitats

4	Excellent	Outdoor planting; sky
3	Good	Indoor planting
2	Fair	Biomorphic forms & patterns; nature presented by digital medium, drawings or other visual means
1	insignificant	No visual connection to the above

6. Projection Path

The Applicant shall produce images from the viewpoints by graphical software at PA stage and produce images from single lens camera at FA stage. The specification for camera is listed in point 7.2;

OR

7. Simulation Path

The Applicant shall produce images from the viewpoints using viewpoint in 3D model at PA stage and single lens camera at FA stage. The specifications for camera or 3D model are as follows:

7.1 Viewpoint in 3D Model at PA stage:

Option 1:

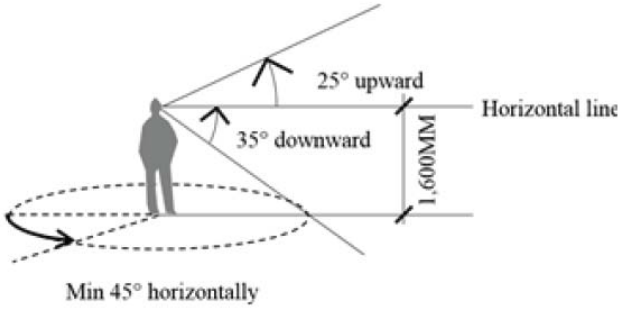
Vertical elevation of camera for viewpoints in 3D model	1,600mm above ground/ finished floor
Vertical upward angle	25°
Vertical downward angle	35°

Option 2:

Vertical elevation of camera for viewpoints in 3D model	1,600mm above ground/ finished floor
Equivalent lens focal length or focal length	27mm

7.2 Single Lens Camera at FA stage:

Vertical elevation of camera	1,600mm above ground/ finished floor
Equivalent lens focal length or focal length	27mm
Aspect Ratio	3:2



7.3 Important notes:

1) No fisheye or image distortion before or after picture taking; and

2) No zooming or pan function shall be used.

7.4 Number and location of viewpoints:

1) A minimum of ONE viewpoint shall be placed within the selected assessment space, and

2) The viewpoint should be appropriately located at the centre of the assessment space (for space of irregular shape, the space shall be subdivided into various notional portions for respective $VQS_{portion}$ calculations and the $VQS_{portion}$ of various portions shall be area-weighted based on their areas to compute the overall VQS of the assessment space).

7.5 Number of Frames:

1) A series of frames from 3 different directions at 45° interval should be taken using landscape *orientation*.

7.6 Methodology:

1) For each frame, assign weighting factors from 1 to 5 to different portions of the frame depending on the quality of the view;

2) Calculate the Visual Quality Score of the frame using Area Weighting Methodology;

3) Repeat the process for each frame; and

4) Calculate the average Visual Quality Score for the viewpoint.

7.7 Primary Tools:

1) 3D model using any appropriate 3D visualisation software at PA stage

2) Physical photographs taken from the *site* at FA stage

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_02_00	BEAM Plus NB submission template for HWB 2	✓	✓
HWB_02_01	Visual quality study report	✓	-
HWB_02_02	Visual quality study report (photographic evidence)	-	✓

Remarks

(a) Additional Information

14 Patterns of *Biophilic Design*. Terrapin Bright Green. [ONLINE] Available at: https://www.terrapinbrightgreen.com/report/14-patterns/ [Accessed August 2019]

Biophilic Design Case Studies. Terrapin Bright Green. [ONLINE] Available at: https://www.terrapinbrightgreen.com/report/biophilic-design-case-studies/ [Accessed August 2019]

Kaplan, R and Kaplan, S, 1989, "The Experience of Nature: A Psychological Perspective", Cambridge, University Press: Cambridge, UK.

Kellert, S.R., Heerwagen, J., Mador, M., Eds., 2008, "*Biophilic Design* - The Theory, Science, and Practice of Bringing Buildings to Life", Wiley: Hoboken, NJ, USA.

Wilson, E.O. 1984, "Biophilia", Harvard University Press: Cambridge, MA, USA.

(b) Related Credits

SS P1 Minimum Landscaping Requirements
The related prerequisite requires minimum *site* coverage of greenery and minimum provisions for viability of planting, for example, the minimum soil volumes and depths for all plant areas.

SS 2 Neighbourhood Amenities
The related credit encourages building developments to have adequate amenities for its users within or in the vicinity of the *Site*. When relevant amenities are counted in SA 2a, they would not be applicable for HWB 2.

SS 7 Biodiversity
The related credit encourages strategies to preserve and/or enhance the ecological value of the *site* in terms of habitat and biodiversity.

SS 8 Urban Heat Island Mitigation
The related credit encourages higher overall *site* coverage of greenery.

HWB 1 Healthy and Active Living
The related credit encourages urban farm as a means to improve the living and / or working experience of building occupants.

7 Health and Wellbeing 7.2 Inclusive Design

HWB 3 Inclusive Design

Extent of Application All buildings

Objective Encourage well integrated weather protection and user-friendliness in the building design for outdoor or semi-outdoor communal / private space design at various levels of a building.

Credits Attainable 1 + 1 BONUS

Credit Requirement

(a) Universal Accessibility

1 credit for providing at least ten (10) applicable enhanced provisions as stipulated in the "Recommended Design Requirements" of BFA 2008.

(b) Weather Protection and Family Friendly Features

1 BONUS credit for providing prescribed weather protection and at least two (2) family friendly facilities features.

Assessment

(a) Universal Accessibility

Provide a report detailing at least ten (10) applicable enhanced provisions as stipulated in the "Recommended Design Requirements" of BFA 2008" [1].

(b) Weather Protection & Family Friendly Facilities

Provide weather protection features against wind-driven rain for all covered semi-outdoor communal areas within the building, allowing a minimum width of 2 m protected zone from driving rain.

Minimum driving rain angles (MRA) from edges of rain protection features shall be calculated based on the following equation:

$$MRA = \tan^{-1} (u / 4.5\, I^{0.107})$$

Where,

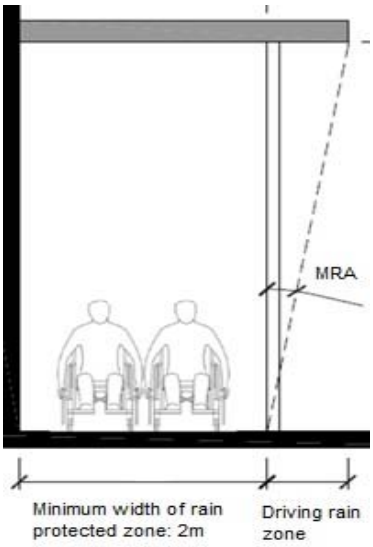
u = Hourly mean wind speed affecting the rain (m/s)

I = Intensity of rainfall (mm/hr)

A default figure of 30 mm/hr is taken as the hourly rainfall intensity under heavy rain conditions (Hong Kong Observatory defines "heavy rain days" as days with hourly rainfall greater than 30 mm).

1 Buildings Department – Design Manual - Barrier Free Access 2008 – Codes of Practice and Design Manuals http://www.bd.gov.hk/english/documents/code/e_bfa2008.htm. [Accessed August 2019].

Wind speed can be determined from the wind profile diagram available at PlanD's *Site* Wind Data webpage [2]. For a semi-external communal space facing a certain *orientation*, the wind profile for that *orientation* at its proposed location (height above ground) shall be used.



Family Friendly Facilities:

1) At least one shaded rest areas with seating for care-takers near play equipment for children. This accounts for 1 inclusive design feature.
2) At least one water closet for children or family in each male and female or stand-alone toilet with seat height in the range of 310 mm to 380 mm for communal use. This accounts for 1 inclusive design feature.
3) At least one baby-care facilities / breast feeding room in the communal areas of the building. This accounts for 1 inclusive design feature.

Additional or alternative inclusive design features may be included, which achievement in credit objectives should be demonstrated.

Submittals

(a) Universal Accessibility

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_03_00	BEAM Plus NB submission template for HWB 3	✓	✓
HWB_03a_01	Specifications specifying the design measures	✓	-

2 Planning Department – Site Wind Availability Data. 2017. [ONLINE] Available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html. [Accessed August 2019].

HWB_03a_02	Drawings showing design measures and/or amenity features	✓	✓
HWB_03a_03	Report showing justifications and details for each design measures and/or amenity features provided	✓	✓
HWB_03a_04	Catalogues/ information of design measures provided OR Photograph	-	✓

(b) Weather Protection & Family Friendly Facilities

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_03_00	BEAM Plus NB submission template for HWB 3	✓	✓
HWB_03b_01	Specification specifying the design measures	✓	-
HWB_03b_02	Drawings showing design measures and/or amenity features	✓	✓
HWB_03b_03	Report showing justifications and details for each design measures and/or amenity features provided	✓	✓
HWB_03b_04	Catalogues/ information of design measures provided OR Photograph	-	✓

Remarks

(a) Additional Information

Chand, Bhargava, Estimation of Angle of Deflection of Rain at Driving Rain Prone Stations in India, 2005.

Sagadashvili, Methods of Processing Meteorological Observational Data for Assessment of Driving Rain Parameters, Proceedings of the Symposium on Building Climatology, Moscow, 619 – 629, 1982.

Building Departments, PNAP ADV-32, Provision of Babycare Rooms in *Commercial Buildings*. [ONLINE] Available at: https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/ADV/ADV032.pdf [Accessed Aug 2019]

(b) Related Credits

SS 1 Pedestrian-oriented and Low Carbon Transport

The related credit promotes convenient and barrier-free pedestrian environment in *site* planning of the outdoor spaces.

7 Health and Wellbeing 7.3 Indoor Environmental Quality

HWB 4 Enhanced Ventilation

Extent of Application All buildings

Objective 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 credit for demonstrating that all *normally occupied spaces* in the building are provided with increased ventilation.

1.2 Fresh air provision in *not normally occupied spaces*

1 credit for demonstrating that all not *normally occupied spaces* in the building are provided with adequate ventilation.

1.3 On-site measurements

1 additional BONUS credit for conducting on-site measurements to verify the ventilation performance for all *normally occupied spaces.*

(b) Exhaust Air

1 credit for the provision of an effective ventilation system for spaces where significant indoor pollution sources are generated.

Assessment

(a) Fresh Air Provision

Prepare a schedule of all spaces present in the building. Categorise the spaces into normally occupied, not normally occupied and unoccupied according to the space type matrix in Appendix 9 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.

1.1 Fresh air provision in *normally occupied spaces*

Demonstrate compliance with the below criteria.

1.1.1 Mechanical ventilation spaces

Provide a report demonstrating compliance with the minimum ventilation rates stipulated in ASHRAE Standard 62.1-2016 [1] in all *normally occupied spaces* is exceeded by at least 30%.

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

1.1.2 Natural ventilation spaces

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

a) Prescriptive path

1. For *residential buildings*:

For *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. Refer to Cap. 123F Building (Planning) Regulations for the requirements for windows or PNAP APP 130 [2] for the definition of primary openings.

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.

2. For non-*residential buildings*:

For *normally occupied spaces*, the openable area should be not less than 5.2% (exceed 4%, as stipulated in ASHRAE 62.1 – 2016 Section 6.4.2, by 30%) of the net occupiable floor area.

b) Performance path

For *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 [3] 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 [4].

---

2 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 Aug 2019].

3 Site Wind Availability System. 2017. [ONLINE] Available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html. [Accessed August 2019].

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

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;

ii. 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 content:

i. Summary of naturally ventilated spaces highlighting compliance

ii. All assumptions made

iii. Methodology

iv. 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.

1.2 Fresh air provision in not normally occupied spaces

1.2.1 Mechanical ventilation spaces

Demonstrate compliance with the minimum ventilation rates stipulated in ASHRAE Standard 62.1-2016 in all not *normally occupied spaces*.

1.2.2 Natural ventilation spaces

Demonstrate the ventilation rates in all not *normally occupied spaces* meets 1.7 ACH. Methodology should follow the performance route for part (a) (1).

1.3 On-site measurements

BONUS credit will be granted only if the credits in part (a) 1.1 have been achieved.

Prepare a measurement methodology which includes the proposed measurement locations and methodology.

1.3.1 Mechanical ventilation 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 followings:

a) ASHRAE 111 [3]; **OR**
b) Tracer gas techniques in accordance with ASTM E 741[4]

At least one sampling point should be present in each *normally occupied space* usage.

If the measurement results demonstrate unmet requirement in part (a) 1.1, the credit in both part (a) (1.1) and part (a) (1.3) will be not be awarded

1.3.2 Natural ventilation spaces

Demonstrate, by measurement, the design ACH is achieved. 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 *normally occupied space* type. For each *normally occupied space* usage, the sampling locations should cover all *orientation*s and low, mid and high floors.

If the measurement results demonstrate unmet requirement in part (a) (1.1), the credit in both part (a) (1.1) and part (a) (1.3) will be not be awarded.

(b) Exhaust air

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. ASHARE Standard 62.1 – 2016 and CIBSE Guide B 2016 [5] are accepted references for this credit. Justification is needed for other references

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

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

5 Chartered Institute of Building Services Engineers – CIBSE Guide B Heating, Ventilating, Air Conditioning and Refrigeration 2016.

Submit exhaust air rate calculation demonstrating the compliance of design criteria and equipment specifications.

Submittals

(a) Fresh Air Provision

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_4_00	BEAM Plus NB submission template for HWB 4a	✓	✓
HWB_4a_01	HWB-4-1_Form	✓	✓
HWB_4a_02	HWB-4-2_Form	✓	✓
HWB_4a_03	HWB-4-3_Form	✓	✓
HWB_4a_04	Schedule of all spaces present in the building	✓	✓
HWB_4a_05	Mechanical Ventilation Report (Applicable to parts 1.1 and 1.2)	✓	✓
HWB_4a_06	Natural Ventilation Report (Applicable to parts 1.1 and 1.2)	✓	✓
HWB_4a_07	CV of the professional as per requirements in the assessment (Applicable to parts 1.1 and 1.2)	✓	✓
HWB_4a_08	MVAC fan schedule and air side schematics (Applicable to parts 1.1 and 1.2)	✓	✓
	MVAC equipment catalogue	-	✓
HWB_4a_09	MVAC layout plan	-	✓
HWB_4a_10	Testing and commissioning reports (Applicable to parts 1.1 and 1.2)	-	✓
HWB_4a_11	Measurement methodology (Applicable to part 1.3)	✓	✓
HWB_4a_12	Measurement results (Applicable to part 1.3)	-	✓

(b) Exhaust Air

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_4_00	BEAM Plus NB submission template for HWB 4b	✓	✓
HWB_4b_01	HWB-4-4_Form	✓	✓
HWB_4b_02	Schedule of all spaces present in the building	✓	✓
HWB_4b_03	Schedule of all spaces provided with local exhaust, highlighting the exhaust rate	✓	✓
HWB_4b_04	Design criteria reference	✓	✓
HWB_4b_05	MVAC fan schedule and air side schematics	✓	✓
	MVAC equipment catalogue	-	✓
HWB_4b_06	MVAC layout plan	-	✓
HWB_4b_07	Testing and commissioning reports	-	✓
HWB_4b_08	Dated photographs for all installed equipment	-	✓
HWB_4b_09	Measurement methodology (if applicable)	✓	✓
HWB_4b_10	Measurement results (if applicable)	-	✓

Remarks

(a) Additional Information

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

http://www.who.int/sustainable-development/housing/strategies/natural-ventilation/en/. [Accessed August 2019]

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

https://www.wbdg.org/resources/natural-ventilation. [Accessed August 2019]

(b) Related Credits

EU 2 Reduction CO_2 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.

7 Health and Wellbeing 7.3 Indoor Environmental Quality

HWB 5 Waste Odour Control

Extent of Application All buildings

Objective To reduce nuisance caused by odour leaving enclosed waste disposal and recycling spaces.

Credits Attainable 1

Credit Requirement 1 credit for installing odour sensor at all discharge points from enclosed waste disposal and recycling spaces.

Assessment Install an odour sensor at each discharge point from all enclosed waste disposal and recycling spaces including refuse collection points (RCP), refuse storage and material recovery chambers (RS&MRC) and refuse storage and material recovery room (RS&MRR).

The sensors should have the capability to alert the operation station or the security station and identify the room when 5 odour units based on an averaging time of 20 seconds [1] is detected.

OR

Propose an alerting strategy (e.g. a sensing system) that could identify the room smell condition while on an averaging time of 20 seconds [1] is detected.

The proposal should be endorsed by a Hong Kong professional institution qualified holder in mechanical or building services discipline.

