




BEAM Plus


New Data Centres

Version 1.0 (2021.09)


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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 assessing buildings 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, managed and operated, etc. Recognised as one of the world's leading green building assessment tools, it provides a comprehensive set of sustainability performance standards that can be pursued by developers and owners.

Owned and operated by the BEAM Society Limited (BSL), BEAM Plus New Data Centres (NDC) is one of the BEAM Plus rating tools that covers the design and construction of new data centres.

Based on the credit achievement from the assessment, the DC will be graded to levels of Platinum, Gold, Silver or Bronze, to reflect the overall performance.

BEAM Plus New Data Centres Version 1.0 (NDC V1.0)

The BEAM Plus New Data Centres Version 1.0 (NDC V1.0) aims to be easy to apply, comprehensive through making references to local and global industry green practices on items including energy consumption and efficiency of data centre facilities and IT equipment of new data centre. The BEAM Plus – DC tools were prepared on the following key fundamentals:

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

Adaptability – The assessment framework is adapted to the specific requirements of DC, including buildings that house the DC.

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

Practicality – Assessment criteria are set by making references to DC industry best practices and technology advancements of DC in order to promote wider adoption of cost-effective green building and green DC practices easily.

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 NDC V1.0

The development of BEAM Plus NDC V1.0 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, assessment criteria, performance categories and their relative importance, submission requirement and grading methodology. The Steering Committee comprises:

Convener – Ir Victor Cheung

Members – Ir Alvin Lo; Dr Anthony Lo; Mr Ben Tam; Dr Benny Chow; Ms Carmen KM Wong; Mr Charles Lee; Ir Colin Chung; Ms Grace Kwok; Mr Herbert Chan; Mr Ho Wing Hung; Ir Sr Jonathan Lee; Mr Keith Chung; Ir Kenneth Li; Sr Kenneth Yun; Ir Kim Tang Cheuk; Mr KM So; Dr Luo Xiaowei; Mr Martin Chan; Ir Sr Martin Wan; Ir Michael Waye; Mr MK Leung; Mr Paul Chong; Ir Raymond Choi; Mr Taylor Man; Prof Wang Shengwei; Ms Yvonne leong

Advisors – Ir Ernest Yeung; Mr KC Mak; Mr Patrick KK Chan; Ms Pelene Ng

Disclaimer

BEAM Plus NDC 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 NDC 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, its members and Steering Committee 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 NDC.

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 NDC without formal certification does not entitle the user or any other party to promote any grading awarded.

Application and Eligibility

Assessed DC must be with area not less than 500 m². Typically, DC refers to any space containing banks of data storage equipment, i.e. servers, data storage, etc., plus any supporting spaces (e.g. switch rooms, UPS rooms, battery rooms). The primary function of the DC must be for housing physical or virtual storage, management, and dissemination of data and information

as generally perceived and accepted by the industry. The data halls and any related plant space should make up a significant majority of the floor area of the assessed DC.

Assessed DC associated function areas must not be larger than 25% of floor area under assessment. The DC associated function areas refer to the building functions/spaces that are provided for the use of staff running the facility:

- i. Reception and waiting areas;
- ii. Office areas (including meeting and training rooms);
- iii. Building management offices;
- iv. Staff restaurant and/or kitchen facilities;
- v. Pantry;
- vi. Staff gym;
- vii. Restrooms, WCs and changing facilities;
- viii. Circulation areas;
- ix. Guard/ Security room;
- x. Staging rooms; and
- xi. Command centres, etc.

The above list is not exhaustive, but serves to indicate the type of areas covered by the scope of this BEAM Plus DC

DC certification area must be separable from other mixed-use elements of the buildings.

BEAM Plus NDC V1.0 covers the data centre development including, from whole building DC to DC constructed in part of the building such as data centre converted from part(s) of industrial building which is commonly found in Hong Kong.

NDC refers to the newly installed purpose-built DC from ground zero in either whole or part of building, including existing building/ DC that is intended to be carried out major alteration or addition ('A&A') works such as constructing an additional floor and/or replacing the entire façade and revitalisation of industrial buildings or change of building use. Data centres of these kinds are eligible for the application of the BEAM Plus NDC certification.

BEAM Plus DC 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 DC 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 NDC covers the demolition, planning, design, construction and commissioning of a DC and should be initiated in the early stages of project development. BEAM Plus NDC aims to promote building green data centres with the least environmental impacts while meeting the business and social needs and user satisfaction, through encouraging the adoption of well accepted and innovative practices and technology within reasonable cost.

A notable attribute of BEAM Plus NDC is that assessment for new DC would

not commence until the DC 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 DC, this approach also serves to 'dovetail' assessment with BEAM Plus EDC and Interiors. It would be expected that a building graded under BEAM Plus NDC 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 in house 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 possess the valid credential for BEAM Plus NDC V1.0 for facilitating the certification process and to ensure the compliance of relevant credit requirements.
Documentation	The Applicant has the obligation to provide evidence to demonstrate credit compliance. In BEAM Plus NDC V1.0, only the necessary amount of material required needs to be submitted. However, the Applicant must make sure all supporting information is timely collected and properly documented. Just in case when the BAS 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 performance categories according to the preferences of the tool developer. In BEAM Plus NDC V1.0, credits are grouped into the following categories:

- i. Integrated Design and Construction Management (IDCM);
- ii. Sustainable Site (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 NDC adopts similar categories in other BEAM Plus tools as part of coherent set of schemes, the number and nature of credits within each category are specific to the context of data centre and Hong Kong and in the context of new DC 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;
- iii. Smart Design and Technologies; and
- iv. Design for Engagement and Education on Green Buildings.

Sustainable Site (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. Ecologically Responsible Design;
- 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:

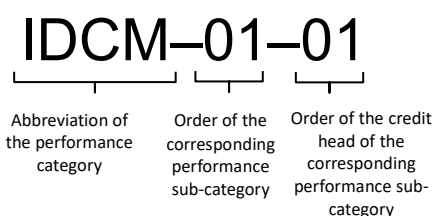
- i. Efficient Use of Materials;
- ii. Selection of Materials; and
- iii. Waste Reduction; and
- iv. Best Practice on Material Usage

Energy Use (EU)

EU focuses on the reduction of building operation energy consumption. It is 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 Generation;
- iii. Energy Efficient Equipment; and
- iv. Energy Management and Analysis.

Water Use (WU)	<p>WU focuses on the reduction of water consumption. The core objectives of WU are as follows:</p> <ul style="list-style-type: none"> i. Water Conservation; ii. Effluent; iii. Water Harvesting and Recycling; and iv. Water Management
Health and Wellbeing (HWB)	<p>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:</p> <ul style="list-style-type: none"> i. Design for Green Living; ii. Inclusive Design; and iii. Indoor Environmental Quality.
Innovations and Additions (IA)	<p>IA focuses on promoting and rewarding true innovations. The core objectives of IA are as follows:</p> <ul style="list-style-type: none"> i. Innovation Techniques; and ii. Innovation Challenges.
Credit Allocation	<p>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.</p>
Credit Code	<p>All BEAM Plus tools will adopt the same nomenclature. The classification of each credit is divided into three levels which includes: i) Performance category, ii) Performance sub-category and iii) Credit head.</p>



The coding system of each credit consist of English letters and Arabic numbers. The first level of the coding system is the performance category which will adopt the abbreviation. The second level is coded by Arabic numbers to present the corresponding performance sub-category. The third level represents the order of credit head.

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 as follows:

Category	Weighting
IDCM	20%
SS	10%
MW	10%
EU	40%
WU	10%
HWB	10%

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 credit and additional bonus credit, as applicable in NDC V1.0, are counted under the corresponding categories. A factor of 1.2 is applied in score calculation for the attainment of bonus credit point and additional bonus credit point.

Bonus credit is independent from the normal credit under the same credit head/ sub-head. It can be achieved regardless of the success or failure in attaining the normal credit. Whereas the additional bonus credit is dependent on the normal credit under the same credit head/ sub-head. The award of normal credit is the prerequisite for attaining the additional bonus credit.

The maximum possible score under each category is 100%.

IA Credit As in NDC V1.0, the IA credits 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 NDC V1.0 is subject to the following conditions:

- i. Satisfying all pre-requisites;
- ii. Achieving overall score required; and
- iii. Obtaining minimum percentage (%) in EU as below.

Grade	Minimum Percentage for EU Category	Total Score
Platinum	70%	≥ 75%
Gold	60%	≥ 65%
Silver	50%	≥ 55%
Bronze	40%	≥ 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 Point(s)
2	Integrated Design and Construction Management (IDCM)			22+16 bonus
IDCM-00-P1	Sustainability Champions – Project	Prerequisite achieved for demonstrating that an accredited BEAM Professional (BEAM Pro) with a valid credential for BEAM Plus New Data Centres is engaged as the Project BEAM Pro of the consultant team.	All DC	Required
IDCM-00-P2	Environmental Management Plan	Prerequisite achieved for demonstrating that an Environmental Management Plan has been properly prepared.	All DC	Required
IDCM-00-P3	Timber Used for Temporary Works	Prerequisite achieved for demonstrating that no virgin forest products are used for temporary works.	All DC	Required
IDCM-01-01	Sustainability Champions - Design	<p>1 credit point for at least 2 members from at least 2 applicable core design disciplines shall be accredited BEAM Professionals with valid credentials for BEAM Plus New Data Centres.</p> <p>1 additional Bonus credit point for at least 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 Data Centres.</p> <p>Alternatively,</p> <ul style="list-style-type: none"> 1 additional Bonus credit point for at least 2 additional members, from an applicable core design discipline different from the disciplines counted in the above credit, shall be accredited BEAM Affiliates. 	All DC	1 + 1 Bonus
IDCM-01-02	Complimentary Certification	<p>(a) BEAM Plus Neighbourhood (ND)</p> <p>1 Bonus credit point where the project is certified by BEAM Plus Neighbourhood (ND) certification.</p> <p>(b) BEAM Plus Interiors (BI)</p> <p>1 Bonus credit point for preparing the Project for BEAM Plus Interiors (BI) certification.</p> <p>(c) BEAM Plus Existing Data Centres (EDC)</p> <p>1 Bonus credit point for preparing the Project for BEAM Plus Existing Data Centres (EDC) certification.</p>	All DC	3 Bonus

	Section	Credit Requirement	Extent of Application	Credit Point(s)
IDCM-01-03	Integrated Design Process	<p>(a) Early Considerations for Integrated Building Design</p> <p>1 credit point 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.</p> <p>1 credit point for organising at least one multi-disciplinary design charrette to formulate passive and active design strategies in the conceptual/ schematic design stage.</p> <p>(b) Early Design Consideration of Buildability/ Constructability</p> <p>1 credit point for early design consideration of buildability to ease construction and save on-site materials/ labour before completion of the design development stage.</p> <p>(c) Design Consideration for Operation and Maintenance</p> <p>1 credit point for design consideration of the long-term operation and maintenance needs of the DC and its engineering services.</p>	All DC	4
IDCM-01-04	Life Cycle Costing	1 credit point for conducting life cycle costing for active systems.	All DC	1
IDCM-01-05	Commissioning	<p>2 credit points for demonstrating (a) the appointment of commissioning authority (CxA) before tender stage and (b) providing a commissioning plan.</p> <p>1 credit point for providing a commissioning review report before construction as described in part (c).</p> <p>1 credit point for providing commissioning reports as described in part (d).</p>	All DC	4

	Section	Credit Requirement	Extent of Application	Credit Point(s)
IDCM-02-01	Sustainability Champions - Construction	1 credit point for at least 2 accredited BEAM Professionals with valid credential for BEAM Plus New Data Centres, are engaged by the main/ lead contractor of the project. <i>Alternatively,</i> <ul style="list-style-type: none"> <i>1 credit point for at least 1 accredited BEAM Professional with valid credential for BEAM Plus New Data Centres and 2 accredited BEAM Affiliates, are engaged by the main/ lead contractor of the project</i> 	All DC	1
IDCM-02-02	Measures to Reduce Site Emissions	<p><u>For whole building DC developments</u></p> <p>(a) Minimisation of Air Pollution</p> <p>1 credit point for providing adequate monitoring and mitigation measures to minimise air pollution during construction (demolition and foundation are included, if any)</p> <p>(b) Minimisation of Noise Pollution</p> <p>1 credit point for providing adequate monitoring and mitigation measures to minimise noise pollution during construction (demolition and foundation are included, if any)</p> <p>(c) Minimisation of Water Pollution</p> <p>1 credit point for providing adequate monitoring and mitigation measures to minimise water pollution during construction (demolition and foundation are included, if any)</p> <p>(d) Minimisation of Light Pollution</p> <p>1 Bonus credit point for providing adequate monitoring and mitigation measures to minimise light pollution during construction (demolition and foundation are included, if any)</p> <p><u>For DC developments located in part of building</u></p> <p>(a) Minimisation of Construction Dust</p> <p>1 credit point for providing adequate monitoring and mitigation measures to minimise air pollution to host building users and neighbouring occupants during construction and fit-out activities.</p>	All DC	3 + 1 Bonus

Section		Credit Requirement	Extent of Application	Credit Point(s)
		(b) Minimisation of Construction Noise		
		1 credit point for providing adequate monitoring and mitigation measures to minimise noise pollution to host building users and neighbouring occupants during construction and fit-out activities.		
IDCM-02-03	Construction and Demolition Waste Recycling	<p>(a) Demolition Waste Recycling</p> <p>1 credit point 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.</p> <p>1 to 2 additional Bonus credit points for recycling at least 30% or 60% of demolition waste.</p> <p>(b) Construction Waste Recycling</p> <p>1 credit point 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).</p> <p>1 to 2 additional Bonus credit point for recycling at least 30% or 60% of construction waste (foundation waste to be included, if any).</p>	<p>IDCM-02-03a All DC requiring demolition which are under the Applicant's control.</p> <p>IDCM-02-03b All DC</p>	2 + 4 Bonus
IDCM-02-04	Construction IAQ Management	1 credit point for implementing a Construction IAQ Management Plan, undertaking a building 'flush out' or 'bake out', and replacement of all filters prior to occupancy.	All DC	1
IDCM-02-05	Considerate Construction	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
IDCM-02-06	Building Management Manuals	1 credit point for providing a fully documented Operations and Maintenance Manual and Energy Management Manual.	All DC	1
IDCM-02-07	Operator Training plus Chemical Storage and Mixing Room	1 credit point for providing training for operations and maintenance staff to the minimum specified; and demonstrating that adequate maintenance facilities are provided for chemical storage and mixing.	All DC	1

	Section	Credit Requirement	Extent of Application	Credit Point(s)
IDCM-03-01	Digital Facility Management Interface	1 Bonus credit point for providing a digital interface in addition to the project design metering provision for future DC facility management team to review the building operation performance.	All DC	1 Bonus
IDCM-03-02	Occupant Engagement Platform	1 Bonus credit point for providing a digital platform to engage building occupants.	All DC	1 Bonus
IDCM-03-03	Document Management System	<p>(a) Project Team Document Management</p> <p>1 credit point for demonstrating the use of document management systems within the design team.</p> <p>(b) Facility Management Team Document Management</p> <p>1 additional Bonus credit point for demonstrating the use of document management platform by the DC owner or DC management company.</p>	All DC	1 + 1 Bonus
IDCM-03-04	BIM Integration	<p>(a) Coordinated Use of BIM with Design Teams and Construction Teams</p> <p>1 credit point for the coordinated use of BIM among the design team.</p> <p>1 additional Bonus credit point for coordinated use of BIM among the design team and the contractors.</p> <p>(b) Other Application of BIM</p> <p>Maximum 2 bonus credit points for the following BIM application:</p> <p><u>BIM for Time</u></p> <p>1 Bonus credit point for using the BIM model for scheduling, cost and quantity, schedules preparation and tracking the project budget.</p> <p><u>BIM for Facility Management Use</u></p> <p>1 Bonus credit point for updating the BIM model to as-built condition.</p>	All DC	1 + 3 Bonus
IDCM-04-01	Design for Engagement and Education on Green Buildings	1 credit point for providing any 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.	All DC	1 + 1 Bonus

Section	Credit Requirement	Extent of Application	Credit Point(s)
	1 additional Bonus credit point for providing 4 education elements.		
	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		

	Section	Credit Requirement	Extent of Application	Credit Point(s)
3	Sustainable Site (SS)			12+ 16 bonus
SS-00-P1	Minimum Landscaping Requirements	<i>This Prerequisite is not applicable under BEAM Plus NDC.</i>		
SS-01-01	Pedestrian-oriented and Low Carbon Transport	<p>(a) Accessibility to Public Transport</p> <p>1 credit point for achieving Accessibility Index of 15 or more for all buildings of a development.</p> <p>(b) Pedestrian-oriented Access</p> <p>1 credit point for achieving 50% or more of the pedestrian-oriented transport planning measures.</p> <p>1 additional Bonus credit point for 100% achievement.</p> <p>(c) Cycling Facilities and Network Integration</p> <p>1 Bonus credit point 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.</p> <p>(d) Charging Facilities for Electric Vehicle (EV)</p> <p>1 Bonus credit point 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).</p>	All DC	2 + 3 Bonus
SS-01-02	Neighbourhood Amenities	1 credit point where adequate amenities for building users are located within the site or 1,000m walking distance/ an equivalent horizontal commuting time from the site entrance(s).	All DC	1
SS-01-03	Building Design for Sustainable Urbanism	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
SS-01-04	Neighbourhood Daylight Access	1 credit point for the designs which the access to daylight of neighbouring sensitive buildings is maintained to the prescribed levels.	Whole building DC developments	1