The proposal should identify minimum the below:

1. Sensing system design
2. Design supporting (e.g. International references, technologies)
3. Layout and Schematic Drawings to outline the design, if applicable including MVAC drawing layout, MVAC schematic and control diagram

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_5_00	BEAM Plus NB submission template for HWB 5	✓	✓
HWB_5_01	HWB-5-1_Form	✓	✓
HWB_5_01	Drawing showing the location of refuse rooms (RCP, RS&MRC and RS&MRR).	✓	✓

1 Environmental Protection Department – Technical Memorandum on Environmental Impact Assessment Process. Environmental Impact Assessment Ordinance. [ONLINE] Available at: http://www.epd.gov.hk/eia/english/legis/memorandum/annex4.html. [Accessed August 2019].

HWB_5_02	MVAC drawings highlighting the odour sensor; OR Endorsed design proposal	✓	✓
HWB_5_03	Control Diagram for the sensors alert system; OR Endorsed design proposal	✓	✓
HWB_5_04	Catalogues of odour sensor OR catalogues of proposed equipment	-	✓
HWB_5_05	Testing and Commissioning report of the odour alert system	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

MW P1 Minimum Waste Handling Facilities

While MW P1 safeguards a prerequisite requirement for the size of RS&MRC, HWB 5 stipulates requirements to reduce risk of odour nuisance.

7	**Health and Wellbeing**	**7.4**	**Indoor Environmental Quality**
		HWB 6	**Acoustics and Noise**

Extent of Application

All buildings for parts (a) (1), (b) (1) and (c)

All buildings with tenanted spaces for parts (a) (2)

Residential buildings for part (b) (2)

Objective

Ensure the building normally *occupied spaces* are in comfortable acoustic environment.

Credits Attainable

4 + 1 BONUS

Credit Requirement

(a) Room Acoustics

1) 1 credit for demonstrating that mid-frequency reverberation time in applicable spaces of landlord's-controlled area meets the prescribed criteria of different types of premises.

2) 1 credit for demonstrating that mid-frequency reverberation time in applicable rooms of non-landlord meets the prescribed criteria of different types of premises.

(b) Noise Isolation

1) 1 credit for demonstrating airborne noise isolation between, spaces fulfils the prescribed criteria.

2) 1 BONUS for demonstrating impact noise isolation between floors fulfils the prescribed criteria.

(c) Background Noise

1 credit for demonstrating background noise levels within the prescribed criteria (including traffic noise and external building services equipment that are within the project boundary)

Assessment

(a) Room Acoustics

1) Demonstrate that mid-frequency reverberation time in applicable rooms of landlord's-controlled area meets the below criteria of different types of premises.

2) Demonstrate that mid-frequency reverberation time in applicable rooms of tenanted area meets the below criteria of different types of premises.

Criteria

The average reverberation time for mid frequencies (500Hz, 1kHz and 2kHz) and noise assessment criterion, should be:

1) Office type premises: 0.4 to 0.6s
2) Classrooms and similar premises: 0.4 to 0.6s
3) Residential premises, hotels and apartments: 0.4 to 0.6s
4) Indoor games halls, indoor swimming pools: 1.5 to 2s
5) Common areas in shopping malls:
   a) Average reverberation time for mid frequencies between 1.0 to 1.5s, or
   b) Noise reduction coefficient (NRC) for ceiling $\geqslant$ 0.7

Based on the nature of the building, alternative appropriate criteria with sufficient justification and evidence provided by the applicant will be allowed. Approval is required for the alternative proposal.

Compliance should be demonstrated by (1) detailed calculations or (2) measurements depending on the applicant's preference. The acoustic calculation or measurement report should be endorsed by a Corporate Member of Hong Kong Institute of Acoustics or equivalent.

The assessment shall include at least one sample of each type of *occupied space*. *Spaces* without design (e.g. finishes, system) should provide endorsed acoustic calculation to support the potential achievement in both PA and FA submission.

The reverberation time shall be assessed using Sabine's formula [1] or similar alternative taking into account the room details and appropriate assumptions about the materials in the space. Measurements during commissioning shall use the method given in ISO 3382 [2] or equivalent.

For buildings without the abovementioned spaces, with no spaces where speech intelligibility is important, or with rooms of a special acoustical nature, submit a schedule of spaces present in the building and relevant justifications for this credit to become not applicable.

(b) Noise Isolation

1) Demonstrate airborne noise isolation between, spaces fulfils the prescribed criteria.

Criteria

Compliance should be demonstrated by computer simulation, detailed calculations, or measurements depending on the Applicant's preference. The performance of the weighted Sound Reduction Index (SRI) or Level Difference should fulfil the requirements as stated in the blow table. The computer simulation report, acoustic calculations or

1 I.Sharland. Woods practical guide to noise control. Colchester, England

2 International Standard Organization – ISO 3382:2009 - Acoustics -- Measurement of room acoustic parameters.

the measurement report should be endorsed by a Corporate Member of Hong Kong Institute of Acoustics or equivalent.

Type of Premises	**Weighted SRI**	**Level Difference**
Between offices/ conference rooms/ retail shops	R_w **44**	$D_{nT,w}$ **38**
Between hotel rooms/ serviced apartments/ function rooms/ activity rooms	R_w **52**	$D_{nT,w}$ **46**
Between classrooms	R_w **37**	$D_{nT,w}$ **31**
Between bedrooms to living rooms (same unit)	R_w **46**	$D_{nT,w}$ **40**
Between bedroom to bedroom/ living room to living room (different units)	R_w **52**	$D_{nT,w}$ **46**
Between bedroom to bedroom (same unit)	R_w **44**	$D_{nT,w}$ **38**

Based on the nature of the building, alternative appropriate criteria with sufficient justification and evidence provided by the applicant will be allowed.

The criteria apply to partition walls which are actually provided and potentially provided by the landlord.

For buildings without the abovementioned spaces, with no spaces where speech intelligibility is important, or with rooms of a special acoustical nature, submit a schedule of spaces present in the building and relevant justifications for this credit to become not applicable.

2) Demonstrate impact noise isolation between floors fulfils the below criteria.

Demonstrate the following by computer simulation or measurements depending on the Applicant's preference.

Type of Premises	**Weighted Normalised Impact Sound Pressure Level (by laboratory)**	**Weighted Normalised Impact Sound Pressure Level (On *site* measurement)**
Floors separating normally occupied space,	$L_{n,w}$ **64**	$L'_{n,w}$ **70**

Submit a schedule of the spaces in the building, the noise isolation criteria adopted, relevant partition or slab details as they impact on noise isolation, the rooms/ premises subject to field tests or for which detailed calculations or simulations have been made, underlying assumptions, and the results of tests of calculations or simulations demonstrating compliance with the criteria.

(c) Background Noise

Demonstrate the background noise levels from both external sources and external building services equipment of project building are within the below criteria.

Criteria

Internal noise level (NR and NC value should be consistently used in the project):

1) Office type premises: NR/NC 40
2) Classrooms and similar premises: NR/NC 35
3) Residential premises, hotel and apartments: NR/NC 35
4) Common areas in shopping malls: NR/NC 45
5) Indoor games halls & Indoor swimming pools: NR/NC 50

Based on the nature of the building, alternative appropriate criteria with sufficient justification and evidence provided by the applicant will be allowed.

Compliance should be demonstrated by detailed calculations or measurements depending on the applicant's preference. The acoustic calculation or measurement report should be endorsed by a Corporate Member of Hong Kong Institute of Acoustics or equivalent.

Internal noise calculations or *site* measurements should include at least one sample of each type of *occupied space*, taking account into the worst case condition of exposure to noise sources external to the space, and undertaken during periods appropriate to the usage pattern for the space. Measuring equipment shall conform to the accuracy requirements given in IEC 61672-1 [3] Class 1 requirements, or equivalent.

The assessment should take into account noise from building services equipment under normal operation mode. For residential units, the assessment should only account traffic noise and chiller/water plant equipment (window type and outdoor unit of VRV is not considered)

For buildings without the abovementioned spaces, with no spaces where speech intelligibility is important, or with rooms of a special acoustical nature, submit a schedule of spaces present in the building and relevant justifications for this credit to become not applicable.

3 International Electrotechnical Commission. IEC 61672-1:2013 Electroacoustic – Sound level meters.

Submittals

(a) Room Acoustics

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_6_00	BEAM Plus NB submission template for HWB 6	✓	✓
HWB_6a_01	Reverberation time calculation at representative locations with supporting documents of the absorption coefficients for landlord's-controlled spaces (Applicable to calculation route only)	✓	✓
HWB_6a_02	Reverberation time measurement protocol for landlord's-controlled spaces (Applicable to measurement route only)	✓	✓
HWB_6a_03	Reverberation time measurement report at representative locations with supporting documents of the absorption coefficients for landlord's-controlled spaces (Applicable to measurement route only)	-	✓
HWB_6a_04	Reverberation time calculation at representative locations with supporting documents of the absorption coefficients for tenanted spaces (Applicable to calculation route only)	✓	✓
HWB_6a_05	Reverberation time measurement protocol for tenanted spaces (Applicable to measurement route only)	✓	✓
HWB_6a_06	Reverberation time measurement report at representative locations with supporting documents of the absorption coefficients for tenanted spaces (Applicable to measurement route only)	-	✓
HWB_6a_07	CV of the professional as per requirements in the assessment	✓	✓

(b) Noise Isolation

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_6_00	BEAM Plus NB submission template for HWB 6	✓	✓
HWB_6b_01	Layout plan or elevation drawings showing the location of partition walls (Applicable to part (1) only)	✓	✓
HWB_6b_02	Construction details of the partition walls (Applicable to calculation and simulation route only).	✓	✓
HWB_6b_03	Airborne noise isolation computer simulation results or calculations (Applicable to calculation and simulation route only)	✓	✓
HWB_6b_04	Airborne noise isolation measurement protocol (Applicable to measurement route only)	✓	✓
HWB_6b_05	Airborne noise isolation measurement reports (Applicable to measurement route only)	-	✓
HWB_6b_06	Layout plan or elevation drawings showing the location of slabs (Applicable to part 2)	✓	✓
HWB_6b_07	Construction details of the partition walls (Applicable to part (ii) calculation and simulation route only)	✓	✓
HWB_6b_08	Impact noise isolation computer simulation results or calculations (Applicable to calculation and simulation route only)	✓	✓
HWB_6b_09	Impact noise isolation measurement protocol (Applicable to measurement route only)	✓	✓
HWB_6b_10	Impact noise isolation measurement reports (Applicable to measurement route only)	-	✓
HWB_6b_11	CV of the professional as per requirements in the assessment	✓	✓

(c) Background Noise

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_6_00	BEAM Plus NB submission template for HWB 6	✓	✓
HWB_6c_01	Background noise calculations (Applicable to calculation route only)	✓	✓
HWB_6c_02	Background noise measurement protocol (Applicable to measurement route only)	✓	✓
HWB_6c_03	Acoustic measurement report (Applicable to measurement route only)	-	✓
HWB_6c_04	Valid calibration certificate of sound level meters (Applicable to measurement route only)	✓	✓
HWB_6c_05	CV of the professional as per requirements in the assessment	✓	✓

Remarks

(a) Additional Information

Acoustic windows or other attenuation may contribute to mitigate background noise problem.

Environmental Protection Department - Innovative Noise Mitigation Designs and Measures - Acoustic Window. [ONLINE] Available at: http://www.epd.gov.hk/epd/Innovative/greeny/eng/acoustic_window.html [Accessed August 2019].

(b) Related Credits

None

7 Health and Wellbeing 7.3 Indoor Environmental Quality

HWB 7 Indoor Vibration

Extent of Application All buildings

Objective Avoidance of excessive vibration from building services equipment and other *external sources* within site boundary.

Credits Attainable 1

Credit Requirement 1 credit for demonstrating vibration levels not exceeding the prescribed criteria.

Assessment Vibration generated from the building services equipment shall be in compliance with the criteria given in ISO 2631-2:2003 [1], BS 6472-1:2008 [2], BS 6472-2:2008 [3], Department of Environment and Conservation of NSW - Assessing Vibration: a technical guideline [4] or equivalent standard.

Calculation/Measurements should be carried out at representative *normally occupied spaces*. The selection of sampling points should follow the guidance given in ISO 2631-2:2003, BS 6472-1:2008, BS 6472-2:2008, Department of Environment and Conservation of NSW - Assessing Vibration: a technical guideline or equivalent standard. Vibration from emergency generator is excluded from assessment.

The level of vibration in terms of root mean square acceleration shall be determined by calculation or on-site measurement. Root mean square acceleration requirement should be assessed with regards to the above standards or equivalent.

Vibration source identified in the report should be justified. External sources other than building service equipment that might impact a building space may include nearby railway, underground tunnel etc.

Calculation or measurement report should be endorsed by a Corporate Member of Hong Kong Institute of Acoustics or equivalent.

---

1 International Standard Organisation. ISO 2631-2:2003. Evaluation of human exposure to whole-body vibration – Part 2: Continuous and shock-induced vibration in buildings (1 to 80Hz).

2 British Standard. BS 6472-1:2008. Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting

3 British Standard. BS 6472-2:2008. Guide to evaluation of human exposure to vibration in buildings Part 2: Blast-induced vibration

4 Department of Environment and Conservation of NSW Assessing Vibration: a technical guideline or equivalent standard 2006. [ONLINE] Available at: http://www.epa.nsw.gov.au/resources/noise/vibrationguide0643.pdf. [Accessed August 2019].

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_7_00	BEAM Plus NB submission template for HWB 7	✓	✓
HWB_7_01	HWB-7-1_Form	✓	✓
HWB_7_02	Specification for isolation efficiency	✓	✓
HWB_7_03	Calculations on the isolation efficiency	✓	✓
HWB_7_04	Layout drawings showing the location of sensitive receivers and vibration source	✓	✓
HWB_7_05	Endorsed Calculation	✓	-
	Endorsed measurement report	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

7 Health and Wellbeing **7.3 Indoor Environmental Quality**

HWB 8 Indoor Air Quality

Extent of Application

All buildings for part (a)

All buildings with enclosed and/ or semi-enclosed car park of areas more than 10% of Construction Floor Area for part (b).

Objective

Demonstrate that airborne contaminants do not give rise to unacceptable levels of air pollution in the building

Credits Attainable

4 + 1 additional BONUS

Credit Requirement

(a) Indoor Air Quality in Occupied Spaces

Demonstrate compliance in one of the following paths:

1.1 Path 1

2 credits for demonstrating compliance with the prescribed limits for Carbon monoxide (CO), Nitrogen dioxide (NO_2), Ozone (O_3), Carbon dioxide (CO_2), Respirable suspended particulates (PM_{10}), Total volatile organic compounds (TVOCs), Formaldehyde (HCHO) and Radon (Rn) in the sampled occupied spaces.

1 credit for demonstrating compliance with the prescribed limits for Airborne bacteria and conduct the Mould assessment in the sampled occupied spaces.

1.2 Path 2

3 credits for submitting a valid IAQ Certification Scheme (Good Class) certificate issued by the Environmental Protection Department (EPD) covering the whole building.

1 additional BONUS if Excellent Class is achieved.

(b) Air Quality in Car Park

1 credit for demonstrating compliance with the pollutant concentration limits specified in ProPECC PN 2/96.

Assessment **(a) Indoor Air Quality in Occupied Spaces**

1.1 Path 1

Prepare a measurement protocol prepared by a IAQ Certificate Issuing Body (CIB) [1] following guidance stated in Step 1 – Step 4 in A Guide on Indoor Air Quality Certification Scheme for Offices and Public Spaces [2].

Measurements should be taken in occupied spaces (including *normally occupied spaces* and *not normally occupied spaces*) and the limits are specified below.

At least one sampling point should be located at each type of IAQ area as defined by the applicant.

Parameter	8-hour average acceptance limit [3]
Carbon dioxide (CO_2)	<1,800 mg/m^3 or <1,000 ppmv
Carbon monoxide (CO)	<7,000 µg/m^3 or <6.1 ppmv
Nitrogen dioxide (NO_2)	<150 µg/m^3 or <80 ppbv Plus [1 hour] <200 µg/m^3 or <106 ppbv
Ozone (O_3)	<120 µg/m^3 or <61 ppbv
Respirable suspended particulate (PM_{10})	<100 µg/m^3
Total volatile organic compounds (TVOC)	<600 µg/m^3 or <261 ppbv
Formaldehyde (HCHO)	<100 µg/m^3 or <81 ppbv Plus [30 mins] <100 µg/m^3 or <81 ppbv
Radon (Rn)	<167 Bq/m^3
Airborne bacteria	<1,000 cfu/m^3
Mould	Prescriptive Checklist

Given the floor plan of the building has not been changed, the sampling points agreed during Provisional Assessment will remain the same for Final Assessment. Otherwise, if the floor plan has been undergone major change, the sampling points will be re-assessed during Final Assessment.

1 Indoor Air Quality Information Centre – Certificate Issuing Body Accreditation. [ONLINE] Available at: http://www.iaq.gov.hk/en/iaq-certification-scheme/certificate-issuing-body-accreditation.aspx. [Accessed August 2019].

2 Indoor Air Quality Management Group – A Guide on Indoor Air Quality Certification Scheme for Offices and Public Spaces 2019. [ONLINE] Available at: http://www.iaq.gov.hk/media/8694/certguide-eng.pdf.. [Accessed Aug 2019]

3 Indoor Air Quality Management Group – A Guide on Indoor Air Quality Certification Scheme for Offices and Public Spaces 2019. [ONLINE] Available at: http://www.iaq.gov.hk/media/8694/certguide-eng.pdf.. [Accessed Aug 2019]

1.2 Path 2

Submit a valid certificate issued by the Environmental Protection Department (EPD) covering the whole building. The whole building should be fully furnished.

(b) Air Quality in Car Park

This part is only applicable to buildings with enclosed and/or semi-enclosed car park of areas more than 10% of Construction Floor Area. Area of open car park, if present in the project, should not be accounted in this percentage.

1. **For mechanically ventilated car park:**

Estimate the peak pollutant loading, including carbon monoxide (CO) and nitrogen dioxide (NO_2), in the car park.

Consolidate a carpark ventilation report using the below equation to calculation the ventilation rate for both CO and NO_2. The higher ventilation rate should be adopted. Demonstrate the ACH can cater the peak pollutant loading and the CO and NO_2 concentration limits specified in ProPECC PN 2/96 [4].

Carbon monoxide (CO)

$$QF = \frac{q^oCO}{3600} D_{pc} \frac{1 \times 10^6}{CO_{lim}} \text{ (idling)}$$

$$QF = \frac{q^oCO}{3600} D_{tc} \frac{1 \times 10^6}{CO_{lim}} \text{ D(travelling)}$$

Nitrogen dioxide (NO_2)

$$QF = \frac{q^oNO_2}{3600} D_{pc} \frac{1 \times 10^6}{NO_{2lim}} \text{ (idling)}$$

$$QF = \frac{q^oNO_2}{3600} D_{tc} \frac{1 \times 10^6}{NO_{2lim}} \text{ D (travelling)}$$

Q_F = required air quantity per second (m^3 /s)

q^oCO = basic value of CO emission per vehicle (assumed to be 120 g/hr,veh if no reference information)

q^oNO_2 = basic value of NO_2 emission per vehicle (assumed to be 24 g/hr,veh if no reference information)

CO_{lim} = maximum permissible CO concentration (mg/m^3 CO)

4 Environmental Protection Department – ProPECC PN2/96 Control of Air Pollution in Car Parks. [ONLINE] Available at: http://www.epd.gov.hk/epd/sites/default/files/epd/english/resources_pub/publications/files/pn96_2.pdf. [Accessed August 2019]

NO_{2lim} = maximum permissible NO_2 concentration (mg/m^3 NO_2)

The maximum permissible pollutant concentration is the difference between the outdoor air pollutant concentration and the maximum allowed concentration. The outdoor air pollutant concentration can be found on EPD's website [5].

D_{pc} = number of idling vehicles with engine running

D_{tc}= number of travelling vehicles per km = $\frac{M_{tc}}{v}$

where M_{tc} = hourly traffic volume of travelling vehicles, and v = mean driving speed of vehicles

Assume in the peak hour, the hourly traffic volume is the full capacity of the car park. Idling time per movement is 3 minutes. The mean driving speed is 5km/hr.

D = travelling distance (km), assumed to be the longest lane in the car park.

Demonstrate the car park satisfy the provisions requirement for CO monitoring and automatic control specified in ProPECC PN 2/96.

2. **For naturally ventilated car park**

Engage an IAQ CIB accredited by HKIAS for on-site measurements to demonstrate the levels of CO and NO_2 are in compliance with ProPECC PN2/96. The measurement after the car park started operation, supported by a project owner's acknowledgment letter.

Submittals

(a) Indoor Air Quality in Occupied Spaces

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below..*		**PA**	**FA**
HWB_8_00	BEAM Plus NB submission template for HWB 8a	✓	✓
HWB_8a_01	HWB-8-1_Form	✓	✓
HWB_8a_02	HWB-8-3_Form	✓	✓
HWB_8a_03	Specification for CIB to endorsed IAQ measurement methodology	✓	-
	CIB endorsed IAQ measurement methodology	-	✓
HWB_8a_04	CIB endorsed IAQ test reports	-	✓
HWB_8a_05	Valid certificate issued by the Environmental Protection	-	✓

5 Environmental Protection Department – Air Quality In Hong Kong 2016 Statistical Summary. [ONLINE] Available at: http://www.aqhi.gov.hk/api_history/english/report/files/2016%20Statistical%20Summary_Final_en.pdf. [Accessed Aug 2019]

	Department (EPD) covering the whole building (only for alternative path)		

(b) Air Quality in Car Park

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_8_00	BEAM Plus NB submission template for HWB 8b	✓	✓
HWB_8b_01	HWB-8-2_Form	✓	✓
HWB_8b_02	Estimation of the peak pollutant loading in car park	✓	✓
HWB_8b_03	Car park ventilation report (not applicable to naturally ventilated car park) with pollution calculation	✓	✓
HWB_8b_04	Car park floor plans highlighting location of CO sensors (not applicable to naturally ventilated car park)	✓	✓
HWB_8b_05	Control logic of car park ventilation (not applicable to naturally ventilated car park)	✓	✓
HWB_8b_06	On-site car park air quality measurement protocol (not applicable to mechanically ventilated car park)	✓	✓
HWB_8b_07	Endorsed test reports of air quality in car park (not applicable to mechanically ventilated car park)	-	✓

Remarks

(a) Additional Information

US Environmental Protection Agency - A Brief Guide to Mold, Moisture and Your Home. [ONLINE] Available at: https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home. [Accessed August 2019].

(b) Related Credits

EU 2 Reduction of CO_2 Emissions

By delinking the control of temperature and humidity using standalone or integrated dehumidification system, energy reduction may be achieved by avoiding overcooling to reach the targeted humidity.

7	**Health and Wellbeing**	**7.3**	**Indoor Environmental Quality**
		HWB 9	**Thermal Comfort**

Extent of Application

All buildings

Objective

Ensure that buildings and systems are tested practicable and the specified thermal comfort conditions can be achieved under conditions of normal occupancy and expected heat gains.

Credits Attainable

2 + 1 additional BONUS

Credit Requirement

(a) Thermal Comfort Analysis

2 credits for conducting thermal comfort analysis and demonstrate that *normally occupied spaces* can fulfil the thermal comfort requirements.

(b) Thermal Comfort Measurement

1 additional BONUS credit for conducting on-site measurements to verify the thermal comfort performance.

Assessment

(a) Thermal Comfort Analysis

Submit a Thermal Comfort Report demonstrating compliance with the assessment criteria. The report should include:

1) Scale drawing(s) depicting the building layout;
2) Screen capture of project building, surrounding building and terrain of the 3D model; and
3) Simulation assumption, results of simulations and calculations for thermal comfort.

The reports should be endorsed by a locally qualified professional who has at least 3 years of relevant experience.

The thermal analysis shall be undertaken using dynamic thermal modelling software. The thermal analysis should cover all *normally occupied spaces* immediately below all main roofs and flat roofs.

Spaces without design (e.g. finishes, system) should provide endorsed calculation to support the potential achievement in both PA and FA submission.

In addition, for each type of ventilation means (natural ventilation, mechanical ventilation and air-conditioning, if present), indicate the highest level *normally occupied spaces* using the respective ventilation means. The thermal analysis should also cover these spaces.

1) The modelling shall include full annual simulation using standard Hong Kong weather data [1];
2) The modelling will include the effect of installed solar control features, e.g. glazing, internal blind, internal or *external shading* components, fabric and infiltration specifications, and site obstructions;
3) The modelling needs not include any internal gains; and
4) Assessment can be confined to the scenarios with the highest mean monthly temperature of the hottest month only with reference to the weather data used.

1. Natural ventilation spaces

The spaces with natural ventilation must be equipped with operable windows / doors that can be readily opened and adjusted by the occupants. Maintenance window is not considered as operable windows. Mechanical ventilation / cooling equipment for the space shall not be provided.

Demonstrate that daily average indoor operative temperatures in *normally occupied space* meet the 80% acceptability limits for 80% of days in the hottest month. The determination of 80% acceptability limits should refer to ASHRAE 55-2013 [2].

The analysis can be based on the following assumptions:

1.1. Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department, the Government of HKSAR [3];

1.2. The surrounding area shall be at less, 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;

1.3. 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

1.4. For practical reasons, the geometry can be simplified as a simple block.

1 Standard Hong Kong weather data file from Energyplus. Weather Data by Region | EnergyPlus. [ONLINE] Available at: https://energyplus.net/weather-region/asia_wmo_region_2/CHN%20%20. [Accessed August 2019].

2 American Society of Heating Refrigeration and Air Conditioning Engineers – ANSI/ASHRAE Standard 55-2013 Thermal Environmental Conditions for Human Occupancy.

3 Lands Department - Survey and Mapping Office - GIS Projects Section. 2017. Survey and Mapping Office - GIS Projects Section. [ONLINE] Available at: http://www.landsd.gov.hk/mapping/en/lic/lic_gis.htm. [Accessed August 2019].

2. Mechanical ventilation spaces

Mechanical cooling equipment for the space shall not be provided, mechanical ventilation with unconditioned air may be utilised.

Demonstrate that daily average indoor operative temperatures in *normally occupied space* meet the 80% acceptability limits for 80% of days in the hottest month. The determination of 80% acceptability limits should refer to ASHRAE 55-2013.

3. Air-conditioned spaces

Demonstrate that the predicted Mean Vote (PMV) in *normally occupied space* is between –1 and +1. The calculation of PMV should refer to ASHRAE 55-2013.

(b) Thermal Comfort Measurement

BONUS credit in part (b) will be granted only if the credits in part (a) have been achieved.

Submit a Thermal Comfort Measurement Report demonstrating compliance with the assessment criteria.

The report should include:

1) Sampling locations;
2) Measurement methodology, equipment photo and results; and
3) Calculations for thermal comfort.

Spaces without design (e.g. finishes, system) should provide endorsed calculation to support the potential achievement in both PA and FA submission.

1. Natural ventilation spaces

10% of the number of naturally ventilated *normally occupied spaces* included in the thermal analysis in part (a) should be sampled.

Record the main physical parameters including outdoor air temperature, indoor air temperature, indoor mean radiant temperature and indoor wind speed. The indoor mean radiant temperature can be assumed to be indoor air temperature. The measurement should take note on the following:

1.1 The measurement should not be taken on a rainy day;

1.2 The measurements should be represented as 8-hour average in the daytime;

1.3 The measurement of indoor temperature; and

1.4 The sensors used in the measurement survey shall have an accuracy that complies with ASHRAE 55-2013 [4], ISO 7726 [5] or equivalent.

Demonstrate that the naturally ventilated *normally occupied space* meet the 80% acceptability limits on any one day during selected hottest month from reference weather data file. The results shall demonstrate compliance with the prescribed design criteria within the prescribed limits, for a minimum of 90% of the prescribed locations.

2. Mechanical ventilation spaces

10% of the number of mechanically ventilated *normally occupied spaces* included in the thermal analysis in part (a) should be sampled.

Record the main physical parameters including outdoor air temperature, indoor air temperature, indoor mean radiant temperature and indoor wind speed. The indoor mean radiant temperature can be assumed to be indoor air temperature. The measurement should take note on the following:

1) The measurement should not be taken on a rainy day;

2) The measurements should be represented as 8-hour average in the daytime or surrogate measurement;

3) The measurement of indoor temperature; and

4) The sensors used in the measurement survey shall have an accuracy that complies with ASHRAE 55-2013, ISO 7726:1998 or equivalent.

Demonstrate that the mechanically ventilated *normally occupied space* meet the 80% acceptability limits on any one day during selected hottest month from reference weather data file. The results shall demonstrate compliance with the prescribed design criteria within the prescribed limits, for a minimum of 90% of the prescribed locations.

3. Air-conditioned spaces

10% of the number of air-conditioned *normally occupied spaces* included in the thermal analysis in part (a) should be sampled.

Record the main physical parameters including indoor air temperature, indoor mean radiant temperature, indoor relative humidity and indoor wind speed. The indoor mean radiant

4 American Society of Heating Refrigeration and Air Conditioning Engineers – ANSI/ASHRAE Standard 55-2013 Thermal Environmental Conditions for Human Occupancy.

5 International Standard Organization – ISO 7726:1998 Ergonomics of the thermal environment — Instruments for measuring physical quantities.

temperature can be assumed to be indoor air temperature. The measurement should take note on the following:

The measurement should not be taken on a rainy day;

1) The measurements should be represented as 8-hour average in the daytime or surrogate measurement;

2) The measurement of indoor temperature and indoor relative humidity; and

3) The sensors used in the measurement survey shall have an accuracy that complies with ASHRAE 55-2013, ISO 7726 or equivalent.

Demonstrate that the predicted Mean Vote (PMV) in *normally occupied space* is between –1 and +1. The results shall demonstrate compliance with the prescribed design criteria within the prescribed limits, for a minimum of 90% of the prescribed locations.

Submittals

(a) Thermal Comfort Analysis

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_9_00	BEAM Plus NB submission template for HWB 9	✓	✓
HWB_9_01	Form-9-1	✓	✓
HWB_9a_02	Endorsed Thermal Comfort Analysis Report	✓	✓
HWB_9a_03	CV of the professional as per requirements in the assessment	✓	✓

(b) Thermal Comfort Measurement

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_9_00	BEAM Plus NB submission template for HWB 9	✓	✓
HWB_9_01	HWB-9-1_Form	-	✓
HWB_9b_02	Thermal Comfort Measurement Report	-	✓
HWB_9b_02	CV of the professional as per requirements in the assessment	-	✓

Remarks

(a) Additional Information

Indoor Air Quality Management Group – A Guide on Indoor Air Quality Certification Scheme for Offices and Public Spaces

2003. [ONLINE] Available at: https://www.iaq.gov.hk/media/8694/certguide-eng.pdf. [Accessed Aug 2019]

(b) Related Credits

None

7 Health and Wellbeing **7.3 Indoor Environmental Quality**

HWB 10 Artificial Lighting

Extent of Application All buildings

Objective Promote indoor lighting design which is comfortable for occupants' indoor activities.

Credits Attainable 2

Credit Requirement

(a) Artificial lighting in *normally occupied spaces*

1 credit for achieving the prescribed lighting performance in *normally occupied spaces*.

(b) Artificial lighting in *not normally occupied spaces* and *unoccupied spaces*

1 credit for achieving the prescribed lighting performance in *not normally occupied spaces* and *unoccupied spaces*.

Assessment

(a) Artificial lighting in *normally occupied spaces*

This credit only assesses indoor *normally occupied spaces* with permanently installed lighting fixtures provided by the project owner. Spaces with fixtures, which are temporarily installed for Occupation Permit (OP) inspection purposes and out of the project owner's fit-out scope, are not assessed.

Demonstrate the achievement of the prescribed lighting performance in *normally occupied spaces* regarding the lighting performance criteria adopted based on The SLL Code for Lighting 2012 Section 2.2 [1]. If the task area is unknown by the time of design, assume the entire space, with 0.5m from walls, is the task area.

Demonstrate compliance with the assessment criteria including maintained illuminance, Unified Glare Rating limit and minimum illuminance uniformity either by measurements using a standardised measurement protocol appropriate to the parameter being assessed, or by modelling.

The following typical surface reflectance can be adopted. If different values are adopted, supporting documents (cut sheets / catalogues / laboratory reports) showing the corresponding information are required for justification.

1 The Chartered Institution of Building Services Engineers (CIBSE) – The SLL Code for Lighting 2012

Table HWB 10-1

Surfaces	Reflectance of surfaces
Ceiling	0.6
Walls	0.3
Working planes	0.2
Floor	0.1

Submit an Artificial Lighting Performance Report, including the following content:

1) Technical details of the installed lighting systems;
2) Design criteria for each room type; and
3) Results of measurements or simulation.

(b) Artificial lighting in *not normally occupied spaces* and *unoccupied spaces*

This credit only assesses indoor *not normally occupied spaces* and unoccupied spaces with permanently installed lighting fixtures provided by the project owner. Spaces with fixtures, which are temporarily installed for Occupation Permit (OP) inspection purposes and out of the project owner's fit-out scope, are not assessed.

Demonstrate the achievement of the prescribed lighting performance in *not normally occupied spaces* and unoccupied spaces regarding the lighting performance criteria adopted based on The SLL Code for Lighting 2012 Section 2.2.

Demonstrate compliance with the assessment criteria including maintained illuminance, Unified Glare Rating limit and minimum illuminance uniformity either by measurements using a standardised measurement protocol appropriate to the parameter being assessed, or by modelling.

The following typical surface reflectance can be adopted. If different values are adopted, supporting documents (cut sheets / catalogues / laboratory reports) showing the corresponding information are required for justification.