	Section	Credit Requirement	Extent of Application	Credit Point(s)
SS-01-05	Noise Control for Building Equipment	1 credit point 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 DC	1
SS-02-01	Light Pollution Control	1 credit point for demonstrating that the obtrusive light from exterior lighting meets the specified performance for the environmental zone in which the building development is located.	All DC	1
SS-02-02	Biodiversity Enhancement	<p>(a) Reduction of Ecological Impact</p> <p>1 Bonus credit point for demonstrating all identified habitat types on Site are of low or negligible indicative ecological values.</p> <p>Alternatively,</p> <ul style="list-style-type: none"> 1 Bonus credit point for all identified habitat types on Site of medium to high indicative ecological value are preserved intact and are either unaffected by the planned development. <p>(b) Enhancement of Biodiversity</p> <p>1 Bonus credit point for preparing a manual on biodiversity-friendly landscape maintenance, PLUS adopting measures to increase diversity and complexity of planting for enhancing the biodiversity of the site.</p>	<p>SS-02-02a: All whole building DC development sites with tree except brownfield or sites on reclaimed land</p> <p>SS-02-02b: All whole building DC development sites with adjacent areas of medium or high ecological value</p>	2 Bonus
SS-03-01	Urban Heat Island Mitigation	<p><u>For Site area < 1,000m²</u></p> <p>1 credit point for implementing at least 2 site level strategies under Section 11 of Hong Kong Planning Standards and Guidelines Chapter 11 Urban Design Guidelines.</p> <p><u>For Site area ≥ 1,000m²</u></p> <p>(a) Sustainable Building Design Measures</p> <p>1 credit point 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).</p>	Whole building DC developments	<p><u>For Site area < 1,000m²:</u> 1</p> <p><u>For Site area ≥ 1,000m²:</u> 4 + 6 Bonus</p>

Section	Credit Requirement	Extent of Application	Credit Point(s)	
	<p>1 credit point for demonstrating compliance with prescribed requirements of the SBD Guidelines as promulgated in the PNAP APP-152; and</p> <p>1 additional Bonus credit point for demonstrating with relevant prescriptive requirements with enhanced performances.</p> <p>(b) Tree Coverage</p> <p>2 to 3 Bonus credit points for demonstrating that at least 10% or 20% of the total Site Area is provided with tree coverage.</p> <p>(c) Air Ventilation Assessment (AVA)</p> <p>For conducting an AVA by wind tunnel or Computational Fluid Dynamics (CFD) according to the prevailing AVA methodology introduced by the Government demonstrating that better or equivalent ventilation performances than a baseline case:</p> <p>1 credit point for demonstrating annual wind condition.</p> <p>1 credit point for demonstrating summer wind condition.</p> <p>(d) Intra Urban Heat Island Study</p> <p>2 Bonus credit points 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.</p>			
SS-03-02	Immediate Neighbourhood Wind Environment	1 credit point 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.	Whole building DC developments	1
SS-03-03	Outdoor Thermal Comfort	<p>(a) Shaded or Covered Routes</p> <p>1 Bonus credit point is achieved where at least one shaded or covered route, connecting the site with nearby amenities/ site main entrance/ transport hub.</p> <p>(b) Passive Open Spaces with Thermal Comfort</p>	Whole building DC developments with a site area of 1,000 m ² or more	2 Bonus

Section		Credit Requirement	Extent of Application	Credit Point(s)
		1 Bonus credit point is achieved 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.		
SS-04-01	Stormwater Management	<p>1 credit point 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.</p> <p>1 additional Bonus credit point for the adopted measures that are able to cater at least 40mm/event for the site in its post-developed conditions.</p>	Whole building DC developments with a site area of 1,000 m ² or more	1 + 1 Bonus
SS-04-02	Design for Climate Change Adaptation	<p>1 Bonus credit point 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.</p> <p>1 additional Bonus credit point for including quantitative calculation to support the resilience design which is technically eligible and cost effective.</p>	Whole building DC developments	2 Bonus

	Section	Credit Requirement	Extent of Application	Credit Point(s)
4	Materials and Waste (MW)			12 + 15 bonus
MW-00-P1	Minimum Waste Handling Facilities	Prerequisite achieved for meeting minimum provisions of waste recycle facilities for the collection, sorting, storage, recycling (recovered material) and disposal (waste).	All DC	Required
MW-01-01	Building Re-use	1 to 3 Bonus credit points for the reuse of at least 20%, 40% or 90% (by mass or volume) of existing structures (sub-structure and superstructure).	Whole building DC developments	3 Bonus
MW-01-02	Modular and Standardised Design	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
MW-01-03	Prefabrication	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
MW-01-04	Design for Durability and Resilience	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
MW-02-01	Sustainable Forest Products	1 credit point for demonstrating at least 50% of all timber and composite timber products used for DC are from sustainable sources/ recycled timber. 1 additional bonus credit point for 90% or more.	All DC, except DC 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).	1 + 1 Bonus
MW-02-02	Recycled Materials	1 credit point for using recycled materials for any one of the building components listed below. 1 additional Bonus credit point for compliance with all the listed building components. 2 additional Bonus credit points for achieving 50% or more of all materials used for the listed building components are materials with recycled content. Building Components: i) Outside Surface Works and Structures; ii) Building Façade and Structural Components; and iii) Interior Non-structural Components.	All DC	1 + 2 Bonus

	Section	Credit Requirement	Extent of Application	Credit Point(s)
MW-02-03	Ozone Depleting Substances	<p>(a) Refrigerants</p> <p>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.</p> <p>(b) Ozone Depleting Materials</p> <p>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.</p>	All building equipment & insulation servicing the assessed DC	2
MW-02-04	Regional Materials	<p>1 credit point for the use of regional materials meeting prescribed requirement, which contribute at least 10% of all building materials used in the project.</p> <p>1 to 2 additional Bonus credit points for at least 20% or 50%.</p>	All DC	1 + 2 Bonus
MW-02-05	Use of Green Products	<p>(a) Certified Green Products</p> <p>1 or 2 credit points for having at least 5% certified green products in 1 or 2 of the listed categories (i.e., outside surface works, building façade and structures, interior non-structural components, and building services components).</p> <p>1 or 2 additional Bonus credit points for having at least 5% or 25% of certified green products under Construction Industry Council (CIC) Green Product Certification in 1 of the listed categories (outside surface works, building façade and structures, interior non-structural components, and building services components).</p> <p>(b) Rapidly Renewable Materials</p> <p>1 or 2 Bonus credit points for 5% or 25% of all building materials/ products of interior non-structural components in the project is rapidly renewable materials.</p>	All DC	2 + 4 Bonus

	Section	Credit Requirement	Extent of Application	Credit Point(s)
MW-02-06	Lift Cycle Assessment	1 credit point for demonstrating the embodied energy in the major elements of the building structure of the DC has been studied and optimised through a Life Cycle Assessment (LCA). Alternatively, <ul style="list-style-type: none"> 1 credit point for demonstrating the embodied carbon in the major elements of the building structure of the building has been studied and optimised by using the CIC Carbon Assessment Tool or similar assessment tools. 	Whole building DC developments	1
MW-03-01	Adaptability and Deconstruction	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
MW-03-02	Enhanced Waste Handling Facilities	<p>(a) Additional Recyclables Collection</p> <p>1 credit point for the provision of facilities for collection, sorting, storage and disposal of 2 other recyclable streams in addition to those described in MW-00-P1.</p> <p>(b) Additional Facility Provisions to Enable enhanced Municipal Solid Waste (MSW) Charing Scheme</p> <p>1 credit point for additional facilities for collection, sorting, storage and disposal of recyclables in addition to those described in MW-00-P1 and MW-03-02 part (a).</p> <p>(c) Waste Treatment Equipment</p> <p>1 Bonus credit point for providing at least one set of waste treatment equipment.</p> <p>(d) Alternatives to Recycling Facilities</p> <p>1 Bonus credit point for providing alternative means of waste collection systems.</p>	<p>All DC</p> <p>Part (b) is applicable only when Municipal Solid Waste Charing Scheme is activated</p>	2 + 2 Bonus
MW-04-01	Best Practice on Material Usage	2 credit points for demonstrating the adoption of at least 4 best practices relating to the efficient use of materials as mentioned in the Green Data Centre Practice Guide published by BEAM Society Limited (BSL).	All DC	2

	Section	Credit Requirement	Extent of Application	Credit Point(s)
5	Energy Use (EU)			35 + 3 Bonus
EU-00-P1	Minimum Energy Performance	<p>Demonstrate (a) performance improvement against the latest edition of Building Energy Code (BEC) and (b) Maximum Power Usage Effectiveness (PUE).</p> <p>(a) Performance against the latest edition of BEC</p> <p>Demonstrate compliance with the latest edition of BEC on:</p> <ol style="list-style-type: none"> 1. Air-conditioning equipment efficiency (full load COP and 75% load for VSD equipment); and 2. Lighting power density for listed space type in the code. <p>(b) Maximum Power Usage Effectiveness (PUE)</p> <p>The data centre must have a design PUE at full IT load condition of no more than 2.0.</p>	All DC	Required
EU-01-01	Low Carbon Passive Design	<p>Passive designs that can reduce building HVAC load and maximise daylight will be rewarded in this credit head under either prescriptive path or performance path.</p> <p><u>Option 1: Prescription Path</u></p> <p>1 to 2 credit points for incorporating 1 or 2 of the passive design strategies listed below:</p> <ol style="list-style-type: none"> i. Optimum Spatial Planning ii. External Overhang (fix/ movable) iii. Vegetated Building Envelope iv. Daylighting Provision <p><u>Option 2: Performance Path</u></p> <p>1 to 3 credit points for incorporating up to 3 of the passive design strategies listed below:</p> <p>HVAC Load Reduction</p> <ol style="list-style-type: none"> 1. Built Form and orientation <p>1 credit point for reducing building envelope load from a hypothetical case with at least 22.5° difference in orientation with justification by simulation.</p>	All DC	3

	Section	Credit Requirement	Extent of Application	Credit Point(s)
		2. Optimum Spatial Planning		
		1 credit point for demonstrating consideration of optimum spatial planning to enhance energy conservation with justification by simulation.		
		3. External Shading Devices		
		1 credit point 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 point for the provision of vegetated building envelope with justification by calculation.		
		Daylight		
		5. Space Layout for Daylight Penetration		
		1 credit point for demonstrating that the space is well-lit by daylight and reduce occupants' dependency on artificial lighting with justification by simulation method.		
EU-01-02	Reduction of CO ₂ Emissions	<p>Predicted Power Usage Effectiveness (PUE)</p> <p>Demonstrate and quantify the proposed DC energy performance operating under Hong Kong climatic conditions at 75% of the design IT load and express them in terms of Power Usage Effectiveness (PUE).</p> <p>1 to 15 credit points for design PUE value between 1.77 and 1.52.</p> <p>1 to 2 additional Bonus credit points for design PUE value lower than 1.5 and 1.4, respectively.</p>	All DC	15 + 2 bonus
EU-01-03	Peak Electricity Demand Reduction	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
EU-01-04	Metering and Monitoring	<p>(a) Fundamental Metering and Monitoring</p> <p>1 credit point for providing energy monitoring system for equipment and systems in spaces.</p>	All DC	2 + 1 bonus

	Section	Credit Requirement	Extent of Application	Credit Point(s)
		(b) Metering and Monitoring for PUE		
		1 credit point for energy metering to provide total facility power and energy usage and total IT equipment power and energy at the output of Power Distribution Units (PDUs) for determining instantaneous and average PUE data at Level 2.		
		1 additional Bonus credit point for providing metering that allows monitoring of individual IT equipment output at data hall racks for determining Level 3 PUE.		
EU-02-01	Renewable and Alternative Energy Systems	(a) Solar Energy Feasibility Study	All DC	4
		1 credit point for evaluating the building roof's potential for harnessing solar energy.		
		(b) Renewable Energy Application		
		<u>Option 1</u>		
		1 to 3 credit points for using on-/ off-site renewable energy systems to offset annual building energy consumption for non-data centre subsystem, i.e. Building Service systems servicing non-data hall areas, plant rooms, personal office areas and personal office loads, etc. to offset 0.4%, 0.6% or 0.8% energy consumption.		
		<u>Option 2</u>		
		1 to 3 credit points where the minimum percentage of 40%, 60% or 80% of the building footprint is being covered/ used by PV panels respectively and/or other renewable power facility generation with equivalent renewable power output.		
EU-03-01	Air-Conditioning Units	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
EU-03-02	Clothes Drying Facilities	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
EU-03-03	Energy Efficient Appliances	(a) Use of Efficient UPS	EU-03-03a: All DC	2
		1 credit point for demonstrating that the Uninterruptible Power Supplies (UPS) is procured in accordance with certified energy efficient products scheme.		

Section		Credit Requirement	Extent of Application	Credit Point(s)
		(b) Use of Sustainable IT Equipment 1 credit point for demonstrating that the IT Equipment for the running and operating of the DC of is procured in accordance with certified energy efficient products scheme.	EU-03-03b: DC with operational control over the IT Equipment.	
EU-03-04	Cooling System Efficiency	(a) <u>Air-cooled Cooling System</u> 1 to 2 credit points for demonstrating the total cooling system efficiency serving data hall is of 0.85 kW/ton and 0.78 kW/ton, respectively. OR (b) <u>Water-cooled Cooling System</u> 1 to 2 credit point (s) for demonstrating the total cooling system efficiency serving data hall is of 0.8 kW/ton and 0.75 kW/ton, respectively. Note: For DC equipped with combined system type, the assessment will be based on the dominated plant, i.e., at least 75% of actual cooling consumption by the dominated system.	All DC	2
EU-03-05	Air Management System	1 to 2 credit points for demonstrating the total air flow efficiency of the air distribution system serving all data hall, from supply to return, is of 0.9 kW/m ³ /s and 0.8 kW/m ³ /s, respectively.	All DC	2
EU-04-01	Best Practice on Energy Use	1 to 3 credit points for incorporating at least 2 best practices under each of the following aspect in the Green DC Practice Guide published by BEAM Society Limited. i. Cooling System; ii. Air Flow Management; iii. Operating at Higher Temperature and Humidity; iv. Cooling Management; and v. Power System.	All DC	5

Section	Credit Requirement	Extent of Application	Credit Point(s)
	<p>2 credit points for incorporating at least 6 best practices across the following aspects as listed in the Green DC Practice Guide published by BEAM Society Limited:</p> <ul style="list-style-type: none"> i) Design of Resilience; ii) Monitoring and Managing Energy Efficiency; iii) IT Equipment Deployment; iv) IT Application System and IT Service Deployment; and v) Telecommunications and Network Cabling. 		