Table HWB 10-2

Surfaces	Reflectance of surfaces
Ceiling	0.6
Walls	0.3
Working planes	0.2
Floor	0.1

Submit an Artificial Lighting Performance Report, including the following content:

1) Technical details of the installed lighting systems;
2) Design criteria for each room type; and
3) Results of measurements or simulation

Submittals

(a) Artificial lighting in *normally occupied spaces*

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_10_00	BEAM Plus NB submission template for HWB 10a	✓	✓
HWB_10a_01	HWB-10-1_Form	✓	✓
HWB_10a_02	Specifications highlighting the design intent with adopted lighting performance criteria for each type of rooms	✓	✓
HWB_10a_03	Catalogues or other supporting documents showing the reflectance value (if non-typical values have been adopted)	✓	✓
HWB_10a_04	Lighting fitting schedule	✓	✓
HWB_10a_05	Artificial Lighting Performance Report	✓	✓

(b) Artificial lighting in *not normally occupied spaces* and *unoccupied spaces*

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_10_00	BEAM Plus NB submission template for HWB 10b	✓	✓
HWB_10b_01	HWB-10-2_Form	✓	✓
HWB_10b_02	Specifications highlighting the design intent with adopted lighting performance criteria for each type of rooms	✓	✓
HWB_10b_03	Catalogues or other supporting documents showing the	✓	✓

	reflectance value (if non-typical values have been adopted)		
HWB_10b_04	Lighting fitting schedule	✓	✓
HWB_10b_05	Artificial Lighting Performance Report	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

7 Health and Wellbeing 7.3 Indoor Environmental Quality

HWB 11 Daylight

Extent of Application Residential, office and education buildings.

Objective To achieve satisfactory daylight performance in indoor *normally occupied spaces* by considering the sufficiency of daylight illuminance and the potential risk of excessive sunlight penetration.

Credits Attainable 2 BOUNS

Credit Requirement 2 BONUS for demonstrating at least 55% of the total area of the studied *normally occupied spaces* achieves spatial Daylight Autonomy$_{300/50\%}$ (sDA$_{300/50\%}$) and no more than 10% of the same area receives Annual Sunlight Exposure$_{100,250}$ (ASE$_{1000,\ 250}$).

Assessment Conduct simulations to show that at least 55% of the total area of *normally occupied spaces* can receive at least 300 lux of sunlight for at least 50% of operating hours each year and no more than 10% of the same area can receive more than 1,000 lux for more than 250 hours each year.

Follow IES LM-83-12 Approved Method: IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure (ASE). Annual sky file referencing a local climate file, such as an EnergyPlus weather format data file (*.epw) [1], should be used for the sky model. Surrounding buildings and terrain included in the model should be based on the GIS information from Lands Department [2]. The following simplifications are allowed:

1) The presence trees can be ignored;
2) The overall external reflectance of the building can be assumed to be 0.2;
3) If furniture layout is not known by the time of design, it can be assumed that no furniture is in the space or a typical furniture layout can be applied; and
4) Internal doors within a unit are assumed to be fully opened.

Submit a Daylight Analysis Report demonstrating compliance with the credit requirement. The report shall include:

1) Scale drawing(s) depicting the building layout;
2) Screen Capture of project building, surrounding building and terrain of the 3D model; and
3) Simulation assumption and results.

1 Standard Hong Kong weather data file from Energyplus. Weather Data by Region | EnergyPlus. [ONLINE] Available at: https://energyplus.net/weather-region/asia_wmo_region_2/CHN%20%20. [Accessed August 2019].

2 Lands Department - Survey and Mapping Office - GIS Projects Section. 2017. Survey and Mapping Office - GIS Projects Section. [ONLINE] Available at: http://www.landsd.gov.hk/mapping/en/lic/lic_gis.htm. [Accessed August 2019].

Endorsement by a locally qualified professional who has at least 3 years of relevant experience in daylight study.

A software validation report from the software developer should be provided to ensure the accuracy of simulation by the software.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_11_00	BEAM Plus NB submission template for HWB 11	✓	✓
HWB_11_01	HWB-11-1_Form	✓	✓
HWB_11_02	Daylight Analysis Report endorsed by Hong Kong Professional institute qualified engineer	✓	✓
HWB_11_03	CV of the professional as per requirements in the assessment	✓	✓
HWB_11_04	Validation report of the simulation software	✓	✓

Remarks

1) Additional Information

Whole Building Design Guide, National Institute of Building Sciences – Daylighting. [ONLINIE] Available at: https://www.wbdg.org/resources/daylighting. [Accessed August 2019].

2) Related Credits

EU 1 Low carbon passive design

This credit considers health and wellbeing of occupants therefore stipulate requirements for drawing natural light but neither too dim nor too fierce. On the other hand, in EU 1 daylight is promoted as means to replace artificial lighting.

7 Health and Wellbeing **7.3 Indoor Environmental Quality**

HWB 12 Biological Contamination

Extent of Application All buildings

Objective To reduce the risk of biological contamination by adopting appropriate design precautions of the water supply systems, HVAC systems and other water features

Credits Attainable 1

Credit Requirement 1 credit for complying with the recommendations given in the Code of Practice for Prevention of Legionnaires' Disease 2016 Edition in respect of Water Supply Systems, HVAC Systems and other Water Features.

Assessment

Water Supply Systems

Demonstrate compliance, if relevant items are present, with the following sections of the Code of Practice for Prevention of Legionnaires' Disease 2016 Edition:

1) Hot Water Supply Systems – Section 4.4.1.1
2) Cold Water Supply Systems – Section 4.5.1

HVAC Systems

Demonstrate compliance, if relevant items are present, with the following sections of the Code of Practice for Prevention of Legionnaires' Disease 2016 Edition [1]:

1) Cooling Tower – Section 4.2.1;
2) Air Handling Unit / Fan Coil Unit – Section 4.3.1 Items (a) – (d);
3) Air Duct and Air Filters – Section 4.3.2 Items (a) – (c);
4) Humidifiers – Section 4.3.3 Items (a) – (c); and
5) Air Washers – Section 4.3.4 Items (a), (b) and (d).

Other Water Features

Demonstrate compliance, if relevant items are present, with the following sections of the Code of Practice for Prevention of Legionnaires' Disease 2016 Edition:

1) Architectural Foundations – Section 4.6.1; and
2) Spa Pools (Whirlpools) – Section 4.7.2.

1 Prevention of Legionnaires' Disease Committee, Hong Kong – Code of Practice for Prevention of Legionnaires' Disease 2016 Edition [ONLINE] Available at: http://www.emsd.gov.hk/filemanager/en/content_645/COP-PLD_2016.pdf. [Accessed August 2019].

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
HWB_12_00	BEAM Plus NB submission template for HWB 12	✓	✓
HWB_12_01	Specifications of Water Supply Systems	✓	✓
HWB_12_02	Schematic diagram of Water Supply Systems	✓	✓
HWB_12_03	Specifications of HVAC Systems	✓	✓
HWB_12_04	Schematic diagram of HVAC Systems	✓	✓
HWB_12_05	Specifications of Other Water Features	✓	✓
HWB_12_06	Schematic diagram of Other Water Features with mark-up narratives	✓	✓
HWB_12_07	Testing and commissioning report for all installed mitigation measures and equipment for the prevention of legionnaires' disease	-	✓
HWB_12_08	Drawing of installation details	-	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

8 Innovations and Additions

8.1 Innovations and Additions

Introduction

BEAM Encourage innovative and/ or new techniques that are yet to find in the mainstream application in Hong Kong addressing sustainability objectives for new buildings.

Background

Any credits gained under this heading shall be regarded as 'Bonus' credits, counting towards the total credits obtained, but not towards the total credits obtainable. BEAM encourages application of new practices, technologies and techniques together with the associated benefits in addressing sustainability objectives for new buildings.

8 Innovations and Additions

8.1 Innovations and Additions

IA 1 Innovations and Additions

Extent of Application

All buildings, for innovations that have not been addressed in the respective categories of the NB certification.

Objective

Encourage innovative and/ or new techniques/ practices/ design that are yet to find in the mainstream application in Hong Kong addressing sustainability objectives for new buildings.

Credits Attainable

Maximum 10 BONUS credits for IA.

Assessment

Present evidence of the application of new practices, technologies and/ or techniques that are (1) not described in this manual; or (2) not market mainstream implementation; or (3) multiple aspect achievement; and the associated benefits in addressing sustainability objectives for new buildings:

1) Identify the sustainability objectives addressed by the proposed innovative applications.
2) Detail the method and criteria evaluating the benefits and effectiveness of the applications (quantifiable performance indicators to be proposed if applicable).
3) Justify the number of bonus credits for the proposed applications.
4) Provide evidence of the implementation of the applications.
5) Evaluate preliminary achievements and any suggestion for improvement for the applications.

The Assessor will refer the proposal to the BSL Technical Review Committee who will consider each application on its merits.

Submittals

Supporting Documents *Please provide softcopies with filename prefix as indicated on the leftmost column below.*		**PA**	**FA**
1.1	BEAM Plus NB submission template for IA	✓	✓
1.2	Report on the objectives, evaluating method and criteria, and proposed number of bonus credits for the innovative techniques	✓	✓
1.3	Report on the evidence of implementation and evaluation of preliminary achievements / proposed improvements for the innovative techniques	-	✓

Remarks

(a) Additional Information
None

(b) Related Credits
None

9 Appendices

9.1 Glossary

Air Ventilation Assessment

Air Ventilation Assessment, in accordance with ETWB Technical Circular No. 1/06, is a tool to assess the impacts of the proposal on the pedestrian wind environment.

Albedo

The proportion of incident radiation reflected by a system. A perfect reflector would have an *albedo* of 1, whereas a perfect absorber would have an *albedo* of 0.

Annual Building Energy

Annual building energy refers to the total annual building energy consumption estimated for baseline case or proposed case. Both setting could be referred to Appendix 9 of this manual.

Biophilic Design

Designing for people as a biological organism, respecting the mind-body systems as indicators of health and well-being in the context of what is locally appropriate and responsive.

Bioretention Facilities

Bioretention facilities filter rainwater that becomes polluted as it flows over hard surfaces like streets, parking lots, roofs, and driveways. The bioretention facility retains the water and filters various pollutants.

Brownfield

Brownfield refers to previously developed land, or land that contains or contained permanent structures and associated infrastructures.

Certificate Validity

Certificate Validity refers to the duration for which a BEAM Plus certificate and grading remain effective and officially recognized by the HKGBC.

Charrette,

Charrette, a design workshop to quickly generate a design solution while integrating the aptitudes and interests of project team and core design disciplines, shall be held no later than design development phase and preferably during schematic design.

Commercial Building

Commercial Building means a building, or that part of the building, intended to be used for business, trade or entertainment, for example office, clubhouse and retail.

Computer Fluid Dynamics

Computational fluid dynamics (CFD) is a branch of fluid mechanics that uses numerical analysis and data structures to analyse and solve problems that involve fluid flows.

Construction Waste

It means any substance, matter or thing which is generated as a result of construction work and abandoned whether or not it has been processed or stockpiled before being abandoned. It is a mixture of surplus materials arising from *site* clearance, excavation, construction, refurbishment, renovation, demolition and road works.

Core amenities

Basic services/ recreational facilities that are most vital and essential to the subject development

Cultural heritage

Declared monuments/ Grade 1 to Grade 3 historic buildings confirmed by the Antiquities Advisory Board (AAB) and other *sites*/ historic buildings proposed to be recorded/ graded by AAB.

Demolition waste

It means all wastes (including recyclable waste) generated from deconstruction of existing buildings at the demolition stage are counted as demolition waste.

Designed for Disassembly

Materials which can be disassembled by using non-specialist tools and for *reuse*, recycling or reprocessing

Educational Building

Educational Building means a building intended to be used to fulfil educational purposes, for example kindergarten, primary school, secondary school and universities.

Embodied Energy

Embodied energy is the energy used during the entire life cycle of a product, including its manufacture, transportation, and disposal, as well as the inherent energy captured within the product itself

Environmental Management Plan (EMP)

An Environmental management plan is a plan to address the potential significant environmental aspects and impacts and to propose appropriate mitigation measures for construction works.

Environmental monitoring and auditing plan (EM&A)

EM&A aims to provide systemic procedures for monitoring, auditing and minimizing environmental impacts associated with Project activities.

External Shading

External shading is a device incorporated in the building facade to limit the internal heat gain resulting from solar radiation.

Facade Zone

The projection of the curtain wall system from the outer face of the structural elements does not exceed 200 mm for a domestic building and 250 mm for a non-domestic building

FSC Certification

A certification system for timber products which confirms that timber has been harvested in a sustainable manner.

Functional program

A *functional program* describes the requirements which a building must satisfy in order to support and enhance human activities. The program also defines the character, services, scope, functions and space requirements.

Girth

Diameter of a tree trunk measured at 1.3 m above ground; or refers as Diameter at Breast Height (DBH)

Global Warming Potential

GWP provides a measure of the potential for damage that a chemical has relative to one unit of carbon dioxide, the primary greenhouse gas

Global Warming Potential

Global Warming Potential, GWP, provides a measure of the potential for damage that a chemical has relative to one unit of carbon dioxide, the primary greenhouse gas.

Ground Granulated Blast Furnace Slag (GGBS)

GGBS is a by-product of the iron manufacturing industry that, after the molten iron is tapped off, the remaining molten slag (consisting of mainly

siliceous and aluminous residue) is then water-quenched rapidly, dried and ground to the required size.

Height of Building

The height of a building refers to the delta mPD between street level and the highest top roof as recorded in statutory documents

(Cant we refer to GBP's G/F mPD - Ma?)

High Void

A high void is a space over 9m measured vertically by its clear height between building structure. Any structures inside a void and the clear vertical height between structures is over 9m, the space between structures is regarded as a high void. For multi-building development, the calculation of percentages of high voids to total building heights shall be considered for individual buildings separately

Hotel Building

Hotel Building means a building intended to be used for habitation. The entire building is under single ownership, for example hotel, service apartment and dormitory.

Hydro-chlorofluorocarbons

HCFCs cause ozone depletion when released into the atmosphere.

Hydro-fluorocarbons

HFCs are commonly used to replace HCFC refrigerants to reduce the OPD, however HFCs refrigerants have a high GWP.

Interior general Lighting

Interior general Lighting**,** lighting that provides a substantially uniform level of illumination through an area. General lighting shall not include decorative lighting or lighting that provides a dissimilar level of illumination to serve a specialized application or feature within such area.

Intermediate waste recycling facility

IWF means waste recycling facility located within 60m walking distance from an external entrance of a low-rise domestic house.

Intra-Urban Heat Index

The effects of intra-urban heating can be quantified by *Intra-urban heat index*, which is defined as the temperature difference between urban and reference meteorological air temperature. Higher *Intra-urban heat index* suggests a more severe intra-urban heating effect.

Local velocity ratio (LVR)

Corresponds to the average velocity ratio of the **overall test points in the open spaces** in the assessment area

Main pedestrian access pathways

The widest pathway(s) of width not less than 2m for pedestrian circulation from building main entrance(s) to *site* entrance(s) or amenities within the *Site*

Master Plan

The masterplan design that certified under BEAM Plus Neighbourhood certification, that has a validity of 5 years and is “scheme sensitive”.

Modular Component

Materials which are manufactured with standardized dimensions, and can be arranged or fitted together in various scenarios of design.

Multi-disciplinary design *charrette*

An intensive, multiparty workshop that brings people from different disciplines and backgrounds together to explore, generate, and collaboratively produce design options.

Non-renewable resource

A resource does not renew itself at a sufficient rate for sustainable extraction in meaningful human time-frames.

Normally occupied spaces

Normally occupied spaces are enclosed areas where people normally stay more than 1 hour. Spaces which are not used daily, but will be occupied for more than one hour when used, are considered *normally occupied spaces*. Refer to Appendix 9.4 for examples of regularly occupied spaces.

Not *normally occupied spaces*

Not normally occupied spaces are enclosed areas within the building where people normally stay less than 1 hour. Refer to Appendix 9.4 for examples of not *normally occupied spaces*.

Occupied Space (Habitable Space)

Enclosed space intended for human activities, excluding those spaces that are intended primarily for other purposes, such as storage rooms and equipment rooms, and that are only occupied occasionally and for short

periods of time. Occupied spaces are further classified as regularly occupied or non-regularly occupied spaces based on the duration of the occupancy, individual or multi-occupant based on the quantity of occupants, and densely or non-densely occupied spaces based on the concentration of occupants in the space.

Open planned design

Open plan is the design for any floor plan which makes use of large, open spaces and minimizes the use of small, enclosed rooms such as private offices

Orientation

Orientation is the compass direction the facade faces

Other Building Type

Other Building Type include, but not limited to, government building, industrial building, data centre, pump house, hospital, library, museum and law court.

Ozone Depleting Potential

ODP of a chemical compound is the relative amount of degradation to the ozone layer it can cause.

Permeability coefficient

A measure of a material's capacity to transmit water. It is defined as a constant of proportionality relating the specific discharge of a porous medium under a unit hydraulic gradient. Hydraulic conductivity is another term for coefficient of permeability.

Primary zone

The 15m vertical zone of a *site* along the abutting street level. The greenery in this zone is for providing visual contacts or access from a street through common parts of the building for enhancing the walkability of urban space to the public, visitors or occupiers. The top level of soil or similar base for planting should be taken as the reference level for inclusion in the Primary Zone**.**

Public realm

Public spaces within and surrounding the *Site* for socialization and enjoyment by the community

Pulverised Fuel Ash (PFA)

PFA is a by-product from power plant as a partial replacement for cement in concrete.

Rapidly Renewable Materials

Planted and harvested in less than a 10-year cycle, and do not result in significant biodiversity loss, increased erosion, or air quality impacts.

Recycle Content

With reference to ISO 14021, recycle content is defined as the proportion, by mass, of the recycled material in a product.

Regional Materials

Materials which are extracted and manufactured within an 800km radius of HKSAR by road transportation; within a 1,600km radius by rail transportation; or within a 4,000km radius by sea transportation.

Residential Building

Residential Building means a building intended to be used for habitation. The building is under multiple ownerships.

Reuse

Materials which can be used again with the same functions as their original use.

Roll-out plan

The Rollout Plan describes the overall plan for the attaining BEAM Plus EB certification. The plan is an increment-based approach that includes specific tasks, actions, milestones, and action parties.

Runoff coefficient

A dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land).

“simple box” environmental/ energy modelling

A simple energy analysis that informs the team about the building’s likely distribution of energy consumption and is used to evaluate potential project energy strategies. A simple box analysis uses sketches and schematic building information. Block blush calculation is expected to demonstrate the building operation pattern. Also refers as “building-massing modelling”.

Site

Site refers to the land, water, vegetation and developable area that constitute the project application *site* within BEAM Plus assessment boundary.

***Site* velocity ratio (SVR)**

Corresponds to the average velocity ratio of the **perimeter test points on site boundary**.

Solar Reflectance Index (SRI)

The *Solar Reflectance Index (SRI)* is a measure of the solar reflectance and emissivity of materials that can be used as an indicator of how hot they are likely to become when solar radiation is incident on their surface. The lower the SRI, the hotter a material is likely to become in the sunshine.

South orientated facade

For building elevation plan that is within 15deg of true south. Building elevation plan that partly fall into the range of 15deg of true south, the entire elevation will be considered as *south orientated facade*.

Sub-structure

Substructure is the part of the structure which is below ground level or supporting *superstructure* loads, such as foundation and basement.

Superstructure

Superstructure is the part of the structure which is above ground level, and which serves the purpose of its intended use.

Sustainable Building Design (SBD) Guidelines

A guideline, promulgated by the Buildings Department, on building design which aim to enhance the quality and sustainability of the built environment in Hong Kong.

Sustainable Forestry Product

Timber or timber products are originally sourced from forestlands participating in an acceptable system or program which certifies sustainable forest management.

Tree Coverage

Area covered by crown of design trees

Unoccupied spaces

Unoccupied spaces are areas within the building where the primary function is not intended for human activities. These spaces are occupied by occupants for a short period of time and only occasionally. Refer to Appendix 9.4 for examples of *unoccupied spaces*.

Whole-systems thinking

A method of analysis and decision-making that looks at the interrelationships of the constituent parts of a system rather than narrowly focusing on the parts themselves.

Wind tunnel

Wind tunnels are large tubes with air moving inside. The tunnels are used to copy the potential air movement, pressure and turbrance around the object.

9 Appendices

9.2 EU 2 Path 1 (Performance Approach)

Whole Building Energy Simulation is required for Path 1 compliance. Both the baseline building model and the proposed building model must cover all building energy components listed in this appendix. The simulation models for calculating the baseline and proposed case building should be developed in accordance with the modelling methodology and the requirements per building category in the following Table-App 1 - 4.

Energy Modelling Methodology

The simulations for the proposed model and baseline model must be calculated using:

(i) the same software

(ii) the same weather data

(iii) the same operating schedules; unless justification is provided through Exceptional Calculation Method (ECM). Otherwise, default operation schedule in Table 4 shall be used.

(iv) the same occupancy density

(v) the same building design in terms of shape

(vi) the same outdoor and indoor design conditions, and

(vii) the same internal illuminance levels (lux) for space lightings

(viii) the same **thermal block** based on similar internal load densities, occupancy, lighting, thermal and space temperature schedules, and in combination with the following guidelines:

- Separate thermal blocks should be assumed for interior and perimeter spaces. Interior spaces should be those located greater than 5m from an exterior wall. Perimeter spaces should be those located within 5m of an exterior wall.
- Separate thermal blocks should be assumed for spaces adjacent to glazed exterior walls; a separate zone should be provided for each *orientation*, except that *orientation*s that differ by less than 45 degrees may be considered to be the same *orientation*. Each zone should include all floor area that is 5m or less from a glazed perimeter wall, except that floor area within 5m of glazed perimeter walls having more than one *orientation* should be divided proportionately between zones.
- Separate thermal blocks should be assumed for spaces having floors that are in contact with the ground or exposed to ambient conditions from zones that do not share these features.
- Separate thermal blocks should be assumed for spaces having exterior ceiling or roof assemblies from zones that do not share these features

Exceptional Calculation Method (ECM)

When no simulation program can adequately model a design, materials or device, an ECM can be used to demonstrate above-standard performance. Its adoption is subject to justification (submitted by the Applicant) of its underlying principles, quantitative & qualitative techniques, assumptions etc. in details.

Any claim of non-regulated load saving or strategies that lead to a difference between proposed and baseline model is required to submit a narrative and provide with ECM calculation.

ECM is allowed to create a representation of that element. If the methodology of approximation has not been previously published in any technical circular or FAQ, it is the responsibility of the applicant to submit a narrative explanation describing the calculation methodology and providing the results for energy savings if necessary.

Documentation include the minimum:

(i) Description of software limitation;

(ii) Description of design mechanism

(iii) Description of calculation mythology, theoretical and empirical information to support the accuracy of the method;

(iv) Demonstrate result and corresponding saving

Necessary software being used in calculation other than that used for building energy assessment shall provide corresponding verification

Table-App 1 Modeling Requirements for Calculating Proposed and Baseline Building Performance

Baseline case	Proposed case
Building Envelope	
a. *Orientation*: The baseline case shall be generated by simulating the building with its actual *orientation* and again after rotating the entire building 90, 180, and 270 degrees, then averaging the results. **Exception**: for multiple buildings project applicant could consider not implement this clause. Under this condition benefits from *orientation* shall be demonstrated through ECM. b. *External Shading*: No shading projections shall be modelled; No manual window shading devices shall be modelled. c. Infiltration: Operable window: 1L/s/m^2, pressure at 75Pa accordance with NFRC 400 or ASTM E283[1] Curtain wall and glazed shop front:0.3L/s/m^2, pressure at 75Pa accordance with NFRC 400 or ASTM E283	a. All components of the building envelope in the proposed case shall be modelled as shown on design documents (or as-built for existing building envelopes)
***Residential Building* & Residents' Recreational Facilities (RRF)**	
a. Above grade Wall & Roof: Create baseline opaque thermal properties for assessed building that just meet the regulatory requirement [2] $RTTV_{wall}$: 14W/m^2; $RTTV_{roof:}$: 4W/m^2, AND if applicable $OTTV_{RRF, tower}$: 21W/m^2; $OTTV_{RRF, podium:}$: 50W/m^2 b. Below grade Walls: Modelled identically with the proposed case c. The baseline shall be developed from the proposed building envelope design for the above target with below steps: Step 1: No shading projections shall be modelled; No manual window shading devices shall be modelled. Step 2: Exclude roof insulation Step 3: Adjust the window-to-wall area ratio (WWR) to achieve the targeted RTTV/OTTV value, Step 4: If RTTV/OTTV targeted value cannot be achieved under 80% WWR, relax the glazing SC value. The final SC value shall not be greater than 0.65. d. If there is existing building envelopes, the model shall reflect the existing conditions prior to any revision that are part of the scope of work being evaluated	a. All components of the building envelope in the proposed case shall be modelled as shown on design documents (or as-built for existing building envelopes). This included: Building geometry and window design *Albedo* of the envelope Thermal properties for the external walls, roof, floors and fenestrations (vertical fenestration and skylight) SC and VLT for fenestrations b. No manual fenestration shading devices such as blinds or shades shall be modelled. Automatically controlled fenestration shades or blinds might be modelled with creditable documentation provided. c. Permanent shading devices such as fins, overhangs and light shelves may be modeled.

1 ANSI/ASHRAEIES Standard 90.1-2016 – Energy Standard for Buildings Except Low-Rise *Residential Building*s

2 Buildings Department – PNAP APP-156 – Design and Construction Requirements for Energy Efficiency of *Residential Building*s; AND Buildings Department – Guideline on Design and Construction Requirements for Energy Efficiency of Residential Buildings 2014

Baseline case	Proposed case
Commercial buildings*, *Hotel Building* & all *other building types	
a. Above grade Walls & Roof: Create a baseline that just meet the regulatory requirement [3] $OTTV_{tower}$: 21W/m^2; $OTTV_{podium}$: 50W/m^2 b. Below grade Walls: modelled identically with the proposed case c. The baseline shall be developed from the proposed building envelope design for the above target with below steps: Step 1: Exclude any *external shading* device Step 2: Exclude roof insulation Step 3: Adjust the window-to-wall area ratio (WWR) to achieve the targeted OTTV value, Step 4: If OTTV targeted value cannot be achieved under 80% WWR, relax the glazing SC value. The final SC value shall not be greater than 0.65. d. Existing building envelopes shall reflect the existing conditions prior to any revision that are part of the scope of work being evaluated	a. All components of the building envelope in the proposed case shall be modelled as shown on design documents (or as-built for existing building envelopes). This included: Building geometry and window design *Albedo* of the envelope Thermal properties for the external walls, roof, floors and fenestrations (vertical fenestration and skylight) SC and VLT for fenestrations b. No manual fenestration shading devices such as blinds or shades shall be modelled. Automatically controlled fenestration shades or blinds might be modelled with creditable documentation provided. c. Permanent shading devices such as fins, overhangs and light shelves may be modelled.

[3] Buildings Department - PNAP APP-67 – Energy Efficiency of Buildings, Building (Energy Efficiency) Regulation; Code of Practice for Overall Thermal Transfer Value in Buildings 1995

Baseline case	Proposed case
***Interior General Lighting* System**	
Lighting that provides a substantially uniform level of illumination through an area. General lighting shall not include decorative lighting or lighting that provides a dissimilar level of illumination to serve a specialized application or feature within such area. All installed lighting shall be modelled in each **thermal block**. 1. Lighting Power shall be determined in space by space method with same categorization as the proposed design. 2. Lighting system power shall include all lighting system components shown or provided for on the plans for background lighting. Lighting system that solely use for emergency purpose is not in scope. 3. Lighting power shall include all power used by the luminaires, including lamps, ballasts, transformers and control devices. 4. Any independently operating lighting systems in a space that are capable of being controlled to prevent simultaneous user operation, the installed interior lighting power shall be based solely on the lighting system with the highest wattage 5. Lighting equipment that additional to general lighting requirement for a space and is controlled by an independent control device is not included. 6. Lighting that is integral to equipment or instrumentation and is installed by its manufacturer is not included in this assessment methodology 7. For space that the completed fixed lighting installations in the space does not exceed 70W, baseline shall be modelled as 70W in the space 8. Lighting installations in BEC TG-2018 ver.0 [4] clauses 5.1.2 are excluded. 9. Automatic lighting control shall be modelled in the baseline case in accordance to BEC2018 ver.0 [5] table 5.4 and clauses 5.6. Residential dwelling unit is excluded from this requirement. **Exceptions**: emergency lighting that is automatically off during normal building operation; lighting that is specially designated as required by a health or life safety statute, ordinance, or regulation	
Residential Building	
a. The lighting power density within the dwelling unit shall be set equal to the below: Bedroom: 13 W/m^2 Living Room/ Dining Room: 15 W/m^2 Kitchen: 13 W/m^2 Bathroom: 13W/m^2 *For <u>any other</u> space type in the building, please refer to BEC 2018 Table 5.4 maximum allowable Lighting Power Density (LPD). b. Lighting Control shall be included to reflect the mandatory control requirements in BEC 2018 for spaces other than dwelling units in a building. c. Daylight responsive control shall be modelled for the space (other than dwelling units) with fenestration area exceeding 5 sq.m and with lighting electrical consumption at 150W and	a. Dwelling Unit where a complete lighting system designed (or installed) shall be consistent with design documents (or actual equipment used). b. Dwelling Unit where a lighting system neither exists nor is specified in a space, lighting power shall be modelled identically with the baseline case, unless a legal bounding agreement is provided for the future users. c. For other spaces where a complete lighting system designed (or installed) shall be consistent with design documents (or actual equipment used) d. For other spaces where a lighting system neither exists nor is specified in a space, lighting power shall be modelled identically with the baseline case. e. For automatic lighting controls in addition to those mandatory requirements in BEC 2018, Exceptional Calculation Method (ECM) is

4 Technical Guidelines on Code of Practise for Energy Efficiency of Building Services Installation 2018 (Ver. 0) – Electrical and Mechanical Services Department HKSAR

5 Code of Practise for Energy Efficiency of Building Services Installation (Ver.0) – Electrical and Mechanical Services Department HKSAR

Baseline case	Proposed case
above. 50% of reduction in perimeter zone is required in response to daylight. d. Automatic lighting control (occupancy sensor) for space (other than dwelling unit) with lighting electrical consumption at 150W and above. 50% of reduction in perimeter zone is required	required to justify the modification of lighting schedules uses for the proposed case. Credible technical documentation for the modification shall be provided.
Commercial Buildings*, hotels & *other building types	
a. Lighting power shall be modelled with reference to the maximum allowable LPD in BEC 2018 Table 5.4 b. For space that that cannot be determined from the BEC 2018 Table 5.4, LPD could be advised by professional and justification shall be provided for advanced approval. c. Daylight responsive control shall be modelled for the space with fenestration area exceeding 5 sq.m and with lighting electrical consumption at 150W and above. 50% of reduction in perimeter zone is required in response to daylight. d. Automatic lighting control (occupancy sensor) for space with lighting electrical consumption at 150W and above. 50% of reduction in perimeter zone is required	a. For spaces where a complete lighting system designed (or installed) shall be consistent with design documents (or actual equipment used) b. For spaces where a lighting system neither exists nor is specified in a space, lighting power shall be modelled identically with the baseline case, unless a legally bounding documents for future use is provided to justify the input. c. For automatic lighting controls in addition to those mandatory requirements in BEC 2018, ECM is required to justify the modification of lighting schedules uses for the proposed case. Credible technical documentation for the modification shall be provided.
Receptacle and Other Load (Process Load)	
Energy for receptacle, and process loads (unregulated load) shall be modelled with respect to building type. Process load shall be input as per design information to reflect the expected energy consumption. Justification shall be provided by applicant through ECM. If no information could be provided, default power density shall be used for the below space type[6] Office: 25W/m^2 Retail: 15W/m^2 For retail shop that might include refrigeration equipment, cooking and food preparation, clothes washing and other major support appliances, pre-defined value in LEED v4 Appendix 3 Table 1-4 shall be used. Grocery Store: 27W/m^2 Residential Unit, Hostel, Dormitory: 0.25W/m^2 Hotel Guest Room: 900W/room Classroom / Lecture theatre: 10W/m^2	

[6] LEED 2009 Appendix 2, Table 1, LEED v4 Appendix 3, Table 1-4 and EMSD - Performance-based Building Energy Code 2007 "Space type categories: default assumptions"

Baseline case	Proposed case
Data Centre: 900W/m^2	
a. Receptacle and process loads shall be estimated based on the building type or space type category and shall be assumed to be identical in the proposed and baseline case, unless advance approved by ECM	a. Receptacle and process loads shall be input as design information with supporting through ECM; if no information could be provided, default value shall be used. b. Both baseline and proposed case shall be modelled identically, including power, schedule and control. c. If both cases are not identical, submission of ECM is required to support the justification by professional with
Miscellaneous	
Miscellaneous energy uses are defined as those that may be treated separately since they have little or no interaction with the conditioned thermal blocks or the HVAC systems that serve them. • Exterior Lighting System • Services Hot Water System • Lift & Escalator System • Irrigation, plumbing and drainable, fire services	
Exterior Lighting System	
a. Where exterior lighting system has been specified (or installed) in the proposed case, the system shall be modelled identically with the proposed case. b. Where no exterior lighting has been specified in proposed case, no exterior lighting shall be modelled	a. When exterior lighting system has been specified (or installed) in the proposed case, the system shall be modelled consistent with design documents (or actual system information) b. Where no exterior lighting has been specified in proposed case, no exterior lighting shall be modelled.
Services Hot Water System For a combination of equipment and auxiliary devices (e.g. controls, accessories, interconnecting means and terminal elements) by which energy is transformed so it heats up water for domestic or commercial purpose other than space heating and process requirements.	
a. Where service hot-water system has been specified (or installed) in the proposed case, the system shall be sized identical to the proposed case, where energy source shall be electrical heater. Efficiency for the water heater shall be 80%. b. Where no service hot water system has been specified but the building will have service hot-water loads, a service water system using electrical heater shall be used. Efficiency for the water heater shall be 80% c. For buildings that will have no service hot-water loads, no service hot-water heating shall be modelled d. Service hot-water energy consumption shall be calculated explicitly based upon the volume of service hot water required and the entering makeup water and the leaving service hot-water temperatures. Leaving temperature shall be	a. Where a service hot-water system has been specified (or installed) in the proposed case, the system shall be modelled consistent with design documents (or actual system information). b. Where no service hot water system has been specified but the building will have service hot water loads, a service water system shall be modelled identical to the baseline case c. For building that will have no service hot-water loads, no service hot-water heating shall be modelled.