	Section	Credit Requirement	Extent of Application	Credit Point(s)
6	Water Use (WU)			12 + 2 bonus
WU-00-P1	Minimum Water Saving Performance	<i>This prerequisite is not applicable under BEAM Plus NDC.</i>		
WU-01-01	Annual Water Use	1 to 3 credit points for demonstrating that the use of water efficient devices leads to an estimated annual saving of 20%, 25% or 30%. 1 additional Bonus credit point for demonstrating that the use of water efficient devices leads to an estimated annual saving of 40%.	All DC	3 + 1 Bonus
WU-01-02	Water Efficient Irrigation	1 to 2 credit points for reducing 25% or 50% of potable water consumption for irrigation in comparison with the baseline. 1 additional Bonus credit point for achieving 100% reduction.	All DC with permanent greenery and permanent irrigation system	2 + 1 Bonus
WU-01-03	Water Efficient Appliances	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
WU-01-04	Water Leakage Detection	1 credit point for installing water leakage detection systems in all municipal potable water tank rooms and data halls.	All DC	1
WU-01-05	Twin Tank System	1 credit point for providing twin tank for potable water supply system and flushing water supply system.	All DC (including DC with centralised/ shared tank that is outside the assessment boundary)	1
WU-01-06	Cooling Tower Water	1 credit point for reducing fresh water consumption by installing water treatment system which can achieve minimum 7 cycles of concentration with acceptable water quality. 1 additional Bonus credit point for 8 or more cycles of concentration with acceptable water quality.	All DC with cooling tower using potable water as make up water	1 + 1 Bonus
WU-02-01	Effluent Discharge to Foul Sewers	1 credit point for demonstrating a reduction in annual sewage volumes by 20% or more.	All DC	1
WU-03-01	Water Harvesting and Recycling	(a) Harvested Rainwater 1 credit point for harvesting of rainwater that achieves a reduction of 5% or more in the consumption of potable water.	All DC	2 + 1 Bonus


Section		Credit Requirement	Extent of Application	Credit Point(s)
		(b) Recycled Grey Water		
		1 credit point for recycling grey water that achieves a reduction of 5% or more in the consumption of potable water.		
		(c) Exemplary Water Recycling		
		1 additional Bonus credit point where (a) harvested rainwater, (b) recycled grey water or a combination of both leads to a reduction of 10% or more in the consumption of potable water.		
WU-04-01	Smart Water Metering	1 credit point for provision of permanent smart water meter for cooling towers water use and indoor plumbing fixtures and fittings, and at least 2 of the other water systems, which are able to display metered data, trending of water consumption and relevant parameters.	All DC with more than one water system	1

	Section	Credit Requirement	Extent of Application	Credit Point(s)
7	Health and Wellbeing (HWB)			15 + 6 bonus
HWB-00-P1	Minimum Ventilation Performance	<p>(a) On-site Outdoor Air Quality</p> <p>Measure outdoor air pollutants on-site prior to building design to understand the site conditions.</p> <p>(b) Minimum Ventilation</p> <p>Demonstrate the project is in compliance with the minimum ventilation quantity in relation to its designed ventilation mode.</p>	All DC, except naturally ventilated spaces.	Required
HWB-01-01	Healthy and Active Living	1 Bonus credit point for scoring at least 3 items of all applicable design measures for healthy and active living.	All DC	1 Bonus
HWB-01-02	Biophilic Design	1 or 2 Bonus credit points for demonstrating visual connection with nature and/ or biophilic design features at an assessment space with Visual Quality Score (VQS) of at least 2 or 3.	All DC	2 Bonus
HWB-02-01	Inclusive Design	<p>(a) Universal Accessibility</p> <p>1 credit point for providing at least 5 applicable enhanced provisions as stipulated in the "Recommended Design Requirements" of BFA 2008.</p> <p>(b) Weather Protection and Family Friendly Features</p> <p>1 Bonus credit point for providing prescribed weather protection and at least 2 family friendly facilities features.</p>	All DC	1 + 1 Bonus
HWB-03-01	Enhanced Ventilation	<p><u>Fresh air provision in normally occupied spaces</u></p> <p>1 credit point for demonstrating that all normally occupied spaces in the DC are provided with increased ventilation.</p> <p><u>Fresh air provision in not normally occupied spaces</u></p> <p>1 credit point for demonstrating that all not normally occupied spaces in the DC are provided with adequate ventilation.</p> <p><u>On-site Measurements</u></p> <p>1 additional Bonus credit point for conducting on-site measurements to verify the ventilation performance for all normally occupied spaces.</p>	All DC	2 + 1 Bonus

	Section	Credit Requirement	Extent of Application	Credit Point(s)
HWB-03-02	Waste Odour Control	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
HWB-03-03	Acoustics and Noise	<p>(a) Data Hall Noise Control</p> <p>1 credit point for demonstrating the internal noise level at data hall area are maintained at an appropriate level.</p> <p>(b) Reverberation time</p> <p>1 credit point for demonstrating airborne noise isolation between rooms, spaces and premises fulfils the prescribed criteria.</p> <p>(c) Noise Isolation</p> <p>1 credit point for demonstrating background noise levels within the prescribed criteria (including traffic noise and external building service equipment that are within the project boundary.</p>	All DC	3
HWB-03-04	Indoor Vibration	1 credit point for demonstrating vibration levels not exceeding the prescribed criteria..	All DC	1
HWB-03-05	Indoor Air Quality	<p>Demonstrate compliance in one of the following paths:</p> <p>(a) Option 1</p> <p>2 credit points for demonstrating compliance with the prescribed limits for Carbon monoxide (CO), Nitrogen dioxide (NO₂), Ozone (O₃), Carbon dioxide (CO₂), Respirable suspended particulates (PM₁₀), Total volatile organic compounds (TVOCs), Formaldehyde (HCHO) and Radon (Rn) in the sampled occupied spaces.</p> <p>1 credit point for demonstrating compliance with the prescribed limits for Airborne bacteria and conduct the Mould assessment in the sampled occupied spaces.</p> <p>(b) Option 2</p> <p>3 credit points for submitting a valid IAQ Certification Scheme (Good Class) certificate issued by the Environmental Protection Department (EPD) covering the whole building.</p> <p>1 additional bonus credit point for achieving Excellent Class.</p>	All DC	3 + 1 Bonus

	Section	Credit Requirement	Extent of Application	Credit Point(s)
HWB-03-06	Thermal Comfort	<p>(a) Temperature Performance in Data Halls</p> <p>1 credit point for sustaining the air temperature at the design value within $\pm 2.0^{\circ}\text{C}$ when air side system in data halls is operating at steady state.</p> <p>(b) Temperature Performance in Normally Occupied Spaces</p> <p>1 credit point for sustaining the air temperature at the design value within $\pm 1.5^{\circ}\text{C}$ when air side system in normally occupied areas is operating at steady state under normal occupied periods.</p>	All DC	2
HWB-03-07	Artificial Lighting	<p>(a) Artificial lighting in data halls</p> <p>1 credit point for achieving the prescribed lighting performance in Data halls.</p> <p>(b) Artificial lighting in normally occupied spaces, not normally occupied spaces and unoccupied spaces</p> <p>1 credit point for achieving the prescribed lighting performance in normally occupied spaces, not normally occupied spaces and unoccupied spaces.</p>	All DC	2
HWB-03-08	Daylight	<i>This credit head is not applicable under BEAM Plus NDC.</i>		
HWB-03-09	Biological Contamination	1 credit point for complying with the recommendations given in the Code of Practice for Prevention of Legionnaires' Disease 2021 Edition in respect of Water Supply Systems, HVAC Systems and other Water Features.	All DC	1
8	Innovations and Additions (IA)			Max.10 bonus
IA-01-01	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 NDC	All DC	Maximum 10 bonus

- 2 Integrated Design and Construction Management** 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 Integrated Design and Construction Management	IDCM-00	Prerequisite
	IDCM-00-P1	Sustainability Champions – Project 
Extent of Application	All DC	
Objective		Facilitate the application of the BEAM Plus certification process and to ensure the compliance of relevant requirements of the BEAM Plus Manual.
Credit Point(s) Attainable	Prerequisite	
Credit Requirement		<p>Prerequisite achieved for demonstrating that an accredited BEAM Professional (BEAM Pro) with a valid credential for BEAM Plus New Data Centres is engaged as the Project BEAM Pro of the consultant team.</p> <p>The Project BEAM Pro shall:</p> <ol style="list-style-type: none"> 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-02-01 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 (The Project BEAM Pro, Design BEAM Pros under IDCM-01-01 and Construction BEAM Pros under IDCM-02-01 must be different personnel); 3. Create a BEAM Plus NDC 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 Applicant on relevant professionals or parties on respective tasks to address relevant BEAM Plus certification requirements.
Assessment		<ol style="list-style-type: none"> 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 NDC Certification Checklist which shall include the following: <ol style="list-style-type: none"> 2.1. Determine the BEAM Plus certification level to pursue; 2.2. Select the BEAM Plus credits to meet the targeted certification level;

- 2.3. Identify the responsible parties to ensure the BEAM Plus requirements for each prerequisite and selected credits are met; and
- 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 in the minute is not required and could be covered:

3.1. Introductory workshop/ meeting

Highlight the attendance of Project BEAM Pro(s) and the section of providing guidance to the project team regarding BEAM Plus principles, structure, timing and certification processes. Indicate the inclusion of Design BEAM Pros (and Affiliates, if any) as defined under IDCM-01-01, if any;

3.2. Kick-off meeting with building main contractor

Highlight the attendance of BEAM Pro(s) and contractor representative(s). Indicate the coordination with Construction BEAM Pro(s) (and Affiliates, if any) as defined under IDCM-02-01, if any. Highlight the key BEAM Plus requirements during the construction stage;

3.3. Review meeting(s) with contractors

Highlight the attendance of BEAM Pro and the section of providing guidance on BEAM Plus requirements to the contractors during construction.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
IDCM-00-P1_00	BEAM Plus NDC submission template for IDCM-00-P1	✓	✓
IDCM-00-P1_01	BEAM Plus NDC Certification Checklist	✓	✓
IDCM-00-P1_02	A copy of the meeting minute of introductory workshop/ meeting	✓	-
IDCM-00-P1_03	A copy of the meeting minute of kick-off meeting with main building contractor/ Construction BEAM Pro(s) (and Affiliates, if any)	✓*	✓
IDCM-00-P1_04	A copy of the meeting minute of review meeting(s) with contractors	✓*	✓
IDCM-00-P1_05	Supporting documents showing how the works are handed over and the timeline for their involvement, if applicable (e.g. Declaration letter from the employer of the Project BEAM Pro)	✓	✓
* Meeting minutes shall be submitted in PA if the meeting(s) is/are held not less than 3 months prior to PA (first submission).			

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 2021].

(b) Related Credits

IDCM-01-01 Sustainability Champions – Design

The related credit encourages the engagement of Design BEAM Pros 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-01-03 Integrated 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-02-01 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	IDCM-00	Prerequisite
	IDCM-00-P2	Environmental Management Plan
Extent of Application	All DC	
Objective	Encourage a high standard of environmental management during construction.	
Credit Point(s) Attainable	Prerequisite	
Credit Requirement	Prerequisite achieved for demonstrating that an Environmental Management Plan has been properly prepared.	
Assessment	<ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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]; 1.4. Buildings Department, PNAP ADV-19, Construction and Demolition Waste [4]; and 1.5. Project Administration Handbook for Civil Engineering Works, Section 4.1.3, Construction and Demolition Materials [5]. 2. For a project that is a Designated Project under the Environmental Impact Assessment (EIA) Ordinance, environmental measurement points agreed by EPD shall be adopted. 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-02-01 or Project BEAM Pro defined under IDCM-00-P1. 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. 	

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-00-P2_00	BEAM Plus NDC submission template for IDCM-00-P2	✓	✓
IDCM-00-P2_01	Specification requiring EMP(s)	✓	-
	[or] EMP(s) of construction (demolition and foundation to be included, if any)	✓*	✓
* Evidence of compliance with prerequisite requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.			

Remarks**(a) Additional Information**

[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 Aug 2021].

[2] Hong Kong Construction Association (HKCA), Best Practice Guide for Environmental Protection on Construction Sites, 3.2.3. [ONLINE]. Available at: <https://www.epd.gov.hk/epd/english/greenconstruction/links/links.html>
[Accessed Aug 2021].

[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 Aug 2021].

[4] Buildings Department, 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 2021].

[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%202020%20Chapter%204%20Rev%2001%20clean_210308.pdf
[Accessed Aug 2021].

Buildings Department, 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 Aug 2021].

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 Aug 2021].

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 Aug 2021].

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/rp c.html
[Accessed Aug 2021].

(b) Related Credits

IDCM-02-02 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-02-03 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**IDCM-00****Prerequisite****IDCM-00-P3 Timber Used for Temporary Works** **Extent of Application**

All DC

Objective

Encourage the well-managed use of timber.

Credit Point(s) 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 demonstrate 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 (e.g. invoices and delivery notes for new timbers used/ transfer notes for reused timbers) if construction (demolition and foundation to be included, if any) has commenced before the submission of PA.
6. If timber was not used for temporary works during certain construction stage(s), provide declaration letter(s) from the site representative(s) OR project developer specifying that timber was not used.
7. The reuse of timber or timber products for temporary works is acceptable. Transfer notes and site photo records should be kept and submitted to show the originating old timber source, the quantity and the date of transfer of the timber products between the despatch work site and the project site (recipient). The transfer notes should bear the detailed name and address of the work sites concerned and duly signed by both the despatch and recipient parties undertaking the transfer (i.e. site representative/ stores officer in managerial position), together with company chops.

If the old timber products are from the same project site, a detailed usage record or inventory prepared by a site representative in respect of the timber products being used/ reused at the project site shall suffice to prove the reuse.
8. In the event the timber products are not purchased from a supplier who is an "accredited company", the following basic evidence should be produced to demonstrate the products:

8.1. Conform to sustainable forestry practice guidelines;

- 8.2. Be accredited by recognised organisations; and;
- 8.3. In compliance with the specification set down by the organisation.
9. Provided that the timber products are sourced from a supplier already accredited by the Approval Organisations, i.e. FSC, AFPA, PEFC or other "known licensed sources" according to the respective protocol (accredited company), and the timber products purchased are issued with the Certificate under the CoC (Chain of Custody) system, it is acceptable that the following documents as proof to demonstrate the timber products as purchased from the timber supplier and used in the project site are from a sustainable source:
- i) Invoice plus Delivery Note (DN) from the supplier of the timber products purchased - on the invoice & DN, it should be marked with the reference Certificate No.; a note which has the effect of confirming the products in the invoice and delivery note are certified; the pack no. of the timber products (samples are available on BSL's website [5] [6]);
 - ii) A copy of the CoC Certificate of the certified timber supplier; and
 - iii) Photographic evidence of the timber products.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-00-P3_00	BEAM Plus NDC submission template for IDCM-00-P3	✓	✓
IDCM-00-P3_01	Summary of Timber Use for Temporary Works with contractor's endorsement (for the use of new timber and/ or reused timber from other sites/ same project site)	✓*	✓
IDCM-00-P3_02	Specifications precluding the use of virgin timber	✓	-
IDCM-00-P3_03	Declaration letter from the site representative OR project developer specifying that timber was not used for temporary works	✓	✓
IDCM-00-P3_04	Timber Product Compliance Certificate [e.g. Chain of Custody (CoC), etc.] (for the use of new timber only)	✓*	✓
IDCM-00-P3_05	Invoices and delivery notes quantifying the new timber used during construction works (for the use of new timber only)	✓*	✓
IDCM-00-P3_06	Transfer notes for timber reused from other sites during construction works (for the reuse of timber from other sites only)	✓*	✓
<p>* Evidence of compliance with prerequisite requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.</p> <p>Remark: Photo records of timber products shall be kept and submitted for assessment upon request.</p>			

Remarks**(a) Additional Information**

[1] Forest Stewardship Council. [ONLINE]. Available at:
<http://www.fsc.org/>
 [Accessed Aug 2021].

[2] American Forest and Paper Association. [ONLINE]. Available at:
<http://www.afandpa.org/>
 [Accessed Aug 2021].

[3] Programme for the Endorsement of Forest Certification. [ONLINE]. Available at: <https://www.pefc.org/>
 [Accessed Aug 2021].

[4] Architectural Services Department, General Specifications for Building 2017, Section 13, Carpentry and Joinery. [ONLINE]. Available at: https://www.archsd.gov.hk/media/publications-publicity/general-specification-for-building/general_specification_for_building_2017_edition-20191223.pdf
 [Accessed Aug 2021].

[5] BEAM Society Limited. [ONLINE]. Available at:
https://www.beamsociety.org.hk/files/download/20191129_FAQ_MA_Attachment_a1.pdf
 [Accessed Aug 2021].

[6] BEAM Society Limited. [ONLINE]. Available at:
https://www.beamsociety.org.hk/files/download/20191129_FAQ_MA_Attachment_a2.pdf
 [Accessed Aug 2021].


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 2021].

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 2021].

WWF, Guide to Responsible Purchasing of Forest Products. [ONLINE]. Available at: http://assets.wwf.org.uk/downloads/responsible_purchasing.pdf
 [Accessed Aug 2021].

(b) Related Credits

None

2 Integrated Design and Construction Management	IDCM-01	Integrated Design Process
	IDCM-01-01	Sustainability Champions – Design 
Extent of Application	All DC	
Objective	Encourage the engagement of BEAM Professionals and/ or Affiliates to integrate BEAM Plus standards and practices into the planning and design of the DC.	
Credit Point(s) Attainable	1 + 1 Bonus	
Credit Requirement	<p>1 credit point for at least 2 members from at least 2 applicable core design disciplines shall be accredited BEAM Professionals with valid credentials for BEAM Plus New Data Centres.</p> <p>1 additional Bonus credit point for at least 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 Data Centres.</p> <p>Alternatively,</p> <ul style="list-style-type: none"> 1 additional Bonus credit point for at least 2 additional members, from an applicable core design discipline different from the disciplines counted in the above credit, shall be accredited BEAM Affiliates. 	
Assessment	<p>The Design BEAM Pros (and Affiliates, if any) shall:</p> <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> Project management; Facility management; Architectural; Structural/ civil engineering; Building services engineering; Surveying; DC Operator; Sustainability / Environmental; Interior designer; and Other as proposed and justified by the specific nature of the Project. 	

The Design BEAM Pros (and Affiliates, if any) may also assume other roles in the consultant team of the Project. (The Design BEAM Pros and Project BEAM Pro under IDCM-00-P1 must be different personnel).

2. If there is any change of Design BEAM Pro/ Affiliate during the period from project inception to completion of detailed design and specifications stage of the Project, supporting documents should be provided to document the hand-over.
3. Participate in introductory workshop/ meeting as required under IDCM-00-P1.
4. Participate in multi-disciplinary design charrette as required under IDCM-01-03, if applicable.
5. Complete the prescribed form with qualification details, appointment information and confirmation of appointment of the Design BEAM Pros (and Affiliates, if any).

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

6. Provide a copy of the following meeting minutes (date and content of the minute will be reviewed for compliance) showing the participation of the Design BEAM Pros (and Affiliates, if any) in an introductory workshop/ meeting as required under IDCM-00-P1 and a multi-disciplinary design charrette as required under IDCM-01-03 (if applicable). Confidential/ sensitive project information is not required and could be covered.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-01_00	BEAM Plus NDC submission template for IDCM-01-01	✓	✓
IDCM-01-01_01	A copy of the meeting minutes of introductory workshop/ meeting	✓	✓*
IDCM-01-01_02	A copy of the meeting minutes of multi-disciplinary design charrette (if any) under IDCM-01-03	✓	✓*
IDCM-00-01_03	Supporting documents showing how the works are handed over and the timeline for their involvement, if applicable (e.g. Declaration letter from the employer of the Design BEAM Pro/ Affiliate)	✓	✓
* The supporting documents are not required in FA if the credit is achieved 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 2021].

(b) Related Credits**IDCM-00-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-01-03 Integrated 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 DC performance, human health and environmental benefits.

IDCM-02-01 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	IDCM-01 Integrated Design Process
	IDCM-01-02 Complimentary Certification
Extent of Application	All DC
Objective	Encourage to pursue green building practices from planning, building design, construction, interior fitting-out to operation.
Credit Point(s) Attainable	3 Bonus
Credit Requirement	<p>(a) BEAM Plus Neighbourhood (ND)</p> <p>1 Bonus credit point where the project is certified by BEAM Plus Neighbourhood (ND) certification.</p> <p>(b) BEAM Plus Interiors (BI)</p> <p>1 Bonus credit point for preparing the Project for BEAM Plus Interiors (BI) certification.</p> <p>(c) BEAM Plus Existing Data Centres (EDC)</p> <p>1 Bonus credit point for preparing the Project for BEAM Plus Existing Data Centres (EDC) certification.</p>
Assessment	<p>(a) BEAM Plus Neighbourhood (ND)</p> <ol style="list-style-type: none"> 1. Provide a copy of valid BEAM Plus Neighbourhood Certificate at the time of the first submission of Provisional Assessment of the BEAM Plus New Data Centres (NDC) certification. 2. Provide evidence demonstrating that site planning is aligned with and is essentially the same as the Master Plan defined in the ND certification. <p>(b) BEAM Plus Interiors (BI)</p> <ol style="list-style-type: none"> 1. Provide justification of the extent of eligible areas of the project. Definition of eligible areas shall refer to the latest BEAM Plus Interiors Manual. 2. 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. 3. Declaration letter signed by the Project Owner/ Developer in attaining the Bonus credit is accepted as an alternative to the above-mentioned evidence for Provisional Assessment.

(c) BEAM Plus Existing Data Centres (EDC)

1. Provide an undertaking letter signed by the Owner/ Developer regarding their commitment to pursue BEAM Plus EDC certification.
2. Provide a feasibility study report on BEAM Plus EDC certification of the project with the following details:
 - 2.1. Checklist for potential credits and rating;
 - 2.2. Budget estimation for EDC certification; and
 - 2.3. Roll-out plan.

If a feasibility study is not available, declaration letter signed by the Project Owner/ Developer in attaining the Bonus credit(s) is accepted as alternative to the abovementioned evidence for Provisional Assessment.

Submittals**(a) BEAM Plus Neighbourhood (ND)**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-02a_00	BEAM Plus NDC submission template for IDCM-01-02a	✓	✓
IDCM-01-02a_01	BEAM Plus Neighbourhood (ND) certificate	✓	✓*
IDCM-01-02a_02	Evidence to demonstrate adaptation of the Master Plan design certified under ND	✓	✓*
* The supporting documents are not required in FA if the credit is achieved in PA			

(b) BEAM Plus Interiors (BI)

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-02b_00	BEAM Plus NDC submission template for IDCM-01-02b	✓	✓
IDCM-01-02b_01	Justification of the extent of eligible non-domestic premises	✓*	✓
IDCM-01-02b_02	Report to demonstrate prerequisite compliance for BI	✓*	✓
	[or] Declaration letter signed by the Project Owner/ Developer (alternative evidence)	✓	-
* Evidence of credit compliance is required if declaration letter signed by the Project Owner/ Developer is not available.			

(c) BEAM Plus Existing Data Centres (EDC)

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-02c_00	BEAM Plus NDC submission template for IDCM-01-02c	✓	✓
IDCM-01-02c_01	Undertaking letter signed by the Project Owner/ Developer on the commitment to pursue BEAM Plus EDC certification.	-	✓
IDCM-01-02c_02	Feasibility study report, including scorecard, budget and roll-out plan	✓*	✓
	[or] Declaration letter signed by the Project Owner/ Developer (alternative evidence)	✓	-
* Evidence of credit compliance is required if declaration letter signed by the Project Owner/ Developer is not available.			

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 Aug 2021].

(b) Related Credits

None

2 Integrated Design and Construction Management	IDCM-01	Integrated Design Process
	IDCM-01-03	Integrated Design Process ☺
	Extent of Application	All DC
	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.
	Credit Point(s) Attainable	4
Credit Requirement	(a) Early Considerations for Integrated Building Design	
	1 credit point 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 credit point for organising at least one multi-disciplinary design charrette to formulate passive and active design strategies in the conceptual/ schematic design stage.	
	(b) Early Design Consideration of Buildability/ Constructability	
	1 credit point for early design consideration of buildability to ease construction and save on-site materials/ labour before completion of the design development stage.	
Assessment	(c) Design Consideration for Operation and Maintenance	
	1 credit point for design consideration of the long-term operation and maintenance needs of the DC and its engineering services.	
	(a) Early Considerations for Integrated Building Design	
	1. Exploration of interrelationships among green building design strategies and systems.	
	1.1. Provide a design review report in comparing preliminary sustainable design benefits for at least one (1) baseline and one (1) alternative design option for each issue.	
	1.2. The report should at least have the sections below for each identified issue:	
	1.2.1. Executive Summary;	
	1.2.2. Project Program;	
	1.2.3. Workshop arranged for integrated design process (with date of workshop, number or arrangement of attendances);	
	1.2.4. Selected consideration, each with:	

- a) 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;
- b) An alternative design option with graphical support at concept stage level and board brush calculation in supporting the argument; and

1.2.5. Conclusion.

- 1.3. 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	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - Cooling load reduction; - Lighting load reduction; - PUE optimisation; - Renewable energy opportunities.
Building envelope attributes ¹ and energy use	<ul style="list-style-type: none"> - Cooling load reduction/ OTTV/ RTTV estimation; - Lighting load reduction.
Note: 1. Building envelope attributes refer to: <ul style="list-style-type: none"> - insulation values; - window-to-wall ratios; - glazing characteristics; - shading; - window operability. 	

- 1.4. Strategies addressing multiple consideration and issues are acceptable.
- 1.5. The sustainable design benefits for respective considerations shall be demonstrated in design appraisal by either:
- 1.5.1. 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;

1.5.2. Spreadsheet calculations; or

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

2. Multi-disciplinary design

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

2.2. The charrette shall, at minimum, address the following issues:

2.2.1. 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-01-01

2.2.2. 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.

2.2.3. 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; and
- 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 or contractor who should be with adequate experience such as at least 10 years of experience OR at least 5 years of experience across 2 projects or more in building construction industry and should not be under the design team (e.g. the client's representative or construction team member with relevant experience);
 - 1.2. Design optimisation of voids and complex form; or
 - 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 fulfill both requirements.

<i>Height of building</i>	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 (foundation to be included, if any) has not yet been commenced at PA stage.

(c) Design Consideration for Operation and Maintenance

1. Provide evidence that the design has considered the long-term operation and maintenance needs for the DC 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; and
 - 1.9. Others, to be proposed by the Applicant with justification.

Submittals

(a) Early Considerations for Integrated Building Design

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-03a_00	BEAM Plus NDC submission template for IDCM-01-03a	✓	✓
IDCM-01-03a_01	Design review report on preliminary sustainable design benefits	✓	✓*
IDCM-01-03a_02	Multi-disciplinary design charrette report (if the additional credit is targeted)	✓	✓*
* The supporting documents are not required in FA if the credit is achieved in PA			

(b) Early Design Consideration of Buildability/ Constructability

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-03b_00	BEAM Plus NDC submission template for IDCM-01-03b	✓	✓
	Summary of Adoption of 3S Concept [Form S-A] (for Item (b) 1.3 only)	✓*	✓
For Item (b) 1.1, please submit the following:		PA	FA
IDCM-01-03b_01	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	✓	✓#
	CV of the construction management consultant or contractor	✓	✓#
For Item (b) 1.2, please submit the following:		PA	FA
IDCM-01-03b_02	Design report demonstrating optimisation of high voids and complex forms	✓	✓#
For Item (b) 1.3, please submit the following:		PA	FA
IDCM-01-03b_03	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)	✓	-
<p>* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.</p> <p># The supporting document(s) is/ are not required in FA if the credit(s) is/ are achieved in PA.</p>			

(c) Design Consideration for Operation and Maintenance

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-03c_00	BEAM Plus New DCs submission template for IDCM-01-03c	✓	✓

IDCM-01-03c_01	Design report demonstrating the adoption of O&M features	✓	✓
IDCM-01-03c_02	Dated photo records of the completed O&M features	-	✓
	[or]		
	Approved material submission	-	✓*
	[or]	-	✓*
	Declaration letter signed by the Project Owner undertaking the provision		
* Alternative supporting document is accepted ONLY if photo records of the completed O&M features are not available at the time of FA.			

Remarks**(a) Additional Information**For IDCM-01-03a

[1] BC Green Building Roundtable. Roadmap for the Integrated Design Process. [ONLINE]. Available at:
<http://www.greenspacencr.org/events/IDRoadmap.pdf>
 [Accessed Aug 2021].

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 2021].

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 2021].

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 2021].

For IDCM-01-03b

[2] Development 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](https://www.devb.gov.hk/filemanager/en/content_29/Guidelines_Enhancement_of_Productivity_(Mar_2013)_English.pdf)
 [Accessed Aug 2021].

For IDCM-01-03c

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 2021].

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 2021]

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 2021].

(b) Related Credits

IDCM-01-04 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-02-02 Biodiversity Enhancement

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

SS-03-01 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-03-02 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-03-03 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-01-01 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-02-01 Renewable and Alternative Energy Systems

The related credit encourages the wider application of renewable energy sources in DCs.

2 Integrated Design and Construction Management	IDCM-01	Integrated Design Process
	IDCM-01-04	Life Cycle Costing 
Extent of Application	All DC	
Objective	Encourage the use of life cycle costing to facilitate investigation of potential design options, specifications, operation and maintenance.	
Credit Point(s) Attainable	1	
Credit Requirement	1 credit point for conducting life cycle costing for active systems.	
Assessment	<ol style="list-style-type: none"> 1. Conduct life cycle costing analysis with design options for each of the below active system, if present in the project construction scope: <ol style="list-style-type: none"> 1.1. Hot water system; 1.2. Interior lighting system; and 1.3. Air-conditioning system. 2. The life cycle costing exercise can be non-discounted and should include the following costs: <ol style="list-style-type: none"> 2.1. Acquisition; 2.2. Operation (utilities); and 2.3. Maintenance (replacements, planned maintenance and management costs) 3. 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. 4. 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. 5. Prepare a life cycle costing report including all the assumptions made and the results of life cycle costing. 6. Substantiate the costs with catalogues, suppliers' recommendations or quotation. Cost approximations suggested by Quantitative Surveyor are also accepted. No professional life cycle costing software is required for this study. 7. Note that the costing exercise imposes no obligation for implementation but encourages consideration of the costs of systems throughout their life cycle. 	

8. The life cycle costing report should include at least the below items with a minimum of 8 A4 pages:
- 8.1. Executive Summary;
 - 8.2. Project Description with Construction scope;
 - 8.3. System options to be considered;
 - 8.4. Life cycle costing and analysis; and
 - 8.5. Conclusion.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-04_00	BEAM Plus NDC submission template for IDCM-01-04	✓	✓
IDCM-01-04_01	Life cycle costing report	✓	✓*
* The supporting documents are not required in FA if the credit is achieved in PA			

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	IDCM-01	Integrated Design Process
	IDCM-01-05	Commissioning
Extent of Application	All DC	
Objective	Ensure the building systems perform as design specified and DCs operate as design intended.	
Credit Point(s) Attainable	4	
Credit Requirement	2 credit points for demonstrating (a) the appointment of commissioning authority (CxA) before tender stage and (b) providing a commissioning plan.	
	1 credit point for providing a commissioning review report before construction as described in part (c).	
	1 credit point for providing commissioning reports as described in part (d).	
Assessment	(a) Engage Commissioning Authority (CxA) <ol style="list-style-type: none"> 1. Identify a Chartered Engineer, Registered Professional Engineer, Member of HKIE (under the discipline of building services, mechanical, electrical, energy or environmental), 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, construction or installation of any building services installations of the project. 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: <ol style="list-style-type: none"> 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. Hot water systems;
 - 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 with the design intent as acknowledged by the project owner.
4. Provide a commissioning review report endorsed by the CxA.

(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. Installation verification checklist;
 - 2.6. List of systems commissioned;
 - 2.7. Equipment documentation;
 - 2.8. 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;
 - 2.9. List of outstanding commissioning issues and any testing that is scheduled on a later date; and
 - 2.10. All outstanding deficiencies identified during or as a result of commissioning activities should be listed and highlighted.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-01-05_00	BEAM Plus NDC submission template for IDCM-01-05	✓	✓
IDCM-01-05_01	Specification on the scope of services of CxA.	✓	✓#

IDCM-01-05_02	Organisation Chart of the project team with CxA's involvement and a brief description of the commissioning tasks.	✓	✓#
IDCM-01-05_03	CV of CxA to demonstrate adequate expertise of the CxA.	✓	✓#
IDCM-01-05_04	Commissioning Plan meeting the requirements with endorsement by CxA.	✓	✓#
IDCM-01-05_05	Commissioning specifications detailing the commissioning requirements for each system and equipment.	✓	-
IDCM-01-05_06	Endorsed commissioning review report to demonstrate all tasks in part (c)	-	✓
IDCM-01-05_07	Endorsed commissioning report to demonstrate all commissioning tasks fulfilling part (d)	-	✓
IDCM-01-05_08	Undertaking letter from the project's CxA confirming his/her involvement before the start of schematic design stage, duties and responsibilities for the testing & commissioning process	✓	-
# The supporting documents are not required in FA if (i) the credits are achieved in PA; and (ii) there is no change of the CxA after PA.			

Remarks**(a) Additional Information**

American Society of Heating, Air-conditioning, and Refrigerating Engineers (ASHRAE) – Standard and Guidelines on Commissioning Essentials. [ONLINE]. Available at:
<http://www.ashrae.org/>
 [Accessed Aug 2021].

Architectural Services Department, Building Services Branch – Testing and Commissioning Procedure. [ONLINE]. Available at:
<https://www.archsd.gov.hk/en/publications-publicity/testing-commissioning-procedure.html>
 [Accessed Aug 2021]

Building Services Research and Information Association (BSRIA) – Commissioning air systems. Application procedures for buildings. [ONLINE]. Available at:
<https://www.bsria.co.uk/>
 [Accessed Aug 2021].


The Chartered Institution of Building Services Engineers (CIBSE) – Air distribution systems. CIBSE. Commissioning Code A. [ONLINE]. Available at:
<http://www.cibse.org/>
 [Accessed Aug 2021].

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

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

(b) Related Credits

None

2 Integrated Design and Construction Management	IDCM-02	Green Construction Practices
	IDCM-02-01	Sustainability Champions – Construction 
Extent of Application	All DC	
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.	
Credit Point(s) Attainable	1	
Credit Requirement	1 credit point for at least 2 accredited BEAM Professionals with valid credential for BEAM Plus New Data Centres, are engaged by the main/ lead contractor of the project.	
	Alternatively,	
	<ul style="list-style-type: none"> • 1 credit point for at least 1 accredited BEAM Professional with valid credential for BEAM Plus New Data Centres and 2 accredited BEAM Affiliates, are engaged by the main/ lead contractor of the project. 	
Assessment	<ol style="list-style-type: none"> 1. The Construction BEAM Pro(s) (and Affiliates, if any) shall: <ol style="list-style-type: none"> 1.1. Be engaged by main/ lead contractor of superstructure from commencement of the respective contract [i.e. if project scope covers foundation and superstructure, the Construction BEAM Pro(s) (and Affiliates, if any) shall be engaged at the start of foundation stage] to completion of the certification process; 1.2. If there is any change of Construction BEAM Pro/ Affiliate within each construction stage (foundation or superstructure) of the Project, 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-00-P1; and 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 Affiliates, if any) may also assume other roles in the construction team of the project. (The Construction BEAM Pros and Project BEAM Pro under IDCM-00-P1 must be different personnel) 2. Complete the prescribed form with qualification details, appointment information and confirmation of the appointment of the Construction BEAM Pro(s) (and Affiliates, if any). 	