Baseline case	Proposed case
based upon the end-use requirements in proposed case. e. Service water loads and usage shall be the same for both the baseline case and the proposed case.	
Lift and Escalator System	
a. With reference to proposed design equipment rank, input by identifying each corresponding maximum allowable electrical power according to Section 8.4 in BEC 2018 ver.0.	a. Where lift and escalator system has been specified (or installed), the system shall be modelled consistent with design documents (or actual system information) b. For controls in addition to those mandatory requirements in BEC 2018, ECM is required to justify the modification of lift schedules uses for the proposed case. Credible technical documentation for the modification shall be provided.
Irrigation, Plumbing and Drainage, Fire Services	
a. No system to be modelled	a. No system to be modelled
On-*site* Power Generation	
a. No on-*site* power generation to be modelled	a. Where an on-*site* power generation system has been specified (or installed) in the proposed case, the system shall be modelled consistent with design documents (or actual system information)

Baseline Case	Proposed case
HVAC system	

1. General
   - Weather conditions used in sizing runs to determine baseline equipment capacities maybe based either on hourly historical weather files containing typical peak conditions or on design days developed using 99.6% heating design temperatures and 1% dry-bulb and 1% wet bulb cooling design temperature
   - Outdoor condition to be used for both baseline and proposed case sizing shall reference to BEC 2018 Table 6.4.
   - Indoor condition (s) to be used for both baseline and proposed case shall be identical. Justification shall be provided else value in BEC 2018 Table 6.4 shall be used.
2. All conditioned spaces in the proposed design should be simulated as being both heated and cooled even if no heating or cooling system is to be installed and temperature and humidity control set points and schedules should be the same for proposed and baseline building designs unless justification is provide through ECM calculation.
3. The HVAC system(s) in baseline building design shall be of the type and description specified in Table 2 “Baseline HVAC System Setting Summary”.
4. Equipment Efficiencies

   All HVAC equipment in the baseline case shall be modelled at the minimum efficiency levels, both part load and full load, in accordance with BEC 2018 ver.0 Table 6.12a (Part 1) and Table 6.12b.

Baseline Case	Proposed case
All HVAC equipment in the proposed case shall be modelled consistent with design documents (or actual installed equipment information) In both baseline and proposed case, for package type system the descriptor shall be broken down into its components so that supply fan energy can be modelled separately 5. Equipment Capacities The equipment capacities for the baseline case shall be based on sizing run and shall be oversized by 15% for cooling. 6. Minimum outdoor air ventilation rate shall be modelled identical in both baseline and proposed case. 7. Demand control is required in baseline case conditioned area when a space with design fresh air flow rate ≥ 1400 L/s 8. Design airflow rates for the baseline case shall be based on a supply-air-to-room-air temperature difference of 11ºC or the required ventilation air or makeup air, whichever is greater. If return or relief fans are specified in the proposed case, the baseline case shall also be modelled with fans serving the same functions and sized for the baseline supply fan air quality less the minimum outdoor air, or 90% of the supply fan air quantity, whichever is larger 9. Design chilled water temperature to be used in the baseline case shall reference to the corresponding value in BEC 2018 Table 6.12b (7ºC / 12.5ºC) 10. Chilled water pump shall be modelled as 65% combined impeller and motor efficiency for baseline case 11. Performance impact due to pipe / duct loses and refrigerant pipe length are not considered in this assessment methodology 12. Existing equipment shall be modelled identical in both baseline and proposed case. The corresponding energy consumption shall be separately metered.	
Residential Building	
(i) Public housing: a. Space: residential unit, common area and recreational facilities area (e.g. communal area) should be modelled with unitary (non-split type) unit. b. Space: kitchen and toilet should be modelled with mechanical ventilation only. Mechanical fans should be 1.1W/L/s of exhaust air flow rate *Calculation method refer to Section 6.7.6.1 in BEC 2018 ver.0.	(i) Public housing: a. Space where complete HVAC system has been designed (or installed), the model shall consistent with design documents (or actual system type used). b. Space where no HVAC system has been designed (or installed) but AC platform is designed for future provision, the HVAC system should be identical to the system modelled in baseline (unitary, non-split type) **Exception**: if natural ventilation design and provision is provided, justification is required through ECM calculation to demonstrate the number of non-AC hours (with reference to ASHRAE 62.1-2013) that complied with design condition for natural ventilation. c. Space where no HVAC system has been designed (or installed) and no AC platform is designed for future provision, no HVAC system has to be modelled.
(ii) Private housing: a. Space: residential flat, common area and recreational facilities area (e.g. club house) should be modelled with unitary (split type) unit b. Space: kitchen and toilet should be modelled with mechanical ventilation only, Mechanical fans should be 1.1W/L/s of exhaust air flow rate	(ii) Private housing: a. Space where complete HVAC system has been designed (or installed), the model shall consistent with design documents (or actual system type used). b. Space where no HVAC system has been designed (or installed) but AC platform is designed for future provision, the HVAC system

Baseline Case	Proposed case
*Calculation method refer to Section 6.7.6.1 in BEC 2018 ver.0.	should be identical to the system modelled in baseline (unitary (split type) **Exception**: if natural ventilation design and provision is provided, justification is required through ECM calculation to demonstrate the number of non-AC hours that complied with design condition (with reference to ASHRAE 62.1-2013) for natural ventilation. c. Space where no HVAC system has been designed (or installed) and no AC platform is designed for future provision, no HVAC system has to be modelled.
Commercial, hotels, educational and *other building types*	
(iii) Commercial, hotels, educational and other buildings with air conditioned floor area < 14,000 sqm a. Conditioned space should be modelled with Unitary air-conditioner –split type unit b. Non-conditioned space should be modelled with mechanical ventilation only, Mechanical fans should be 1.1W/L/s of exhaust air flow rate *Calculation method refer to Section 6.7.6.1 in BEC 2018 ver.0.	(iii) Commercial, hotels, educational and other buildings with air conditioned floor area < 14,000 sqm a. Space where complete HVAC system has been designed (or installed), the model shall consistent with design documents (or actual system type used). b. Space where no HVAC system has been designed (or installed) but AC platform is designed for future provision, the HVAC system should be identical to the system modelled in baseline (Unitary air-conditioner – non-split type unit) **Exception**: if natural ventilation design and provision is provided, justification is required through ECM calculation to demonstrate the number of non-AC hours that complied with design condition (with reference to ASHRAE 62.1-2013) for natural ventilation. The corresponding design shall be equipped with automatic change over provision. c. Space where no HVAC system has been designed (or installed) and no AC platform is designed for future provision, no HVAC system has to be modelled.
(iv) Commercial, hotels, educational and other buildings with air conditioned floor area ≥ 14,000 sqm a. Conditioned space should be modelled with VAV system with reheat. b. Supply fan system shall be 2.1W/L/s *Calculation method based on description stated in Section 6.7.3 and 6.7.5 in BEC 2018 ver.0. c. Non-conditioned space should be modelled with mechanical ventilation only, Mechanical fans should be 1.1W/L/s of exhaust air flow rate *Calculation method refer to Section 6.7.6.1 in BEC 2018 ver.0. d. Chiller configuration shall meet the specific requirements in Table 3	(iv) Commercial, hotels, educational and other buildings with air conditioned floor area ≥ 14,000 sqm a. Space where complete HVAC system has been designed (or installed), the model shall consistent with design documents (or actual system type used). b. Space where no HVAC system has been designed (or installed) but AC platform is designed for future provision, the HVAC system should be identical to the system modelled in baseline (unitary (split type) **Exception**: if natural ventilation design and provision is provided, justification is required through ECM calculation to demonstrate the number of non-AC hours that complied with design condition (with reference to ASHRAE 62.1-2013) for

Baseline Case	Proposed case
	natural ventilation. The corresponding design shall be equipped with automatic change over provision.
District cooling system (if applicable)	
a. Set-up a virtual main plant based on building cooling load: **< 2000kW:** 2 water cooled centrifugal chillers with same capacity **2000≤ cooling load< 9000kW:** no chiller larger than 1000kW & all sized equally **≥ 9000kW**: no chiller larger than 3000kW & all sized equally b. Performance of individual components refer to BEC 2018 ver.0 Table 6.12b c. Virtual primary variable pumping system shall be included	a. Based on actual efficiency performance; or b. If project team cannot obtain actual performance data for main plant, it is permissible to use the following default average performance values: DCS cooling plant – COP of 4.4 for total cooling plant average efficiency (including cooling towers and primary pumps) c. Seasonal Thermal distribution losses – including minor leaks and condensate losses (but not pumping energy, which must be accounted for separately where it applies): chilled water district cooling: 5%
Ventilation System	
Carpark ventilation (if applicable) shall be operated with staging of fans, provide down to 50% less of the design capacity *Calculation method based on description stated in Section 6.10.7 in BEC 2018 ver.0.	Carpark ventilation shall be consistent with design documents (or actual system installed)

Table-App 2 Baseline HVAC System Setting Summary

	Residential		Commercial, Hotels , Educational and *Other Building Types*		Any Building Types that used District Cooling System (DCS)
	Public Housing	Private Housing	Air-conditioned Floor Area < 14,000 m^2	Air-conditioned Floor Area ≥ 14,000 m^2	
Cooling Generation	Unitary air-conditioner – non-split type	Unitary air-conditioner – split type	Unitary air-conditioner –split type	Chiller	District Chiller plants
Heating Generation	Unitary air-conditioner – non-split type	Unitary air-conditioner – split type	Unitary air-conditioner –split type	Electric Resistance	Electric Resistance
Performance of Individual Components Guideline	BEC 2018 ver.0 Table 6.12a (Part 1)	BEC 2018 ver.0 Table 6.12a (Part 1)	BEC 2018 ver.0 Table 6.12a (Part 1)	BEC 2018 ver.0 Table 6.12b	BEC 2018 ver.0 Table 6.12b
Terminal Type	N/A	N/A	N/A	VAV with reheat	VAV with reheat
Heat Rejection	Air-cooled	Air-cooled	Air-cooled	Water-cooled*	Water-cooled

* For projects not under Fresh WaterCooling Towers (FWCT) Scheme, air-cooled chiller is allowed in baseline setting.

Table-App 3 - Baseline Chiller configuration

Buildings with air-conditioned Floor Area	**Number and type of chiller (s)**
< 20,000 m^2	2 water-cooled screw chillers sized equally
≥ 20,000 m^2	2 water-cooled centrifugal chillers minimum with chillers added so that no chiller larger than 2800kW, all sized equally
All type	Primary/secondary systems with variable speed drives on secondary pumping loop

Table-App 4 Default operation Schedule for Calculation[7]

Assembly Occupancy

Hour of Day (Time)	Schedule for Occupancy			Schedule for Lighting / Receptacle			Schedule for HVAC System			Schedule for Service Hot Water			Schedule for Elevator		
	Percent of Maximum Load			Percent of Maximum Load						Percent of Maximum Load			Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12 - 1am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
2 (1 - 2am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
3 (2 - 3am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
4 (3 - 4am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
5 (4 - 5am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
6 (5 - 6am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
7 (6 - 7am)	0	0	0	35/40	5	5	On	On	On	0	0	0	0	0	0
8 (7 - 8am)	0	0	0	35/40	30	30	On	On	On	0	0	0	0	0	0
9 (8 - 9am)	20	20	10	35/40	30	30	On	On	On	0	0	0	0	0	0
10 (9 - 10am)	20	20	10	65/75	40/50	30	On	On	On	5	5	5	0	0	0
11 (10 - 11am)	20	20	10	65/75	40/50	30	On	On	On	5	5	5	0	0	0
12 (11 - 12pm)	80	60	10	65/75	40/50	30	On	On	On	35	20	10	0	0	0
13 (12 - 1pm)	80	60	10	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
14 (13 - 2pm)	80	60	70	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
15 (14 - 3pm)	80	60	70	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
16 (15 - 4pm)	80	60	70	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
17 (16 - 5pm)	80	60	70	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
18 (17 - 6pm)	80	60	70	65/75	40/50	55/65	On	On	On	0	0	0	0	0	0
19 (18 - 7pm)	20	60	70	65/75	40/50	55/65	On	On	On	0	0	0	0	0	0
20 (19 - 8pm)	20	60	70	65/75	40/50	55/65	On	On	On	0	65	65	0	0	0
21 (20 - 9pm)	20	60	70	65/75	40/50	55/65	On	On	On	0	30	30	0	0	0
22 (21 - 10pm)	20	80	70	65/75	40/50	55/65	On	On	On	0	0	0	0	0	0
23 (22 - 11pm)	10	10	20	25	40/50	5	On	On	On	0	0	0	0	0	0
24 (23 - 12am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
Total/Day	710	750	700	1010/1155	660/800	745/845	1800	1700	1700	70	125	115	0	0	0
Total/Week	50.50 hours			64.55/74.20 hours			124 hours			5.9 hours			0 hours		
Total/Year	2633 hours			3357/3869 hours			6465 hours			308 hours			0 hours		

wk = Weekday

1. Elevator schedules, except for resturants, are from the U.S. Department of Energy Standard Evaluation Techniques, except they have been changed to 0% when occupancy is 0%. These values may be used only if actual schedules are not known.
2. Lighting profiles are modified to reflect the requirement for occupancy sensors in space

[7] ASHRAE 90.1-2010

Office Occupancy

Hour of Day (Time)	Schedule for Occupancy			Schedule for Lighting / Receptacle			Schedule for HVAC System			Schedule for Service Hot Water			Schedule for Elevator		
	Percent of Maximum Load			Percent of Maximum Load						Percent of Maximum Load			Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12 - 1am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
2 (1 - 2am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
3 (2 - 3am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
4 (3 - 4am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
5 (4 - 5am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
6 (5 - 6am)	0	0	0	10	5	5	Off	Off	Off	8	8	7	0	0	0
7 (6 - 7am)	10	10	5	10	10	5	On	On	Off	7	7	4	0	0	0
8 (7 - 8am)	20	10	5	30	10	5	On	On	Off	19	11	4	35	16	0
9 (8 - 9am)	95	30	5	65/90	30	5	On	On	Off	35	15	4	69	14	0
10 (9 - 10am)	95	30	5	65/90	30	5	On	On	Off	38	21	4	43	21	0
11 (10 - 11am)	95	30	5	65/90	30	5	On	On	Off	39	19	4	37	18	0
12 (11 - 12pm)	95	30	5	65/90	30	5	On	On	Off	47	23	6	43	25	0
13 (12 - 1pm)	50	10	5	55/80	15	5	On	On	Off	57	20	6	58	21	0
14 (13 - 2pm)	95	10	5	65/90	15	5	On	On	Off	54	19	9	48	13	0
15 (14 - 3pm)	95	10	5	65/90	15	5	On	On	Off	34	15	6	37	8	0
16 (15 - 4pm)	95	10	5	65/90	15	5	On	On	Off	33	12	4	37	4	0
17 (16 - 5pm)	95	10	5	65/90	15	5	On	On	Off	44	14	4	46	5	0
18 (17 - 6pm)	30	5	5	35/50	5	5	On	On	Off	26	7	4	62	6	0
19 (18 - 7pm)	10	5	0	30	5	5	On	Off	Off	21	7	4	20	0	0
20 (19 - 8pm)	10	0	0	30	5	5	On	Off	Off	15	7	4	12	0	0
21 (20 - 9pm)	10	0	0	20	5	5	On	Off	Off	17	7	4	4	0	0
22 (21 - 10pm)	10	0	0	20	5	5	On	Off	Off	8	9	7	4	0	0
23 (22 - 11pm)	5	0	0	10	5	5	Off	Off	Off	5	5	4	0	0	0
24 (23 - 12am)	5	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
Total/Day	920	200	60	800/1040	280	120	1600	1200	0	537	256	113	555	151	0
Total/Week	48.60 hours			44.00/56.00 hours			124 hours			30.54 hours			29.26 hours		
Total/Year	2534 hours			2288/2920 hours			6465 hours			1592 hours			1526 hours		

wk = Weekday

1. Elevator schedules, except for resturants, are from the U.S. Department of Energy Standard Evaluation Techniques, except they have been changed to 0% when occupancy is 0%. These values may be used only if actual schedules are not known.
2. Lighting profiles are modified to reflect the requirement for occupancy sensors in space