- 2.1. The appointed Construction BEAM Pro(s) (and Affiliates, if any) should maintain his/ her accreditation and credential during his/her appointment.
- 2.2. Provide copies of relevant contract documents highlighting the clause requiring the main/ lead contractor to engage related Construction BEAM Pro(s) (and Affiliates, if any) 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-00-P1, which shows the checking and compliance efforts by Construction BEAM Pro(s) (and Affiliates, if any).

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-01_00	BEAM Plus NDC submission template for IDCM-02-01	✓	✓
IDCM-02-01_01	Specification requiring engagement of Construction BEAM Pro(s) and BEAM Affiliates (if applicable) (for each construction stage)	✓	-
IDCM-02-01_02	A copy of the meeting minutes of kick-off meeting with the Project BEAM Pro	✓*	✓
IDCM-02-01_03	A copy of the meeting minutes of review meeting(s) with the Project BEAM Pro	✓*	✓
IDCM-02-01_04	Supporting documents showing how the works are handed over and the timeline for their involvement, if applicable (e.g. Declaration letter from the employer of the Construction BEAM Pro/ Affiliate)	✓	✓
* Meeting minutes shall be submitted in PA if the meeting(s) is/are held not less than 3 months prior to PA (first submission).			

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 2021].

(b) Related Credits**IDCM-00-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-01-01 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 DC.

2 Integrated Design and Construction Management	IDCM-02	Green Construction Practices
	IDCM-02-02	Measures to Reduce Site Emissions 
Extent of Application	All DC	
Objective	Encourage a high standard of environmental management and minimise pollution (air, noise, water discharge and light) during the demolition (if any), construction of DCs and the infrastructure serving DCs.	
Credit Point(s) Attainable	For whole building DC developments: 3 + 1 Bonus	
	For DC developments located in part of building: 2	
Credit Requirement	<u>For whole building DC developments</u>	
	(a) Minimisation of Air Pollution	
	1 credit point 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 point 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 point 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 Bonus credit point for providing adequate monitoring and mitigation measures to minimise light pollution during construction (demolition and foundation are included, if any)	
	Note:	
	<ol style="list-style-type: none"> 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. All applicable stages must be included in the partial credit calculation. 	

For DC developments located in part of building**(a) Minimisation of Construction Dust**

1 credit point for providing adequate monitoring and mitigation measures to minimise air pollution to host building users and neighbouring occupants during construction and fit-out activities.

(b) Minimisation of Construction Noise

1 credit point for providing adequate monitoring and mitigation measures to minimise noise pollution to host building users and neighbouring occupants during construction and fit-out activities.

Assessment For whole building DC developments**(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-00-P2.
 - 2.1. Provide baseline monitoring measurement report to demonstrate the following:
 - 2.1.1. Description and locations of air sensitive receivers (ASRs);
 - 2.1.2. Details of baseline monitoring measurement period, measurement results of baseline 1-hour Total Suspended Particulates (TSP) and identification of action levels; and
 - 2.1.3. Calibration certificates of the measurement instruments.
 - 2.2. 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. Prepare monthly environmental management reports throughout the construction period 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-00-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;
 - 3.4. Total Suspended Particulates (TSP) levels are satisfactory according to IDCM-00-P2, Assessment section, item 1.3; and
 - 3.5. Measurement of 24-hour TSP levels is NOT required.

- 3.6. The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or the Project BEAM Pro as defined under IDCM-00-P1.
4. For a project that is a Designated Project under the Environmental Impact Assessment (EIA) Ordinance with requirement of environmental monitoring, submit:
 - 4.1. Copy of the EM&A Report(s) submitted to EPD required under the EIA Ordinance in replacement of the monthly environmental management reports as stated above; and
 - 4.2. Completed prescribed form endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or the Project BEAM Pro as defined under IDCM-00-P1 to demonstrate the implementation of proactive dust control provisions.
5. Provide extracts of tender documents (e.g. specifications) highlighting the clause requiring the contractors to provide monthly environmental management / EM&A 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 IDCM-00-P2.
 - 2.1. Provide baseline monitoring measurement report to demonstrate the following:
 - 2.1.1. Description and locations of noise sensitive receivers (NSRs);
 - 2.1.2. Details of baseline monitoring measurement period, measurement result of baseline noise levels and identification of noise limit levels; and
 - 2.1.3. Calibration certificates of the measurement instruments.
 - 2.2. Provide extracts of tender documents, contract conditions and/ or specifications highlighting the clause requiring the contractors to provide baseline monitoring measurements if construction (demolition and foundation to be included, if any) has not yet commenced at PA stage.
3. Prepare monthly environmental management reports throughout the construction period to demonstrate the following:
 - 3.1. Implementation of monitoring and mitigation measures to minimise noise pollution as defined in Environmental Management Plan (EMP) under IDCM-00-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 forms; and
- 3.4. Noise levels that complied with the noise level limitation according to IDCM-00-P2, Assessment section, item 1.3.
- 3.5. The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or the Project BEAM Pro as defined under IDCM-00-P1.
4. For a project that is a Designated Project under the Environmental Impact Assessment (EIA) Ordinance with requirement of environmental monitoring, submit:
 - 4.1. Copy of the EM&A Report(s) submitted to EPD required under the EIA Ordinance in replacement of the monthly environmental management reports as stated above; and
 - 4.2. Completed prescribed form endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or the Project BEAM Pro as defined under IDCM-00-P1 to demonstrate the implementation of proactive dust control provisions.
5. Provide extracts of tender documents (e.g. specifications) highlighting the clause requiring the contractors to provide monthly environmental management / EM&A 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-00-P2, Assessment section, item 1.3.
3. Prepare monthly environmental management reports throughout the construction period to demonstrate the following:
 - 3.1. Implementation of monitoring and mitigation measures to minimise noise pollution as defined in Environmental Management Plan (EMP) under IDCM-00-P2;
 - 3.2. 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;
 - 3.3. Implementation of proactive wastewater control provisions with the completed prescribed forms; and
 - 3.4. Wastewater discharge qualities fulfilling permit requirement according to IDCM-00-P2, Assessment section, item 1.3. Copy of the discharge license issued by EPD and testing reports of the discharge water samples by accredited laboratory shall be provided as substantiation.
 - 3.5. The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or the Project BEAM Pro as defined under IDCM-00-P1.

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

(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 11 p.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 external light control measures if construction (demolition and foundation to be included, if any) has not yet been commenced at PA stage.
3. Demonstrate implementation of external light control measures with the completed prescribed form.

For DC developments located in part of building**(a) Minimisation of Construction Dust**

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. Checklist of dust control provisions is provided in the prescribed form.
2. Prepare monthly environmental management reports throughout the construction period to demonstrate the following:
 - 2.1. Implementation of monitoring and mitigation measures to minimise air pollution as defined in EMP;
 - 2.2. There are no convictions or complaints about air emissions from site, that have been upheld by the Environmental Protection Department, Building Management Office (BMO) or police leading to the issue of a fine or prosecution; and
 - 2.3. Implementation of proactive dust control provisions with the completed prescribed forms.
3. The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or the Project BEAM Pro as defined under IDCM-00-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 has not yet commenced at PA stage.

(b) Minimisation of Construction Noise

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. Prepare monthly environmental management reports throughout the construction period to demonstrate the following:
 - 2.1. Implementation of monitoring and mitigation measures to minimise noise pollution as defined in EMP;
 - 2.2. There are no convictions or complaints about noise emissions from site, that have been upheld by the Environmental Protection Department, Building Management Office (BMO) or police leading to the issue of a fine or prosecution; and
 - 2.3. Implementation of proactive noise control provisions with the completed prescribed forms.
3. The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or the Project BEAM Pro as defined under IDCM-00-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.

Submittals**For whole building DC developments****(a) Minimisation of Air Pollution**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-02a_00	BEAM Plus NDC submission template for IDCM-02-02a	✓	✓
IDCM-02-02a_01	Baseline monitoring measurement report [or] Extracts of tender documents, contract conditions and/or specifications highlighting the clause requiring the contractors to provide baseline monitoring measurements	✓*	✓
IDCM-02-02a_02	A total of 3 [^] monthly environmental management / EM&A reports at a minimum with at least 1 report for each of the construction stages with the completed prescribed form [IDCM-02-02-1_Form] [or] Extracts of tender documents (e.g. specifications) specifying the requirements of monthly environmental management / EM&A report(s) (if applicable)	✓*	✓
IDCM-02-02a_03	Summary of baseline and impact monitoring for construction air quality	✓*	✓
<p>* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.</p> <p>[^] If there are less than 3 construction stages, a minimum total of 3 monthly reports should still be submitted, with at least 3-month interval between each report (e.g. if the first submitted report is dated September 2019, the next report to be submitted should be dated December 2019 or later).</p>			

(b) Minimisation of Noise Pollution

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-02b_00	BEAM Plus NDC submission template for IDCM-02-02b	✓	✓

IDCM-02-02b_01	Baseline monitoring measurement report [or] Extracts of tender documents, contract conditions and/or specifications highlighting the clause requiring the contractors to provide baseline monitoring measurements	✓*	✓
IDCM-02-02b_02	A total of 3 [^] monthly environmental management / EM&A reports at a minimum with at least 1 report for each of the construction stages with the completed prescribed form [IDCM-02-02-2_Form] [or] Extracts of tender documents (e.g. specifications) specifying the requirements of monthly environmental management / EM&A report(s) (if applicable)	✓*	✓
IDCM-02-02b_03	Summary of baseline and impact monitoring for construction noise quality	✓*	✓
IDCM-02-02b_04	Examination schedule [#] for any educational institution(s) identified as noise sensitive receiver(s) (Optional)	✓*	✓
<p>* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.</p> <p>[^] If there are less than 3 construction stages, a minimum total of 3 monthly reports should still be submitted, with at least 3-month interval between each report (e.g. if the first submitted report is dated September 2019, the next report to be submitted should be dated December 2019 or later).</p> <p>[#] Construction Noise Limit Level for School: 70 dB(A) (Normal School Days)/ 65dB(A) (Examination Period)</p>			

(c) Minimisation of Water Pollution

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-02c_00	BEAM Plus NDC submission template for IDCM-02-02c	✓	✓
IDCM-02-02c_01	A total of 3 [^] monthly environmental management / EM&A reports at a minimum with at least 1 report for each of the construction stages with the completed prescribed form [IDCM-02-02-3_Form]	✓*	✓

	[or] Extracts of tender documents (e.g. specifications) specifying the requirements of monthly environmental management / EM&A report(s) (if applicable)	✓	-
IDCM-02-02c_02	Summary of construction wastewater discharge monitoring result	✓*	✓
<p>* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.</p> <p>^ If there are less than 3 construction stages, a minimum total of 3 monthly reports should still be submitted, with at least 3-month interval between each report (e.g. if the first submitted report is dated September 2019, the next report to be submitted should be dated December 2019 or later).</p>			

(d) Minimisation of Light Pollution

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-02d_00	BEAM Plus NDC submission template for IDCM-02-02d	✓	✓
IDCM-02-02c_01	External light control measures to minimise light pollution during construction	✓*	✓
IDCM-02-02c_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)	✓	-
<p>* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.</p>			

For DC developments located in part of building**(a) Minimisation of Construction Dust**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-02a_00	BEAM Plus NDC submission template for IDCM-02-02a	✓	✓

IDCM-02-02a_01	<p>A total of 3[^] monthly environmental management / EM&A reports at a minimum with at least 1 report for each of the construction stages with the completed prescribed form [IDCM-02-02-1_Form]</p> <p>[or]</p> <p>Extracts of tender documents (e.g. specifications) specifying the requirements of monthly environmental management / EM&A report(s) (if applicable)</p>	<p>✓*</p> <p>✓</p>	<p>✓</p> <p>-</p>
<p>* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.</p> <p>[^] If there are less than 3 construction stages, a minimum total of 3 monthly reports should still be submitted, with at least 3-month interval between each report (e.g. if the first submitted report is dated September 2019, the next report to be submitted should be dated December 2019 or later).</p>			

(b) Minimisation of Construction Noise

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-02b_00	BEAM Plus NDC submission template for IDCM-02-02b	✓	✓
IDCM-02-02b_01	<p>A total of 3[^] monthly environmental management / EM&A reports at a minimum with at least 1 report for each of the construction stages with the completed prescribed form [IDCM-02-02-2_Form]</p> <p>[or]</p> <p>Extracts of tender documents (e.g. specifications) specifying the requirements of monthly environmental management / EM&A report(s) (if applicable)</p>	<p>✓*</p> <p>✓</p>	<p>✓</p> <p>-</p>
<p>* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.</p> <p>[^] If there are less than 3 construction stages, a minimum total of 3 monthly reports should still be submitted, with at least 3-month interval between each report (e.g. if the first submitted report is dated September 2019, the next report to be submitted should be dated December 2019 or later).</p>			

Remarks**(a) Additional Information**

[1] Hong Kong Construction Association (HKCA), Best Practice Guide for Environmental Protection on Construction Sites. [ONLINE]. Available at: <https://www.epd.gov.hk/epd/english/greenconstruction/links/links.html> [Accessed Aug 2021].

[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_publications/files/pn94_1.pdf [Accessed Aug 2021].

Buildings Department. 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 2021].

Buildings Department, 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 Aug 2021].

Environment 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 Aug 2021]

Environmental Protection Department. Good Practices on Mitigating Construction Noise. [ONLINE]. Available at: https://www.epd.gov.hk/epd/misc/construction_noise/contents/index.php/en/index.html [Accessed Aug 2021].

Environmental Protection Department. Air - Guidelines & References. [ONLINE]. Available at: http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/air_guidelines.html [Accessed Aug 2021].

Environmental Protection Department. Noise - Guidelines & References. [ONLINE]. Available at: https://www.epd.gov.hk/epd/english/environmentinhk/noise/guide_ref/noise_guidelines.html [Accessed Aug 2021].


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 Aug 2021].

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 Aug 2021].

(b) Related Credits

IDCM-00-P2 Environmental Management Plan

The related prerequisite credit encourages a high standard of environmental management during construction

2 Integrated Design and Construction Management	IDCM-02	Green Construction Practices
	IDCM-02-03	Construction and Demolition Waste Recycling 
Extent of Application	IDCM-02-03a – All DC requiring demolition which are under the Applicant's control. IDCM-02-03b – All DC	
Objective	Encourage best practices in the management of construction resource consumption, including waste reduction.	
Credit Point(s) Attainable	2 + 4 Bonus	
Credit Requirement	(a) Demolition Waste Recycling	
	1 credit point 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 to 2 additional Bonus credit points for recycling at least 30% or 60% of demolition waste.	
	(b) Construction Waste Recycling	
	1 credit point 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 to 2 additional Bonus credit point for recycling at least 30% or 60% of construction waste (foundation waste to be included, if any).	
Assessment	<ol style="list-style-type: none"> 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. Checklist of waste management provisions is provided in the prescribed form. The disposal of inert waste to landfills, fill banks, sorting facilities, fill barging points, public fill reception facility, other construction waste disposal facilities and reuse of timber or timber products from the same site (timber or timber products under reuse are considered as resource materials and not waste) will not be considered as acceptable strategies for fulfilling the credit requirement. Waste handled by specialist Third Party Contractor could be considered as an acceptable strategy for fulfilling this credit requirement. 	
	(a) Demolition Waste Recycling	
	<ol style="list-style-type: none"> Provide the Demolition Waste Management Plan (WMP) as defined in Environmental Management Plan (EMP) under IDCM-00-P2 prepared by the demolition contractor and reviewed/ endorsed by Construction BEAM Pro (or Construction BEAM Affiliate) defined under IDCM-02-01 or Project BEAM Pro defined under IDCM-00-P1. Reference shall be made to Civil Engineering and Development Department (CEDD)'s Project Administration Handbook, Chapter 4, Paragraph 4.1.3. 	