Hotel Building Occupancy

Hour of Day (Time)	Schedule for Occupancy			Schedule for Lighting / Receptacle			Schedule for HVAC System			Schedule for Service Hot Water			Schedule for Elevator		
	Percent of Maximum Load			Percent of Maximum Load (Blg/Guest)									Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Use %	Sup Stp	Htg Stp	Wk	Sat	Sun
1 (12 - 1am)	90	90	70	20	20	30	On	On	On	20	20	25	40	44	55
2 (1 - 2am)	90	90	70	15	20	30	On	On	On	15	15	20	33	35	55
3 (2 - 3am)	90	90	70	10	10	20	On	On	On	15	15	20	33	35	43
4 (3 - 4am)	90	90	70	10	10	20	On	On	On	15	15	20	33	35	43
5 (4 - 5am)	90	90	70	10	10	20	On	On	On	20	20	20	33	35	43
6 (5 - 6am)	90	90	70	20	10	20	On	On	On	25	25	30	33	35	43
7 (6 - 7am)	70	70	70	40	30	30	On	On	On	50	40	50	42	40	52
8 (7 - 8am)	40	50	70	50	30	40	On	On	On	60	50	50	42	32	52
9 (8 - 9am)	40	50	50	40	40	40	On	On	On	55	50	50	52	45	65
10 (9 - 10am)	20	30	50	40	40	30	On	On	On	45	50	55	52	45	65
11 (10 - 11am)	20	30	50	25	30	30	On	On	On	40	45	50	40	42	53
12 (11 - 12pm)	20	30	30	25	25	30	On	On	On	45	50	50	51	60	60
13 (12 - 1pm)	20	30	30	25	25	30	On	On	On	40	50	40	51	65	53
14 (13 - 2pm)	20	30	20	25	25	20	On	On	On	35	45	40	51	65	51
15 (14 - 3pm)	20	30	20	25	25	20	On	On	On	30	40	30	51	65	50
16 (15 - 4pm)	30	30	20	25	25	20	On	On	On	30	40	30	51	65	44
17 (16 - 5pm)	50	30	30	25	25	20	On	On	On	30	35	30	63	65	64
18 (17 - 6pm)	50	50	40	25	25	20	On	On	On	40	40	40	80	75	62
19 (18 - 7pm)	50	60	40	60	60	50	On	On	On	55	55	50	86	80	65
20 (19 - 8pm)	70	60	60	80	70	70	On	On	On	60	55	50	70	80	63
21 (20 - 9pm)	70	60	60	90	70	80	On	On	On	50	50	40	70	75	63
22 (21 - 10pm)	80	70	80	80	70	60	On	On	On	55	55	50	70	75	63
23 (22 - 11pm)	90	70	80	60	60	50	On	On	On	45	40	40	45	55	40
24 (23 - 12am)	90	70	80	30	30	30	On	On	On	25	30	20	45	55	40

wk = Weekday

1. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques, except they have been changed to 0% when occupancy is 0%. These values may be used only if actual schedules are not known.
2. Lighting profiles are modified to reflect the requirement for occupancy sensors in space.

Residential Occupancy

Hour of Day (Time)	Schedule for Occupancy			Schedule for Lighting / Receptacle			Schedule for HVAC System			Schedule for Service Hot Water			Schedule for Elevator		
	Percent of Maximum Load			Percent of Maximum Load									Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Use %	Sup Stp	Htg Stp	Wk	Sat	Sun
1 (12 - 1am)	100	100	100	7	7	7	On	On	On	8	43	60	0	0	0
2 (1 - 2am)	100	100	100	7	7	7	On	On	On	4	43	60	0	0	0
3 (2 - 3am)	100	100	100	7	7	7	On	On	On	1	43	60	0	0	0
4 (3 - 4am)	100	100	100	7	7	7	On	On	On	1	43	60	0	0	0
5 (4 - 5am)	100	100	100	19	19	19	On	On	On	4	43	60	0	0	0
6 (5 - 6am)	100	100	100	39	39	39	On	On	On	27	43	60	0	0	0
7 (6 - 7am)	100	100	100	44	44	44	On	On	On	94	43	60	0	0	0
8 (7 - 8am)	85	85	85	39	39	39	On	On	On	1	43	60	35	16	0
9 (8 - 9am)	39	39	39	17	17	17	On	On	On	96	43	60	69	14	0
10 (9 - 10am)	25	25	25	12	12	12	On	On	On	84	43	60	43	21	0
11 (10 - 11am)	25	25	25	12	12	12	On	On	On	76	43	60	37	18	0
12 (11 - 12pm)	25	25	25	12	12	12	On	On	On	61	43	60	43	25	0
13 (12 - 1pm)	25	25	25	12	12	12	On	On	On	53	43	60	58	21	0
14 (13 - 2pm)	25	25	25	12	12	12	On	On	On	47	43	60	48	13	0
15 (14 - 3pm)	25	25	25	12	12	12	On	On	On	41	43	60	37	8	0
16 (15 - 4pm)	25	25	25	21	21	21	On	On	On	47	43	60	37	4	0
17 (16 - 5pm)	30	30	30	44	44	44	On	On	On	55	43	60	46	5	0
18 (17 - 6pm)	52	52	52	62	62	62	On	On	On	73	43	60	62	6	0
19 (18 - 7pm)	87	87	87	83	83	83	On	On	On	86	43	60	20	0	0
20 (19 - 8pm)	87	87	87	99	99	99	On	On	On	82	43	60	12	0	0
21 (20 - 9pm)	87	87	87	100	100	100	On	On	On	75	43	60	4	0	0
22 (21 - 10pm)	100	100	100	69	69	69	On	On	On	61	43	60	4	0	0
23 (22 - 11pm)	100	100	100	38	38	38	On	On	On	53	43	60	0	0	0
24 (23 - 12am)	100	100	100	16	16	16	On	On	On	29	43	60	0	0	0

wk = Weekday

Schedule is referenced to U.S. Department of Energy Commercial Reference Building Models of the National Building Stock NREL/TP-5500-46861 February 2011 – Table B-6 Midrise Apartment Hourly Operation Schedules

Parking Garage Occupancy

Hour of Day (Time)	Schedule for Occupancy			Schedule for Lighting / Receptacle			Schedule for HVAC System			Schedule for Service Hot Water			Schedule for Elevator		
	Percent of Maximum Load			Percent of Maximum Load						Percent of Maximum Load			Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12 - 1am)				50/100	50/100	50/100									
2 (1 - 2am)				50/100	50/100	50/100									
3 (2 - 3am)				50/100	50/100	50/100									
4 (3 - 4am)				50/100	50/100	50/100									
5 (4 - 5am)				50/100	50/100	50/100									
6 (5 - 6am)				50/100	50/100	50/100									
7 (6 - 7am)				100	100	50/100									
8 (7 - 8am)				100	100	50/100									
9 (8 - 9am)				100	100	50/100									
10 (9 - 10am)				100	100	50/100									
11 (10 - 11am)				100	100	50/100	Based on likely use						Included with other occupancies		
12 (11 - 12pm)		NA		100	100	50/100					NA				
13 (12 - 1pm)				100	100	50/100									
14 (13 - 2pm)				100	100	50/100									
15 (14 - 3pm)				100	100	50/100									
16 (15 - 4pm)				100	100	50/100									
17 (16 - 5pm)				100	100	50/100									
18 (17 - 6pm)				100	50/100	50/100									
19 (18 - 7pm)				100	50/100	50/100									
20 (19 - 8pm)				100	50/100	50/100									
21 (20 - 9pm)				100	50/100	50/100									
22 (21 - 10pm)				100	50/100	50/100									
23 (22 - 11pm)				50/100	50/100	50/100									
24 (23 - 12am)				50/100	50/100	50/100									
Total/Day				2000/2400	1750/2400	1200/2400									
Total/Week				129.50/168 hours											
Total/Year				6734/8760 hours											

wk = Weekday

1. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques, except they have been changed to 0% when occupancy is 0%. These values may be used only if actual schedules are not known.

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in space. For parking garage lighting, the schedule has been revised to accompany the office schedule: the lighting in the parking garage is set to be on at 100% for all hours when the building occupancy is 10% or greater, but reduced to 50% for all hours when the building occupancy is less than 10%. For other uses, it is acceptable to modify the parking garage schedule to parallel that use.

Restaurant Occupancy

Hour of Day (Time)	Schedule for Occupancy			Schedule for Lighting / Receptacle			Schedule for HVAC System			Schedule for Service Hot Water			Schedule for Elevator		
	Percent of Maximum Load			Percent of Maximum Load						Percent of Maximum Load			Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12 - 1am)	15	30	20	15	20	20	On	On	On	20	20	25	0	0	0
2 (1 - 2am)	15	25	20	15	15	15	On	On	On	15	15	20	0	0	0
3 (2 - 3am)	5	5	5	15	15	15	On	On	On	15	15	20	0	0	0
4 (3 - 4am)	0	0	0	15	15	15	Off	Off	Off	0	0	0	0	0	0
5 (4 - 5am)	0	0	0	15	15	15	Off	Off	Off	0	0	0	0	0	0
6 (5 - 6am)	0	0	0	20	15	15	Off	Off	Off	0	0	0	0	0	0
7 (6 - 7am)	0	0	0	35/40	30	30	Off	Off	Off	0	0	0	0	0	0
8 (7 - 8am)	5	0	0	35/40	30	30	On	Off	Off	60	0	0	0	0	0
9 (8 - 9am)	5	0	0	55/60	55/60	45/50	On	Off	Off	55	0	0	0	0	0
10 (9 - 10am)	5	5	0	55/60	55/60	45/50	On	On	Off	45	50	0	0	0	0
11 (10 - 11am)	20	20	10	85/90	75/80	65/70	On	On	On	40	45	50	0	0	0
12 (11 - 12pm)	50	45	20	85/90	75/80	65/70	On	On	On	45	50	50	0	0	0
13 (12 - 1pm)	80	50	25	85/90	75/80	65/70	On	On	On	40	50	40	0	0	0
14 (13 - 2pm)	70	50	25	85/90	75/80	65/70	On	On	On	35	45	40	0	0	0
15 (14 - 3pm)	40	35	15	85/90	75/80	65/70	On	On	On	30	40	30	0	0	0
16 (15 - 4pm)	20	30	20	85/90	75/80	65/70	On	On	On	30	40	30	0	0	0
17 (16 - 5pm)	25	30	25	85/90	75/80	55/60	On	On	On	30	35	30	0	0	0
18 (17 - 6pm)	50	30	35	85/90	85/90	55/60	On	On	On	40	40	40	0	0	0
19 (18 - 7pm)	80	70	55	85/90	85/90	55/60	On	On	On	55	55	50	0	0	0
20 (19 - 8pm)	80	90	65	85/90	85/90	55/60	On	On	On	60	55	50	0	0	0
21 (20 - 9pm)	80	70	70	85/90	85/90	55/60	On	On	On	50	50	40	0	0	0
22 (21 - 10pm)	50	65	35	85/90	85/90	55/60	On	On	On	55	55	50	0	0	0
23 (22 - 11pm)	35	55	20	45/50	45/50	45/50	On	On	On	45	40	40	0	0	0
24 (23 - 12am)	20	35	20	30	30	30	On	On	On	25	30	20	0	0	0
Total/Day	750	740	485	1370/1455	1290/1365	1040/1155	0	0	0	790	730	625	0	0	0
Total/Week	49.75 hours			91.80/97.55 hours			135 hours			53.05 hours			0 hours		
Total/Year	2594 hours			4774/5086 hours			7039 hours			2766 hours			0 hours		

wk = Weekday

1. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques, except they have been changed to 0% when occupancy is 0%. These values may be used only if actual schedules are not known.
2. Lighting profiles are modified to reflect the requirement for occupancy sensors in space.

Retail Occupancy

Hour of Day (Time)	Schedule for Occupancy			Schedule for Lighting / Receptacle			Schedule for HVAC System			Schedule for Service Hot Water			Schedule for Elevator		
	Percent of Maximum Load			Percent of Maximum Load						Percent of Maximum Load			Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12 - 1am)	0	0	0	5	5	5	Off	Off	Off	4	11	7	0	0	0
2 (1 - 2am)	0	0	0	5	5	5	Off	Off	Off	5	10	7	0	0	0
3 (2 - 3am)	0	0	0	5	5	5	Off	Off	Off	5	8	7	0	0	0
4 (3 - 4am)	0	0	0	5	5	5	Off	Off	Off	4	6	6	0	0	0
5 (4 - 5am)	0	0	0	5	5	5	Off	Off	Off	4	6	6	0	0	0
6 (5 - 6am)	0	0	0	5	5	5	Off	Off	Off	4	6	6	0	0	0
7 (6 - 7am)	0	0	0	5	5	5	On	On	Off	4	7	7	0	0	0
8 (7 - 8am)	10	10	0	20	10	5	On	On	Off	15	20	10	12	9	0
9 (8 - 9am)	20	20	0	50	30	10	On	On	On	23	24	12	22	21	0
10 (9 - 10am)	50	50	10	85/90	55/60	10	On	On	On	32	27	14	64	56	11
11 (10 - 11am)	50	60	20	85/90	85/90	40	On	On	On	41	42	29	74	66	13
12 (11 - 12pm)	70	80	20	85/90	85/90	40	On	On	On	57	54	31	68	68	35
13 (12 - 1pm)	70	80	40	85/90	85/90	55/60	On	On	On	62	59	36	68	68	37
14 (13 - 2pm)	70	80	40	85/90	85/90	55/60	On	On	On	61	60	36	71	69	37
15 (14 - 3pm)	70	80	40	85/90	85/90	55/60	On	On	On	50	49	34	72	70	39
16 (15 - 4pm)	80	80	40	85/90	85/90	55/60	On	On	On	45	48	35	72	69	41
17 (16 - 5pm)	70	80	40	85/90	85/90	55/60	On	On	On	46	47	37	73	66	38
18 (17 - 6pm)	50	60	20	85/90	85/90	40	On	On	Off	47	46	34	68	58	34
19 (18 - 7pm)	50	20	10	55/60	50	20	On	On	Off	42	44	25	68	47	3
20 (19 - 8pm)	30	20	0	55/60	30	5	On	On	Off	34	36	27	58	43	0
21 (20 - 9pm)	30	20	0	50	30	5	On	On	Off	33	29	21	54	43	0
22 (21 - 10pm)	0	10	0	20	10	5	Off	On	Off	23	22	16	0	8	0
23 (22 - 11pm)	0	0	0	5	5	5	Off	Off	Off	13	16	10	0	0	0
24 (23 - 12am)	0	0	0	5	5	5	Off	Off	Off	8	13	6	0	0	0
Total/Day	720	750	280	1060/1115	940/985	500/525	1500	1600	900	662	690	459	844	761	288
Total/Week	46.30 hours			67.40/70.85 hours			100 hours			44.59 hours			52.69 hours		
Total/Year	2414 hours			3505/3694 hours			5214 hours			2325 hours			2747 hours		

wk = Weekday

1. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques, except they have been changed to 0% when occupancy is 0%. These values may be used only if actual schedules are not known.
2. Lighting profiles are modified to reflect the requirement for occupancy sensors in space.