2. Provide monthly waste management reports to show the following:
 - 2.1. Implementation of the Waste Management Plan (WMP) as defined in Environmental Management Plan (EMP) under IDCM-00-P2;
 - 2.2. Proactive waste management provisions and the completed prescribed form;
 - 2.3. Waste flow tables;
 - 2.4. All waste and recycling records;
 - 2.5. Collection organisation/ recycler information; and
 - 2.6. Monthly waste management report(s) shall be prepared by contractors and reviewed/ endorsed by Construction BEAM Pro (or Construction BEAM Affiliate) defined under IDCM-02-01 or Project BEAM Pro defined under IDCM-00-P1 from the commencement to completion of the demolition works.
3. 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.
4. 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 the Construction Waste Management Plan (WMP) (foundation to be included, if any) as defined in the Environmental Management Plan (EMP) under IDCM-00-P2 prepared by the contractor(s) and reviewed/ endorsed by Construction BEAM Pro (or Construction BEAM Affiliate) defined under IDCM-02-01 or Project BEAM Pro defined under IDCM-00-P1. Reference shall be made to Civil Engineering and Development Department (CEDD)'s Project Administration Handbook, Chapter 4, Paragraph 4.1.3.
2. Provide monthly waste management reports to show the following:
 - 2.1. Implementation of the Waste Management Plan (WMP) as defined in Environmental Management Plan (EMP) under IDCM-00-P2;
 - 2.2. Proactive waste management provisions and the completed prescribed form;
 - 2.3. Waste flow tables;
 - 2.4. All waste and recycling records; and
 - 2.5. Collection organisation/ recycler information.
 - 2.6. Monthly waste management report(s) shall be prepared by contractors and reviewed/ endorsed by Construction BEAM Pro (or Construction BEAM Affiliate) defined under IDCM-02-01 or Project BEAM Pro defined under IDCM-00-P1 from the commencement to completion of the demolition works.

3. 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.
4. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-03a_00	BEAM Plus NDC submission template for IDCM-02-03a	✓	✓
IDCM-02-03a_01	IDCM-02-03_Form	✓*	✓
IDCM-02-03a_02	Endorsed Demolition Waste Management Plan	✓*	✓
IDCM-02-03a_03	Extracts of tender documents (e.g. specifications) specifying the requirements of waste management measures (if applicable) [or]	✓	-
IDCM-02-03a_04	Any 3 monthly waste management reports.	✓*	✓
IDCM-02-03a_05	Waste flow table summarising the monthly disposal and recycling records throughout the demolition stage with calculation of the percentage of demolition waste recycled	✓*	✓
* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.			

(b) Construction Waste Recycling

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-03b_00	BEAM Plus NDC submission template for IDCM-02-03b	✓	✓
IDCM-02-03b_01	IDCM-02-03_Form	✓*	✓
IDCM-02-03b_02	Endorsed Construction Waste Management Plan	✓*	✓
IDCM-02-03b_03	Extracts of tender documents (e.g. specifications) specifying the	✓	-

	requirements of waste management measures (if applicable) [or]		
IDCM-02-03b_04	Any 3 monthly waste management reports.	✓*	✓
IDCM-02-03b_05	Waste flow table summarising the monthly disposal and recycling records throughout the construction stage and calculation of the percentage of construction waste recycled	✓*	✓
* Evidence of compliance with credit requirements for construction works started not less than 3 months prior to PA (first submission) shall be submitted in PA.			

Remarks**(a) Additional Information**

Buildings Department, 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 2021]

Hong Kong Construction Association (HKCA), Best Practice Guide for Environmental Protection on Construction Sites. [ONLINE]. Available at:
<https://www.epd.gov.hk/epd/english/greenconstruction/links/links.html>
 [Accessed Aug 2021]

(b) Related Credits

IDCM-00-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 IAQ Management for Renovation
	IDCM-02-04 Construction IAQ Management
Extent of Application	All DC
Objective	Ensure that project materials and ventilation systems are not contaminated by construction activities.
Credit Point(s) Attainable	1
Credit Requirement	1 credit point for implementing a Construction IAQ Management Plan, undertaking a building 'flush out' or 'bake out', and replacement of all filters prior to occupancy.
Assessment	<ol style="list-style-type: none"> 1. Provide a Construction IAQ Management Plan that includes the following: <ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> 2.1. The report(s) shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or Project BEAM Pro as defined under IDCM-00-P1. 2.2. 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. 3. Provide a report to demonstrate: <ol style="list-style-type: none"> 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.
- 3.8. The report shall be reviewed and endorsed by the Construction BEAM Pro (or BEAM Affiliate) as defined under IDCM-02-01 or Project BEAM Pro as defined under IDCM-00-P1.
- 3.9. 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.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-04_00	BEAM Plus NDC submission template for IDCM-02-04	✓	✓
IDCM-02-04_01	Construction IAQ Management Plan for indoor construction within the site	✓*	✓
IDCM-02-04_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-02-04_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)	✓	-
IDCM-02-04_04	HVAC drawings to demonstrate if any central air-conditioning and ventilation system is provided (to substantiate exemption for a building 'flush out' or 'bake	✓	✓

	out' and replacement of all filters prior to occupancy)		
* Evidence of compliance with credit requirements for construction (superstructure) works started not less than 3 months prior to PA (first submission) shall be submitted in PA.			

Remarks**(a) Additional Information**

[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/product/iaq-guidelines-for-occupied-buildings-under-construction>
[Accessed Aug 2021]

[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 2021]

(b) Related Credits

None

2 Integrated Design and Construction Management**IDCM-02****Green Construction Practices****IDCM-02-05****Considerate Construction**

This credit head is not applicable under BEAM Plus NDC.

2 Integrated Design and Construction Management	IDCM-02	Green Construction Practices
	IDCM-02-06	Building Management Manuals
Extent of Application	All DC	
Objective	Encourage the provision of a fully documented operations and maintenance manual to enable DC 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.	
Credit Point(s) Attainable	1	
Credit Requirement	1 credit point for providing a fully documented Operations and Maintenance Manual and Energy Management Manual.	
Assessment	1. <u>Building Operations and Maintenance Manual (O&M Manual)</u> <ol style="list-style-type: none"> 1.1. The O&M Manual shall include all of the following: <ol style="list-style-type: none"> 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, 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: <ol style="list-style-type: none"> 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; and 1.2.6. commissioning criteria. 1.3. The basis of design shall include all of the following: <ol style="list-style-type: none"> 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 O&M 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 O&M 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 O&M 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 DC 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 DC 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 DC 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-06_00	BEAM Plus NDC submission template for IDCM-02-06	✓	✓
IDCM-02-06_01	Owner's requirements/ specification on provision of O&M Manual for all equipment and systems, including those given in item 1.1.3.	✓	-
IDCM-02-06_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-02-06_03	Owner's requirements/ specification on the provision of Energy Management Manual for energy-related systems.	✓	-
IDCM-02-06_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 Aug 2021].

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 Aug 2021]

(b) Related Credits

None

2 Integrated Design and Construction Management	IDCM-02	Green Construction Practices
	IDCM-02-07	Operator Training plus Chemical Storage and Mixing Room
Extent of Application	All DC	
Objective	Encourage the provision of training for operations and maintenance staff to the minimum specified and demonstrate adequate maintenance facilities are provided for chemical storage and mixing.	
Credit Point(s) Attainable	1	
Credit Requirement	1 credit point for providing training for operations and maintenance staff to the minimum specified; and demonstrating that adequate maintenance facilities are provided for chemical storage and mixing.	
Assessment	<div>1. <u>Operator Training</u></div> <div>1.1. The training program shall cover as a minimum the items listed below.</div> <div>1.1.1. General purpose of each building system including basic theory of operation, capabilities and limitations, and modes of control and sequences of operation;</div> <div>1.1.2. Review of control drawings and schematics;</div> <div>1.1.3. Procedures for start-up, shutdown, seasonal changeover, normal operation, unoccupied operation and manual operation;</div> <div>1.1.4. Controls set-up and programming;</div> <div>1.1.5. Troubleshooting;</div> <div>1.1.6. Alarms;</div> <div>1.1.7. Interactions with other systems;</div> <div>1.1.8. Operational monitoring and record keeping requirements, and the use of data for analysing system performance;</div> <div>1.1.9. Adjustments and optimising methods for energy conservation;</div> <div>1.1.10. Any relevant health and safety issues;</div> <div>1.1.11. Inspection, service, and maintenance requirements for each system, including any need for specialised services;</div> <div>1.1.12. Sources for replacement parts/ equipment; and</div> <div>1.1.13. Any tenant interaction issues.</div>	

- 1.2. The demonstration portion of the training program shall include the following.
 - 1.2.1. Typical operation examples of each system;
 - 1.2.2. Start-up and shutdown procedures;
 - 1.2.3. Operation under all specified modes of control and sequences of operation;
 - 1.2.4. Procedures under emergency or abnormal conditions; and
 - 1.2.5. Procedures for effective operational monitoring.
- 1.3. Verify that the training of the DC'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.
- 1.4. A permanent room for training is not necessary. Evidence of carrying out operator training (e.g., record of attendance) is required.

2. Chemical Storage Room

- 2.1. A centralised chemical storage and mixing room for each individual building of the whole building DC developments on the site (i.e., janitor and central storage area) should be provided where DCs include provision of housekeeping and chemical products that create odour during their mixing processes (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 DC's future operation and maintenance items and equipment:
- 2.2. No size requirement for the chemical storage room.
- 2.3. Submit details in the form of drawings and a report with ventilation calculation to demonstrate the compliance of the following functional requirements of chemical storage and/ or mixing provision where applicable:
 - 2.3.1. A drainage point and a water supply point (where chemical mixing is required);
 - 2.3.2. An exhaust route for ventilation system to vent out (e.g. separate outside venting or exhaust route to centralised exhaust riser with non-return damper at the branched duct for the designated room) and maintain negative pressure with respect to adjacent spaces when the doors to the room are closed (where chemical mixing is required);
 - 2.3.3. A separate area with self-closing and lockable door (where chemical storage is required); and
 - 2.3.4. Full height-partitions (where chemical mixing is required).

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-02-07_00	BEAM Plus NDC submission template for IDCM-02-07	✓	✓
IDCM-02-07_01	Owner's requirements/ specification on the provision of program and records of operation and maintenance training.	✓	-
IDCM-02-07_02	Copies of Training program (e.g. PowerPoint presentation, training manual, etc.) which cover the items listed in the assessment criteria.	-	✓
IDCM-02-07_03	Evidence of operator training (e.g. sample record of attendance) verifying that training of the DC'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-02-07_04	Drawing(s) to show the required drainage point and water supply points are provided (if applicable).	✓	✓
IDCM-02-07_05	Drawing(s) and calculation demonstrating that chemical storage room is equipped with the required ventilation provisions (if applicable).	✓	✓
IDCM-02-07_06	Drawing(s) to show the chemical storage room with self-enclosing and lockage door and/ or full-height partitions (if applicable).	✓	✓

Remarks**(a) Additional Information**

None

(b) Related Credits

None

2 Integrated Design and Construction Management

IDCM-03 Smart Design and Technologies

IDCM-03-01 Digital Facility Management Interface

Extent of Application All DC

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

Credit Point(s) Attainable 1 Bonus

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

Assessment

- Develop and implement a digital interface for future DC 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 2018 [1]. Metering system design and hardware quality is not assessed in this credit head.
- 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:
 - 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	<ul style="list-style-type: none"> Air Temperature (°C) Humidity (RH) Daylight (Lux)
Building	<ul style="list-style-type: none"> PUE, Level 2 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) - Chillers - Heat pumps - Pumps - Heat Rejection	<ul style="list-style-type: none"> Electricity (kW and kWh) Operation Hour Supply & Return Water temperature (°C) Water Flow rate (m³/s)
	Each Equipment in HVAC (Water Side) - Absorption Chiller - Boiler	<ul style="list-style-type: none"> Fuel (kW and kWh) Operation Hour Supply & Return Water temperature (°C) Water Flow rate (m³/s)
	Each Equipment in HVAC (Air Side) - Primary Air/ Air Handling Unit Fans - Return Air Fans - Free Cooling Fans	<ul style="list-style-type: none"> Electricity (kW and kWh) Operation Hour Each service zone's temperature (°C) Supply & Return Air temperature (°C) Flow rate (m³/s)
	VRV and Unitary System	<ul style="list-style-type: none"> Electricity (kW and kWh)
	Ventilation System - Carpark Ventilation - Toilet Ventilation (≥ 2.5kW each)	<ul style="list-style-type: none"> Electricity (kW and kWh) Operation Hour CO / NO_x concentration level (if applicable)
Lift and Escalators System	Each Lift and Escalators	<ul style="list-style-type: none"> Electricity (kW and kWh)

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

- 2.7. 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.
3. Achievement of EU-01-04 is not required as the basic requirement in assessing this credit head.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-03-01_00	BEAM Plus NDC submission template for IDCM-03-01	✓	✓
IDCM-03-01_01	Specifications of monitoring system for future facility management team	✓	-
IDCM-03-01_02	Schematics of interface demonstrating compliance with the requirements	-	✓
IDCM-03-01_03	Evidence (e.g. approved contractor's submission with technical information) showing that the interface is capable of providing the information as prescribed in the assessment requirement items (2.1) to (2.7)	-	✓

Remarks**(a) Additional information**

[1] Electrical and Mechanical Services Department – Code of Practice for Building Energy Audit 2018. [ONLINE]. Available at: https://www.emsd.gov.hk/bceo/en/pee/EAC_2018.pdf [Accessed Aug 2021].

(b) Related Credits

EU-01-04 Metering and Monitoring

This credit head may act as a platform gathering and processing the data collected in EU-01-04 Metering and Monitoring.

IDCM-01-03 Integrated Design Process

In conjunction with IDCM-01-03c Design Consideration for Operation and Maintenance, it is recommended to consult the facility management team while specifying the document management system

2 Integrated Design and Construction Management **IDCM-03 Smart Design and Technologies****IDCM-03-02 Occupant Engagement Platform****Extent of Application** All DC**Objective** Encourage the provision of digital platforms to connect building occupants and the building status to drive behaviour change.**Credit Point(s) Attainable** 1 Bonus**Credit Requirement** 1 Bonus credit point for providing a digital platform to engage building occupants.

- Assessment**
1. 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-01-04 part (a) requirement and provide the following information:
 - 1.1. Description of green measures implemented in the building;
 - 1.2. Energy consumption in the occupants' respective leased spaces;
 - 1.3. Recommendations to conserve energy use in the building; and
 - 1.4. Healthy lifestyle tips.
 2. The digital platform should be in a form of one of the following:
 - 2.1. Digital displays in at least one common area(s) accessible by all occupants;
 - 2.2. Mobile applications accessible by all occupants; or
 - 2.3. Web-based applications accessible by all occupants.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
IDCM-03-02_00	BEAM Plus NDC submission template for IDCM-03-02	✓	✓
IDCM-03-02_01	Specifications of digital platform for future occupants	✓	-
IDCM-03-02_02	Operation manual or other evidence (e.g. approved contractor's submission with technical information) showing that the digital platform can provide the information as prescribed in the credit requirement	-	✓

Remarks**(a) Additional information**

None

(b) Related Credits

EU-01-04 - Metering and Monitoring

This credit head may act as a platform to present the data collected in EU-01-04 - Metering and Monitoring in a simple way for occupants to understand the building status.

2 Integrated Design and Construction Management	IDCM-03	Smart Design and Technologies
	IDCM-03-03	Document Management System
Extent of Application	All DC	
Objective		Encourage tidy and digital documentation throughout the design and construction process for the ease of handing over to facility management teams.
Credit Point(s) Attainable	1 + 1 Bonus	
Credit Requirement	(a) Project Team Document Management	
		1 credit point for demonstrating the use of document management systems within the design team.
	(b) Facility Management Team Document Management	
		1 additional Bonus credit point for demonstrating the use of document management platform by the DC owner or DC management company.
Assessment	(a) Project Team Document Management	
		<ol style="list-style-type: none"> 1. Demonstrate coordinated use of Design Team Document Management among design teams which shall include the following members: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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. Provide specifications of the document management system including: <ol style="list-style-type: none"> 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-02-06, IDCM-02-07, IDCM-03-01 and IDCM-03-02 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-03-03a_00	BEAM Plus New DCs submission template for IDCM-03-03a	✓	✓
IDCM-03-03a_01	Specifications of document management system	✓	-
IDCM-03-03a_02	Evidence (e.g. screenshots) to demonstrate the use of document management system	-	✓

(b) Facility Management Team Document Management

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-03-03b_00	BEAM Plus New DCs submission template for IDCM-03-03b	✓	✓
IDCM-03-03b_01	Specifications of document management system	✓	-
IDCM-03-03b_02	Evidence to demonstrate that the platform will be used by the 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 2021].

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 2021].

The Hong Kong Institute of Surveyors - Green Property Management Practices. [ONLINE]. Available at:
<https://www.hkis.org.hk/ufiles/gpmp2015.pdf>
 [Accessed Aug 2021].

(b) Related Credits

EU-01-04 - Metering and Monitoring

This credit head may act as a platform to present the data collected in EU-01-04 - Metering and Monitoring in a simple way for occupants to understand the building status.

2 Integrated Design and Construction Management	IDCM-03	Smart Design and Technologies
	IDCM-03-04	BIM Integration
Extent of Application	All DC	
Objective	Encourage tidy and digital documentation throughout the design and construction process for the ease of handing over to facility management teams.	
Credit Point(s) Attainable	1 + 3 Bonus	
Credit Requirement	<p>(a) Coordinated Use of BIM with Design Teams and Construction Teams</p> <p>1 credit point for the coordinated use of BIM among the design team.</p> <p>1 additional Bonus credit point for coordinated use of BIM among the design team and the contractors.</p> <p>(b) Other Application of BIM</p> <p>Maximum 2 Bonus credit points for the following BIM application:</p> <p><u>BIM for Time</u></p> <p>1 Bonus credit point for using the BIM model for scheduling, cost and quantity, schedules preparation and tracking the project budget.</p> <p><u>BIM for Facility Management Use</u></p> <p>1 Bonus credit point for updating the BIM model to as-built condition.</p>	
Assessment	<p>(a) Coordinated Use of BIM with Design Teams and Construction Teams</p> <ol style="list-style-type: none"> Prepare a project execution plan including the following content: <ol style="list-style-type: none"> Project BIM objectives; Model Level of Development (LOD); Methods of communication; Project BIM standards; and Model/ Data validation protocols. Demonstrate coordinated use of BIM among design teams which shall include the following members: <ol style="list-style-type: none"> Architects/ project designers; MEP engineers; and 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 (both graphical presentation and non-graphical information) as defined in local or international standards such as the Hong Kong Construction Industry Council BIM Standards and Guidelines [1] or the American Institute of Architects (AIA) Project Building Information Modelling Protocol Form [2] for builder and MEP elements.
5. For the addition Bonus credit point:

In addition to requirements in (a) 1 to 4, provide one representing document (e.g. crashes report) to demonstrate use of BIM among design teams and the contractors.

(b) Other BIM Application

1. **BIM for Time:**

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

2. **BIM for Facility Management Use:**

- 2.1. Update the BIM model to the as-built condition including fixtures, finishes and equipment data:
- 2.2. Demonstrate that the BIM will be handed over to the facility management team for facility management use

Submittals (a) Coordinated Use of BIM with Design Teams and Construction Teams

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-03-04a_00	BEAM Plus NDC submission template for IDCM-03-04a	✓	✓
IDCM-03-04a_01	Project execution plan	✓	✓#
IDCM-03-04a_02	Specifications of BIM software	✓	-
IDCM-03-04a_03	Project-specific documents demonstrating the use of BIM performing the required functions	✓	✓#
IDCM-03-04a_04	Project-specific document demonstrating the coordinated use of BIM among design teams	✓	✓#
IDCM-03-04a_05	Project-specific representing document demonstrating the use of BIM among design team and construction team	✓*	✓
# The supporting documents are not required in FA if the credit is achieved in PA * Evidence of compliance with credit requirements shall be submitted in PA if superstructure works are started not less than 3 months prior to PA (first submission).			

(b) BIM for Other Application

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IDCM-03-04b_00	BEAM Plus NDC submission template for IDCM-03-04b	✓	✓
For BIM for Time:		PA	FA
IDCM-03-04b_01	Project execution plan	✓	✓
IDCM-03-04b_02	Specifications of BIM software	✓	-
IDCM-03-04b_03	Project-specific documents demonstrating the use of BIM which performs the function requirements related to time	✓	✓
For BIM for Facility Management Use:		PA	FA
IDCM-03-04b_04	Specifications of an as-built BIM model to be provided by contractor	✓	-
IDCM-03-04b_05	Specifications of handing over the as-built BIM model to facility management	✓	-
IDCM-03-04b_06	Evidence of handing over the as-built BIM model to facility management	-	✓

Remarks**(a) Additional information**

[1] The Hong Kong Construction Industry Council – CIC BIM Standards. [ONLINE]. Available at: <https://www.bim.cic.hk/en/resources/publications?cate=3&keyword=> [Accessed Aug 2021].

[2] The American Institute of Architects (AIA) - The American G202™ – 2013, Project Building Information Modelling Protocol Form [ONLINE]. Available at: https://contractdocs.aia.org/PreviewFiles/Preview_G202-2013%20OmniClass.pdf [Accessed Aug 2021].

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 2021].

Housing Authority, Building Information Modelling. [ONLINE]. Available at: <http://www.housingauthority.gov.hk/en/business-partnerships/resources/building-information-modelling/> [Accessed Aug 2021].

Hong Kong Construction Industry Council, CIC BIM Standards. [ONLINE]. Available at: <https://www.bim.cic.hk/en/resources/publications?cate=3&keyword=> [Accessed Aug 2021].

(b) Related Credits

IDCM-01-03 Integrative Design Process

The use of BIM is a valuable add-on to IDCM-01-03 Integrative Design Process as it facilitates integrative design by strengthening the coordination within the project team.

2 Integrated Design and Construction Management

IDCM-04 Design for Engagement and Education on Green Buildings

IDCM-04-01 Design for Engagement and Education on Green Buildings

Extent of Application

All DC

Objective

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

Credit Point(s) Attainable

1 + 1 Bonus

Credit Requirement

1 credit point for providing any 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 additional Bonus credit point for providing 4 education elements.

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.

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		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
IDCM-04-01_00	BEAM Plus NDC submission template for IDCM-04-01	✓	✓
IDCM-04-01_01a	User manual: Synopsis & content framework	✓	-
IDCM-04-01_01b	User manual: Completed manual	-	✓
IDCM-04-01_02a	Educational signage plan	✓	-
IDCM-04-01_02b	Record photos of educational signage	-	✓
IDCM-04-01_03a	Undertaking letter signed by the project owner declaring that the education platform will be provided for building users	✓	-

IDCM-04-01_03b	Supporting document of education platform(s) provided, e.g. pdf of the website or pdf of the electronic newsletter, etc.	-	✓
IDCM-04-01_04a	Other supporting document(s) for the additional or alternative education element(s) proposed by applicant	✓	-
IDCM-04-01_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

The assessment criteria in this category focus on the location of the DC, emissions from the site, microclimate enhancement to the surroundings and amenities provisions.

Site location is important with regard to adequacy of local amenities and public transport provisions, reduction of travel needs and reliance on private vehicles. There is often an opportunity to enhance the quality of buildings through more thoughtful 'greening' and other features.

The impacts on neighbouring developments and various discharges and emissions from the site can be significant throughout a building's lifetime.

**3 Sustainable
Site****SS-00****Prerequisite****SS-00-P1****Minimum Landscaping Requirements***This Prerequisite is not applicable under BEAM Plus NDC.*

3 Sustainable Site SS-01 Neighbourhood Integration**SS-01-01 Pedestrian-oriented and Low Carbon Transport****Extent of** All DC**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.**Credit Point(s) Attainable** 2 + 3 Bonus**Credit Requirement (a) Accessibility to Public Transport**

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

(b) Pedestrian-oriented Access

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

1 additional Bonus credit point for 100% achievement.

(c) Cycling Facilities and Network Integration

1 Bonus credit point 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 point 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 prescribed form:
 - 3.1. Use service frequency data at peak periods for the calculation of waiting time; and
 - 3.2. Adopt a walking speed of 80m per minute for the calculation of walk time.
 - 3.3. For a walking route using mechanical means to assist pedestrian movement, provide evidence 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) plus horizontal commuting time 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 13 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 [3].	1
g	Widths for the main pedestrian pathways meeting recommended widths of HKPSG Chapter 8 [3].	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
<p>Note:</p> <p>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.</p>		

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 [3] 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 [3] 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. 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.

(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:
- 2) 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 [4].
- 3) Demonstrate that 50% of all the carparking spaces are provided with EV charging facilities that meet the following requirements:
 - 1.1. Installation of medium chargers with output power not less than 7kW;
 - 1.2. Sockets/ connectors provided are widely applicable for various EV brands/ types of the market;
 - 1.3. Medium chargers with both American SAE standard and European IEC standard sockets/ connectors shall be provided for all visitor car parks; and
 - 1.4. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-01-01a_00	BEAM Plus NDC submission template for SS-01-01a	✓	✓
SS-01-01a_01	Calculation for Accessibility Index (AI)	✓	✓
SS-01-01a_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-01-01a_03	Evidence of service frequencies of public transport	✓	✓
SS-01-01a_04	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)		
<i>For future services/ facilities provisions in operation no later than one year after the completion and occupation of the proposed development, please include the following:</i>		PA	FA
SS-01-01a_05	Evidence issued by a government agency or a quasi-government body for the targeted operation dates of any future public transport services/ facilities	✓	✓
SS-01-01a_06	Evidence showing the actual occupation date of the proposed development	-	✓
<i>If shuttle service is provided, please include the following:</i>		PA	FA
SS-01-01a_07	Scaled building layout plans for drop- off/ pick-up point(s) of shuttle service vehicles	✓	✓
SS-01-01a_08	Notification of shuttle service provisions by the service provider to building users confirming that: <ul style="list-style-type: none"> - 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-01-01a_09	Justification for the adequacy of services (if the capacity of shuttle service vehicles is below 16 passengers)	-	✓
SS-01-01a_10	Undertaking letter by the developer/ property owner that the shuttle services will be provided for a minimum of 5 years.	-	✓
SS-01-01a_11	A minimum of 1 year rolling contract in place with the service provider information.	-	✓
SS-01-01a_12	Evidence of shuttle services in project completion	-	✓

(b) Pedestrian-oriented Access

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-01-01b_00	BEAM Plus NDC submission template for SS-01-01b	✓	✓
SS-01-01b_01	Drawings and descriptions on the relevant pedestrian-oriented features	✓	✓
SS-01-01b_02	Relevant parts of the lease conditions/ engineering conditions on the car park provisions (If applicable)	✓	✓
SS-01-01b_03	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-01-01b_04	Layout plan showing the locations and types of car parking spaces (If applicable)	✓	✓
SS-01-01b_05	Calculation of minimum car park provision (If applicable)	✓	✓
SS-01-01b_06	Swept path diagram to show simultaneous free flow of vehicles in and out of the car park at the point of access (If applicable)	✓	✓
SS-01-01b_07	Drawings showing the provisions of petrol interceptor in the carpark to avoid ground contamination from oil run-off (If applicable)	✓	✓
SS-01-01b_08	Plans showing a shaded pedestrian route under trees for main pedestrian pathways; and 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-01-01b_09	Evidence of pedestrian-oriented features in project completion	-	✓

(c) Cycling Facilities and Network Integration

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-01-01c_00	BEAM Plus NDC submission template for SS-01-01c	✓	✓
SS-01-01c_01	Scaled drawing on an A3-sized sheet indicating the nearby public cycling network	✓	✓
SS-01-01c_02	Drawings and calculations of cycling tracks, parking and other facilities within the site meeting stipulated requirements	✓	✓
SS-01-01c_03	Extracts of HKPSG's recommended cycling facilities provisions, or Transport Department advice on cycling facilities provisions	✓	✓
SS-01-01c_04	Evidence of cycling facilities in project completion	-	✓
SS-01-01c_05	Drawings demonstrating the shower and changing facilities (for non-residential projects or non-residential portion of mixed-use projects)	✓	✓

(d) Charging Facilities for EV

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-01-01d_00	BEAM Plus NDC submission template for SS-01-01d	✓	✓
SS-01-01d_01	Drawings and description of EV charging facility provisions	✓	✓
SS-01-01d_02	Evidence of EV charging facilities in project completion	-	✓

Remarks**(a) Additional Information**

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

[2] Transport for London. Public Transport Accessibility Levels. [ONLINE]. Available at: <https://data.london.gov.uk/dataset/public-transport-accessibility-levels>
[Accessed Aug 2021]

[3] 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 2021]

[4] 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 2021]

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 Aug 2021].

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

(b) Related Credits

SS-01-02 Neighbourhood Amenities

The related credit head 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 DC building users and/ or the public.

SS-02-02 Biodiversity Enhancement

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

SS-03-01 Urban Heat Island Mitigation

The related credit head 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-03-03 Outdoor Thermal Comfort

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

SS-04-01 Stormwater Management

The related credit head 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	SS-01	Neighbourhood Integration
	SS-01-02	Neighbourhood Amenities
Extent of Application	All DC	
Objective	Encourage building development that is integrated within, and an asset to, the immediate neighbourhood.	
Credit Point(s) Attainable	1	
Credit Requirement	Amenities for Building Users 1 credit point where adequate amenities for building users are located within the site or 1,000m walking distance/ an equivalent horizontal commuting time from the site entrance(s).	
Assessment	Amenities for Building Users 1. Provide a summary based on a survey of the immediate neighbourhood and the development itself to demonstrate that at least 5 amenities for building users are located within the site or 1,000m 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). 1.1. Restaurants/ cafes/ food & beverage outlets; 1.2. Vending machines for snacks and drinks; 1.3. Banks or Automated Teller Machines (ATM); 1.4. Medical/ health facilities (including dental clinic); 1.5. Places of worship; 1.6. Active recreational facilities or open spaces; and 1.7. Passive recreational facilities or open spaces. 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; and 2.2. Count 2 or more amenities of the same type as 2 amenities. Example 1: 3 cafes and 2 ATMs shall be counted as 4 amenities. Example 2: 3 cafes, 2 ATMs and 3 public toilets shall be counted as 6 amenities 3. For a walking route using a mechanical means to assist pedestrian movement, provide evidence to demonstrate:	

- 3.1. The mechanical means having no restricted operating hour or in operation when the counted amenities are opened;
- 3.2. Mapping of the start and end points of the mechanical means to be shown on a scaled drawing, and
- 3.3. Calculation of combined horizontal commuting time (walk times plus horizontal commuting times on the mechanical means to amenities being no more than 7 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.
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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-01-02_00	BEAM Plus NDC submission template for SS-01-02	✓	✓
SS-01-02_01	Scaled drawing on an A3-sized sheet indicating the distances alongside unhampered walking routes from the site's entrance(s) to amenities	✓	✓
SS-01-02_02	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-01-02_03	Justifications on the needs of building users/public to count amenities that are not listed (If applicable)	✓	✓
SS-01-02_04	Evidence for the targeted opening schedules for future amenities provisions (If applicable)	✓	✓
SS-01-02_05	Evidence of the actual occupation date of the proposed development (If future amenities with known targeted opening schedules are counted)	-	✓
SS-01-02_06	Evidence of the amenities identified in the vicinity within 1,000m walking distance	✓	✓

Remarks**(a) Additional Information**

Planning Department. Hong Kong Planning Standards and Guidelines. Chapter 3: Community Facilities [ONLINE]. Available at: https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/pdf/ch3.pdf [Accessed Aug 2021]

Planning Department. Hong Kong Planning Standards and Guidelines. Chapter 4: Recreation, Open Space and Greening. [ONLINE]. Available at: https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/pdf/ch4.pdf [Accessed Aug 2021].

(b) Related Credits

SS-01-01 Pedestrian-oriented and Low Carbon Transport

The related credit head 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 SS-01 Neighbourhood Integration**SS-01-03 Building Design for Sustainable Urbanism**

This credit head is not applicable under BEAM Plus NDC.

3 Sustainable Site SS-01 Neighbourhood Integration

SS-01-04 Neighbourhood Daylight Access

Extent of Application Whole building DC developments

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

Credit Point(s) Attainable 1

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

Assessment 1. Demonstrate either 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.
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 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;
 - 3.2. For VDF simulation method:
 - 3.2.1. Name of the simulation software used;
 - 3.2.2. Modelling assumptions;
 - 3.2.3. Screen captures of project building, surrounding building and terrain of the 3D model;
 - 3.2.4. Screen captures of the Sensitive Receivers' locations;
 - 3.2.5. Summary of sensitive receivers and VDF results;
 - 3.2.6. Simulation output results (raw data output files / render images); and
 - 3.2.7. If the simulation software is not on the list in Annex 4 of PNAP APP-130, a software validation report from the software developer should be provided to ensure the accuracy of the simulation by the software.

3.3. For physical modelling simulation method:

- 3.3.1. General information such as site orientation, site latitude, scale of physical model, etc.;
- 3.3.2. Sensor and camera location;
- 3.3.3. Material and edge joining;
- 3.3.4. Colour and Wall Reflection Coefficient;
- 3.3.5. Modelisation of the external surfaces; and
- 3.3.6. Modelisation of external obstructions.

3.4. For UVA method:

- 3.4.1. 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.

5. Sensitive Buildings

- 5.1. 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;

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

5.3. Sensitive buildings include:

- 5.3.1. Residential buildings;
- 5.3.2. Premises that requires daylight to enhance the lighting environment for the occupants to perform tasks, such as offices and schools;
- 5.3.3. 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
- 5.3.4. Premises that require daylight primarily for view, such as hotels and hospitals
 - a) Examples of premises that should be included: Commercial, education, shopping centre, hall, church, temple, hotel, hostel, hospitals and shops; and
 - b) Temporary structures are not required to be modelled.

5.4. Sensitive Receivers

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

6. The below requirements should be fulfilled in the daylight simulation:
- 6.1. Sky model should use CIE overcast sky (10,000 lux);
 - 6.2. Overall external reflectance of an average of 0.2 for building (include the project development, unless provide other supporting) and 0.2 for ground;
 - 6.3. Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department;
 - 6.4. 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; and
 - 6.5. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-01-04_00	BEAM Plus NDC submission template for SS-01-04	✓	✓
SS-01-04_01	CV of the professional as described in credit requirement	✓	✓#
SS-01-04_02	Site plan indicating the location of the sensitive receiver	✓	✓#
SS-01-04_03	Daylight access study report	✓	✓#
SS-01-04_04	Validation Report of the simulation software (Simulation Path only)*	✓	✓#
# The supporting documents are not required in FA if the credit is achieved in PA			
* It is required only if the simulation software is not on the list in Annex 4 of PNAP APP-130			

Remarks**(a) Additional Information**

[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 August 2021].