School Occupancy

Hour of Day (Time)	Schedule for Occupancy			Schedule for Lighting / Receptacle			Schedule for HVAC System			Schedule for Service Hot Water			Schedule for Elevator		
	Percent of Maximum Load			Percent of Maximum Load						Percent of Maximum Load			Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12 - 1am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
2 (1 - 2am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
3 (2 - 3am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
4 (3 - 4am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
5 (4 - 5am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
6 (5 - 6am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
7 (6 - 7am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
8 (7 - 8am)	5	0	0	30	5	5	On	Off	Off	10	3	3	0	0	0
9 (8 - 9am)	75	10	0	60/85	15	5	On	On	Off	34	3	5	30	0	0
10 (9 - 10am)	90	10	0	65/95	15	5	On	On	Off	60	5	5	30	0	0
11 (10 - 11am)	90	10	0	65/95	15	5	On	On	Off	63	5	5	30	0	0
12 (11 - 12pm)	80	10	0	65/95	15	5	On	On	Off	72	5	5	30	0	0
13 (12 - 1pm)	80	10	0	55/80	15	5	On	On	Off	79	5	5	30	0	0
14 (13 - 2pm)	80	0	0	55/80	5	5	On	Off	Off	83	3	5	30	0	0
15 (14 - 3pm)	80	0	0	55/80	5	5	On	Off	Off	61	3	3	30	0	0
16 (15 - 4pm)	45	0	0	50/70	5	5	On	Off	Off	65	3	3	15	0	0
17 (16 - 5pm)	15	0	0	35/50	5	5	On	Off	Off	10	3	3	0	0	0
18 (17 - 6pm)	5	0	0	35/50	5	5	On	Off	Off	10	3	3	0	0	0
19 (18 - 7pm)	15	0	0	35	5	5	On	Off	Off	19	3	3	0	0	0
20 (19 - 8pm)	20	0	0	35	5	5	On	Off	Off	25	3	3	0	0	0
21 (20 - 9pm)	20	0	0	35	5	5	On	Off	Off	22	3	3	0	0	0
22 (21 - 10pm)	10	0	0	30	5	5	On	Off	Off	22	3	3	0	0	0
23 (22 - 11pm)	0	0	0	5	5	5	Off	Off	Off	12	3	3	0	0	0
24 (23 - 12am)	0	0	0	5	5	5	Off	Off	Off	9	3	3	0	0	0
Total/Day	710	50	0	750/990	170	120	1500	500	0	691	80	84	285	0	0
Total/Week	36.00 hours			40.40/52.40 hours			80.00 hours			36.19 hours			14.25 hours		
Total/Year	1877 hours			2101/2732 hours			4171 hours			1887 hours			743 hours		

wk = Weekday

1. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques, except they have been changed to 0% when occupancy is 0%. These values may be used only if actual schedules are not known.
2. Lighting profiles are modified to reflect the requirement for occupancy sensors in space.

9 Appendices

9.3 Eu 2 Path 2 (Prescriptive Approach)

When outdoor conditions are suitable, natural ventilation, as oppose to mechanical cooling, can be used to remove heat gains and pollutants from buildings. This reduces energy consumption.

The wind availability at a window is determined by *site* massing and neighbourhood massing which are addressed elsewhere in this guidance. It is not the intention of this credit to assess the natural ventilation potential in a specific wind environment, simply to give designers a tool to optimise window design and spatial to achieve good natural ventilation.

Acoustic windows calculation should be accounted with reference to APP 130 (2/2015) Section 6.

Cross Ventilation Requirements

Units can be considered to have good cross ventilation when the air flow path between facade openings is relatively unobstructed.

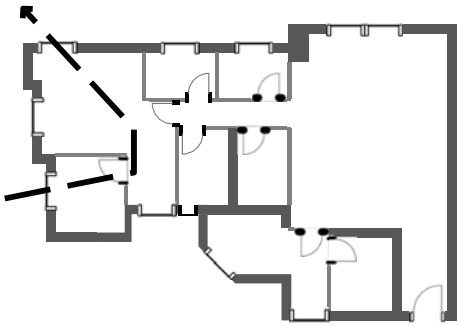
Design should demonstrate cross ventilation enhancement consideration by below design principle:

Openable windows can be located in different habitable areas, e.g. living room and bedroom or on differently orientated facades of the same habitable area.

The cross ventilation path between openings should be one turn only, from the middle of one window to another; (Figure 1 & 3)

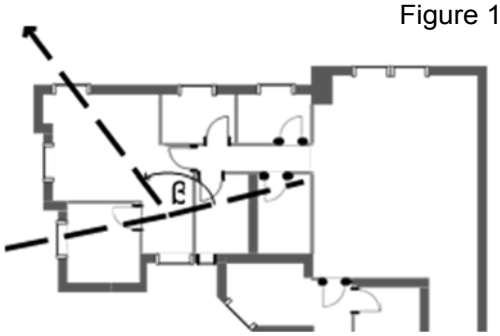
The angle of turn for the cross ventilation path at the joint of the two lines should not be greater than 90°; (Figure 2 & 3)

Cross ventilation path shall not be more than 12m in length for each habitable area (Figure 3)



✖ No more than one turn allowed

Figure 1



✖ Angle of turn, β, should not be greater than 90°

Figure 2

Pass:
- One turn only
- Angle of turn not greater than 90°
- total distance a+b ≤ 12m

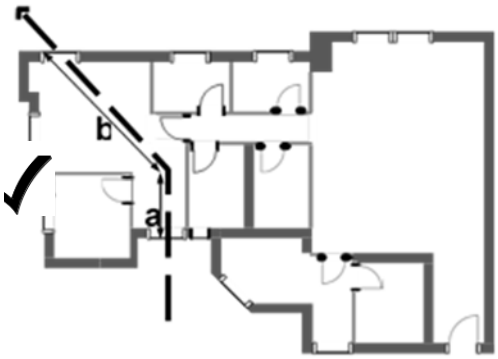


Figure 3

In each habitable area, total physical openings area (i.e. not aerodynamic free area) should be double of that of the statutory requirement (i.e.1/8 of openable window area to usable floor area);

When considering a single room, the openable window size located at each wall should be at least 1/16 of the usable floor area;

To ensure cross ventilation can affect the majority of the *habitable space*, it is required to have the windows a reasonable distance apart. To assess this, draw the smallest box possible that covers the habitable area and divide into equal halves through the longest side. The windows shall lie in different halves of the habitable area. (Figure 4)

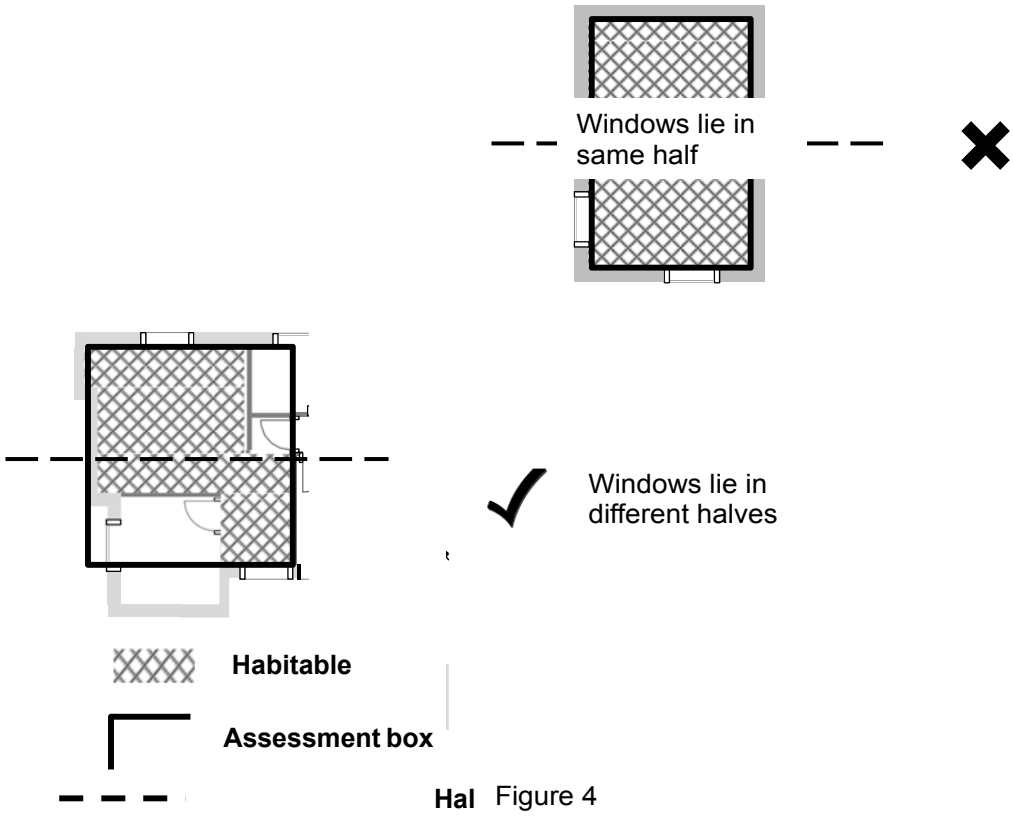


Figure 4

For windows located within Re-entrants

Concave areas of buildings with width greater than 4.5m will typically have similar flow characteristics to the free-stream. Hence, for the purpose of ventilation, a re-entrant begins when a concaved area has width less than 4.5m.This can be defined graphically by a plane of 4.5m wide (referred to as the External Plane, (ExP), extending from infinity towards a concave area: the re-entrant begins where such a plane can no longer pass through.

A secondary opening located in the re-entrant may still achieve satisfactory cross-ventilation performance provided that the re-entrant is sufficiently wide and the window is located relatively close to the beginning of the re-entrant. Such an acceptable window can be defined by connecting a plane of 2.3m width and 4.5m length (referred to as Secondary Window Plane, (SWP) to ExP. Windows that can be reached by SWP are considered acceptable secondary windows.

For the purpose of this assessment, the effective area of an apartment can be extended by the concept of a “notional” area. Such a notional area can be defined by connecting a Notional Plane (NP) of 1.5m width from SWP to a secondary window. The conditions for demonstrating cross ventilation explained above now cover NOT only the actual residential unit, but also the notional area together, i.e. the ventilation path is measured from the primary window to the SWP, See Figure 5

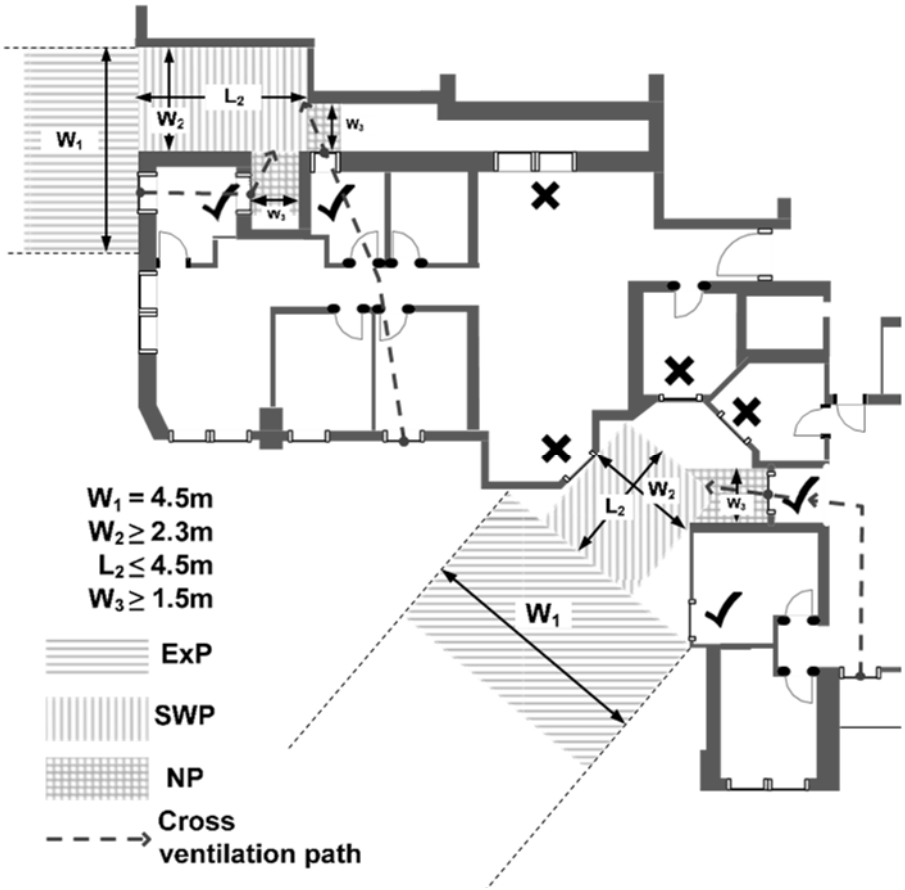


Figure 5 Allowable locations of windows in re-entrants

Single Side Ventilation Requirements

Units can be considered to have good single sided ventilation when the ventilated space is sufficiently small to allow for air exchanges resulting from turbulent fluctuations in the wind which induce pressure differentials across openings or stack effects. The following criteria set out guidelines to achieve single side ventilation requirements.

The window will ventilate up to 4.5m from opening area, the area under question shall be contained within this zone. (Figure 6)

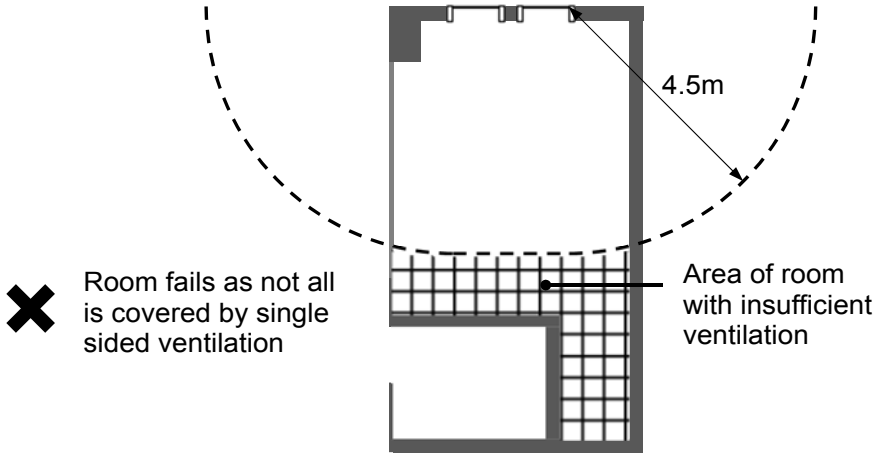


Figure 6 Room ventilation zone

At least two separated openable window panes should be located at same wall or different walls for single sided ventilation; and

The total physical openings area (i.e. not aerodynamic free area) in each habitable area shall be at least 1/5 openable window of the usable floor area.

9 Appendices

9.4 Space type

BEAM Plus considers indoor environmental quality (IEQ) as a key to sustain occupants' health and wellbeing. To assist the applicant design more thorough and satisfactory IEQ strategies, BEAM Plus imposes high requirements for indoor environmental quality covering ventilation, air quality, acoustics and lighting.

As the impacts of IEQ are dependent on the level of interaction between the occupants and the indoor spaces where they spend their time in, it is crucial for the applicant to understand and identify the level of usage of each indoor space. To facilitate assessment, the applicant should prepare a schedule including all spaces present within the building and their respective location. The spaces should be categorised into the following three space type (refer to Glossary for definitions):

- *Normally occupied spaces*
- *Not normally occupied spaces*
- *Unoccupied spaces*

Listed below are some example of each space type. These examples are not exhaustive. If a space present in the applicant's building is not included below, the applicant should identify similar examples or categorise the space type according to the definition. Justification is required should the applicant believe a space cannot be categorised according to the space type definitions.

Space Usage of *normally occupied spaces*

- Auditorium
- Concourse
- Conference room
- Dining (commercial and residential)
- Food and beverage dining area
- Front desk
- Gallery area
- Gymnasium
- Hospital patient rooms
- Hotel guest room
- Hotel entrance lobby
- Information desk
- Kitchens (commercial)
- Lecture hall
- Meeting room
- Open office
- Private office
- Reception
- Residential bedroom
- Residential dining room
- Residential living room
- Retails
- School classroom
- Shipping and receiving
- Lecture hall

Space Usage of *not normally occupied spaces*

- Break room
- Copy rooms
- Corridor
- Entrance lobby (other than hotel)
- Staircases
- Main lift lobby
- Lift lobby
- Pantry
- Toilet
- Residential kitchen

Space Usage of *Unoccupied spaces*

- Emergency exit corridor
- Mechanical and electrical rooms
- Car park
- Store room
- Warehouse
- Data Centre/Server room

9 Appendices

9.5 Stormwater Detention Systems O&M Checklist

Operations and maintenance checklist for stormwater detention system:

#	DESCRIPTIONS	Y/N/ NA	Findings / Follow Up actions
1	**Monthly/after significant storm event**		
a	No stagnant water in tank		
b	No residual water at inlet/outlet structures		
c	No mosquito breeding		
d	No pest infestation within the system		
e	No clogging at inlet/outlet structures/trash racks		
f	No excessive sediment builds up in tanks		
g	Inspect, lubricate and conduct routine test to check reliability of pump(s)		
h	Check condition and conduct function test of all pump starters and their controls including level control systems		
i	Standby generator load test		
j	Structural integrity of tank and features are not compromised (check for crack/leaks)		
k	No obstruction of maintenance access/openings		
l	Access into the detention tank system is secure (out of bounds to public and unauthorised personnel)		
2	**Yearly/as required (before year-end monsoon season)**		
a	Desilting detention tank has been carried out, trash screens have been cleaned		
b	Inspect, service, replace, lubricate and test performance of pump(s)		

c	Inspect protective devices such as overload, earth fault, residual current relays		
d	Check condition and conduct function test of all pump starters and controls including level control systems. Replace faulty and worn out parts if required		