(b) Related Credits

None

3 Sustainable Site SS-01 Neighbourhood Integration**SS-01-05 Noise Control for Building Equipment**

Extent of Application	All DC
Objective	Encourage proactive design techniques to reduce the nuisance caused to the neighbours by noise from building services equipment.
Credit Point(s) Attainable	1
Credit Requirement	1 credit point 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	<ol style="list-style-type: none"> 1. Provide a noise prediction / assessment report with detailed analysis, appropriate calculations or measurements to demonstrate that the levels of the intruding noise at the facades of existing or planned noise sensitive receivers comply with the following assessment criteria: <ol style="list-style-type: none"> 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 planned 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, and fans (duct type and centrifugal) [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 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 [3]. Applicants are required to justify the selected Area Sensitivity Rating (ASR)

1.8. The acoustic calculation or measurement report should be endorsed by:

- 1.8.1. Corporate Member of Hong Kong Institute of Acoustics; or
- 1.8.2. Corporate/ certified/ full member of other international acoustic institution; or
- 1.8.3. Member of HKIE (Building Services, Mechanical or Environmental discipline) with relevant experience in Acoustic/ Vibration Design.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-01-05_00	BEAM Plus NDC submission template for SS-01-05	✓	✓
SS-01-05_01	Layout plans indicating the location of the major noise sources and NSR's location and corresponding distance	✓	✓
SS-01-05_02	Endorsed noise prediction/ assessment report	✓	✓
SS-01-05_03	Equipment catalogue showing the sound power level of equipment	✓	✓
SS-01-05_04	Outline zoning plan to show the planned development(s) around the project site	✓	✓
SS-01-05_05	CV of the professional as described in credit requirement	✓	✓

Remarks

(a) Additional Information

[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 2021].

[2] EPD - Good Practices on Ventilation System Noise Control (August 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 2021].

(b) Related Credits

None

3 Sustainable Site	SS-02 Ecologically Responsible Design
	SS-02-01 Light Pollution Control
Extent of Application	All DC
Objective	Ensure that the exterior lighting and building design do not create unwanted and unnecessary light pollution.
Credit Point(s) Attainable	1
Credit Requirement	1 credit point for demonstrating that the obtrusive light from exterior lighting meets the specified performance for the environmental zone in which the building development is located.
Assessment	<ol style="list-style-type: none"> 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 [1] are complied with. 5. Meet the obtrusive light control requirements, using either the backlight-uplight-glare (BUG) method when all installed luminaires' BUG rating information is available, or the calculation method if partial exterior luminaires are not BUG rated. 6. <u>Calculation Method</u> <ol style="list-style-type: none"> 6.1. Demonstrate that the exterior lighting design complies within the maximum figure for each parameter (light into windows, source intensity, sky glow and building luminance), taken from Table 3, Table 4, Table 6 and Table 8 respectively in ILP Guidance Notes [2]. Provide justification of the environmental zone as defined in Table 2 of ILP Guidance Notes [2] for the project. Note that it is a district-scale consideration 6.2. Prepare a light pollution calculation report for modelling studies to demonstrate compliance of the above criteria, including <ol style="list-style-type: none"> 6.2.1. Assumptions adopted; 6.2.2. Screen capture of input parameters; 6.2.3. Screen capture of modelled buildings; 6.2.4. Results highlighting compliance of credit requirements.

7. BUG Method

- 7.1. Demonstrate that the luminaire uplight, backlight and glare ratings for the specific light source installed in the luminaire, taken from IES TM-15-11 – Addendum A [3], based on mounting location and distance from the property line (assessment boundary), do not exceed the criteria for the corresponding lighting zone as defined in Model Lighting Ordinance (MLO) [4]. Provide justification for the lighting zone adopted for the project. Note that the lighting zone is a district-scale consideration.
- 7.2. Define assessment boundary on layout.
- 7.3. 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.
- 7.4. Prepare a BUG method report to demonstrate compliance of the above criteria, including:
 - 7.4.1. Highlighting manufacturer BUG rating information for installed luminaires
 - 7.4.2. Software calculation (if applicable) for the BUG rating with all assumption adopted, screen capture of input parameters and results of BUG rating

8. Exemptions from this credit assessment

- 8.1. The following exterior lighting is exempted from the requirements, provided it is controlled separately from the non-exempt lighting:
 - 8.1.1. Specialised signal, directional, and marker lighting for transportation;
 - 8.1.2. Lighting for theatrical purposes for stage, film, and video performances; and
 - 8.1.3. Hospital emergency departments, including associated helipads.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-02-01_00	BEAM Plus NDC submission template for SS-02-01	✓	✓
SS-02-01_01	Scaled map showing immediate neighbourhood of the site for assessment	✓	✓#
SS-02-01_02	External lighting layout plans	✓	✓#
SS-02-01_03	Schedule of exterior lighting fixtures and lighting catalogues on performance data	✓	✓#
SS-02-01_04	Light pollution calculation report [or]	✓	✓#
	BUG method report	✓	✓#
SS-02-01_05	Report on the compliance of Guidelines on Industry Best Practices for External Lighting	✓	✓#
# The supporting documents are not required in FA if the credit is achieved in PA			

Remarks**(a) Additional Information**

[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_in_stall_eng.pdf
 [Accessed Aug 2021].

[2] The Institution of Lighting Professionals. Guidance notes for the reduction of obtrusive light, GN01:2011. [ONLINE]. Available at:
<https://www.theilp.org.uk/documents/obtrusive-light/>
 [Accessed Aug 2021].

[3] Backlight, Uplight, and Glare (BUG) Ratings - IES TM-15-11 – Addendum A. [ONLINE]. Available at:
<https://ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf>
 [Accessed Aug 2021].


[4] Illuminating Engineering Society and International Dark-Sky Association (IES/ IDA) Model Lighting Ordinance User Guides. [ONLINE]. Available at:
http://darksky.org/wp-content/uploads/bsk-pdf-manager/16_MLO_FINAL_JUNE2011.PDF
 [Accessed Aug 2021].

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

International Dark-sky Association. Information Resource. [ONLINE]. Available at:
<http://www.darksky.org/resources>
 [Accessed Aug 2021].

(b) Related Credits

None

3 Sustainable Site	SS-02 Ecologically Responsible Design
	SS-02-02 Biodiversity Enhancement 
Extent of Application	<p>All whole building DC developments site with tree except brownfield or sites on reclaimed land for SS-02-02a</p> <p>All whole building DC developments site with adjacent areas of medium or high ecological value for SS-02-02b</p>
Objective	Preserve and/ or enhance the biodiversity of the site.
Credit Point(s) Attainable	2 Bonus
Credit Requirement	<p>(a) Reduction of Ecological Impact</p> <p>1 Bonus credit point for demonstrating all identified habitat types on Site are of low or negligible indicative ecological values.</p> <p>Alternatively,</p> <ul style="list-style-type: none"> • <i>1 Bonus credit point for all identified habitat types on Site of medium to high indicative ecological value are preserved intact and are either unaffected by the planned development.</i> <p>(b) Enhancement of Biodiversity</p> <p>1 Bonus credit point for preparing a manual on biodiversity-friendly landscape maintenance, PLUS adopting measures to increase diversity and complexity of planting for enhancing the biodiversity of the site.</p>
Assessment	<p>(a) Reduction of Ecological Impact</p> <ol style="list-style-type: none"> 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

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.

(b) Enhancement of Biodiversity

1. Prepare a Biodiversity-friendly Landscape Maintenance Manual including the sections below:
 - 1.1. Design objectives of biodiversity enhancement;
 - 1.2. Maintenance requirement; and
 - 1.3. Waste minimisation.
2. Prepare a Biodiversity enhancement report to indicate the measures to be implemented:
 - 2.1. Increase diversity and complexity of planting;

- 2.2. Provide planting plans and demonstrate plant species type, characteristics of the species chosen (tree/ shrub/ herb/ climber), nativeness (native/ exotic), quantity and location;
- 2.3. Demonstrate the planting scheme incorporated ALL elements below:
 - 2.3.1. Chosen diverse plant species. Reference to 10-20-30 rule for planting [2];
 - 2.3.2. Increase complexity of vegetation structure and provide habitats for wildlife by mixing vegetation with varied height [2]; and
 - 2.3.3. Use > 50% native or adaptive species.
3. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-02-02a_00	BEAM Plus NDC submission template for SS-02-02a	✓	✓
SS-02-02a_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-02-02a_02	Ecological impact reduction report on interconnectivity with adjacent areas of ecological value	✓	✓#
# The supporting documents are not required in FA if the Bonus credit(s) is/ are achieved in PA			

(b) Enhancement of Biodiversity

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-02-02b_00	BEAM Plus NDC submission template for SS-02-02b	✓	✓
SS-02-02b_01	Biodiversity-friendly landscape maintenance Manual	✓	✓
SS-02-02b_02	Biodiversity enhancement report	✓	✓
SS-02-02b_03	CV of the professional as per requirements in the assessment	✓	✓

Remarks**(a) Additional Information**

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

[2] Development Bureau, HKSAR, 2018 Street Tree Selection Guide “Chapter 9 – Complementary Vegetation Community Mix”

Beck T, Principles of ecological landscape design. Island Press, Washington, Covelo, London.

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.

Gunnell, K. et al. 2013. Designing for Biodiversity: A Technical Guide for New and Existing Buildings. Second Edition. RIBA Publishing, London. UK

MacArthur R.H. and Wilson E.O., The theory of island biogeography, Princeton University Press, New Jersey, USA

Sheppard, C. 2011. Bird-Friendly Building Design. American Bird Conservancy, The Plains, VA. USA

(b) Related Credits

SS-01-01 Pedestrian-oriented and Low Carbon Transport

The related credit head encourages the shading of main pedestrian paths by trees. The soil space of trees shall meet the minimum standards stipulated in SS-00-P1.

SS-03-01 Urban Heat Island Mitigation

The related credit head encourages higher overall site coverage of greenery.

SS-03-03 Outdoor Thermal Comfort

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

SS-04-01 Stormwater Management


The related credit head considers softscape provided with the site for infiltration and detention in stormwater management.

WU-01-02 Water Efficient Irrigation

The related credit head considers water efficient irrigation for greenery provided within the site.

HWB-01-02 Biophilic Design

The related credit head encourages human-nature connection for building occupants.

3 Sustainable Site	SS-03 Bioclimatic Design
	SS-03-01 Urban Heat Island Mitigation 
Extent of Application	Whole building DC developments
Objective	Encourage building design to adopt measures to mitigate urban heat island effect.
Credit Point(s) Attainable	For Site area < 1,000m ² : 1 For Site area ≥ 1,000m ² : 4 + 6 Bonus
Credit Requirement	<p><u>For Site area < 1,000m²</u></p> <p>(a) Urban Design Guidelines Chapter 11</p> <p>1 credit point for implementing at least 2 site level strategies under Section 11 of Hong Kong Planning Standards and Guidelines Chapter 11 Urban Design Guidelines.</p> <p><u>For Site area ≥ 1,000m²</u></p> <p>(a) Sustainable Building Design Measures</p> <p>1 credit point 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).</p> <p>1 credit point for demonstrating compliance with prescribed requirements of the SBD Guidelines as promulgated in the PNAP APP-152; and</p> <p>1 additional Bonus credit point for demonstrating with relevant prescriptive requirements with enhanced performances.</p> <p>(b) Tree Coverage</p> <p>2 to 3 Bonus credit points for demonstrating that at least 10% or 20% of the total Site Area is provided with tree coverage.</p> <p>(c) Air Ventilation Assessment (AVA)</p> <p>For conducting an AVA by wind tunnel or Computational Fluid Dynamics (CFD) according to the prevailing AVA methodology introduced by the Government demonstrating that better or equivalent ventilation performances than a baseline case:</p> <p>1 credit point for demonstrating annual wind condition.</p> <p>1 credit point for demonstrating summer wind condition.</p> <p>(d) Intra Urban Heat Island Study</p> <p>2 Bonus credit points 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.</p>

Assessment For Site area < 1,000m²**(a) Urban Design Guidelines Chapter 11**

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:
 - 1.1. Mark up on layout plan for the implemented strategies; and
 - 1.2. Description on the implemented strategies.

For Site area ≥ 1,000m²**(a) Sustainable Building Design Measures**

1. Non-roof Impervious Surfaces Requirements
 - 1.1. 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
 - 2.1. Provide evidence in the form of scaled drawings and calculations to demonstrate compliance with relevant prescriptive requirements of the SBD Guidelines on site coverage of greenery as promulgated in the PNAP APP-152 [1].
 - 2.2. 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):
 - 2.2.1. 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).
 - 2.2.2. 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).
 - 2.2.3. 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).
 - 2.2.4. Roof materials with Solar Reflectance Index (SRI) of 78 or above is acceptable as an alternative to vegetated roof. A combination of both vegetated roof and roof using materials with Solar Reflectance Index (SRI) of 78 or above is also acceptable.
3. Enhanced Performances of Sustainable Building Design Guidelines

3.1. Further to requirements stated in SS-03-01a (2), provide evidence to demonstrate compliance with the following:

3.1.1. 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.

3.1.2. 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.

3.1.3. 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.

3.1.4. Demonstrate that the species, density and topsoil comply with the General Specification for Building Section 25: Landscape, or equivalent.

3.1.5. Minimum 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 L _p < 60m	Site area < 20,000m ² and with L _p ≥ 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%

3.1.6. 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. Evidence 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 area 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:

3.1. Compliance Route 1: CFD Simulation

- 3.1.1. 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.
- 3.1.2. The site velocity ratio (SVR) and local velocity ratio (LVR) of all test points should be reported.
- 3.1.3. The modelling methodology should adopt prevailing AVA methodology introduced by the government [2], unless specified below.
- 3.1.4. A software validation report from the software developer should be provided to ensure the accuracy of simulation by the software.

3.1.5. The below requirements should be fulfilled in the CFD simulation:

- a) Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department, the Government of HKSAR;
- b) 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;
- c) 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

3.1.6. For practical reasons, the geometry can be simplified to block.

3.1.7. 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 the Planning Department (PlanD) [3] or experimental site wind data from wind tunnel test.

3.1.8. 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:

$$\text{Power Law } \left(\frac{u_z}{U_\delta}\right) = \left(\frac{z}{\delta}\right)^\alpha \quad \text{Log Law } u_z = \frac{u_*}{\kappa} \ln\left(\frac{z-d}{z_0}\right)$$

u_z Velocity at height z from ground

U_δ Velocity at reference height (boundary layer depth)

z Height z from ground

δ Reference height (boundary layer depth)

α Power law exponent

κ Von Karman constant = 0.4

z_0 Roughness length

u_* Friction velocity

d zero-plane displacement height

Terrain crossed by approaching wind	α	δ	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

- 3.1.9. These coefficients serve as reference only [4]. Applicants should justify the suitability of coefficients for the project.
- 3.1.10. 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). For the Detailed Study, wind from all 16 directions and their probability of occurrences must be accounted for, and wind profiles(s) obtained from wind tunnel experiments should be used to conduct the study, and when calculating the Wind Velocity Ratio.
- 3.1.11. The simulation report should be endorsed by a locally qualified professional with 3 years of relevant experience in CFD simulation

3.2. Compliance Route 2: Wind Tunnel Test

- 3.2.1. Demonstrate compliance by submitting a wind tunnel test report.
- 3.2.2. 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.
- 3.2.3. 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).
- 3.2.4. The wind profile can be created by the Power Law or the Log Law with appropriate coefficients.
- 3.2.5. 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). For the Detailed Study, wind from all 16 directions and their probability of occurrences must be accounted for, and wind profiles(s) obtained from wind tunnel experiments should be used to conduct the study, and when calculating the Wind Velocity Ratio.

3.3. Test Point Locations and Focus Areas for Both Routes

- 3.3.1. 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.
- 3.3.2. Test point shall be placed 2m above pedestrian level within the assessment area.
- 3.3.3. Perimeter test points are positioned on the project site boundary. Typically about 30 perimeter test points well-spaced out and located will suffice.

- 3.3.4. 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

$$\text{Intra Urban Heat Index} = \text{Max} [T(t)_{\text{urban}} - T(t)_{\text{met}}] < 0.8$$

$T(t)_{\text{urban}}$ = Predicted urban air temperature at the Site

$T(t)_{\text{met}}$ = 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 $T(t)_{\text{urban}}$ and $T(t)_{\text{met}}$ 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 & 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

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
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		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
SS-03-01a_00	BEAM Plus NDC submission template for SS-03-01a	✓	✓
<i>For SS-03-01a with site area < 1,000 m², please provide the following:</i>		PA	FA
SS-03-01a_01	Narrative and layout plan with markup to demonstrate the site planning comply with the strategies under Section 11 of HKPSG	✓	✓ [#]
<i>For SS-03-01a (1) with site area ≥ 1,000 m², please provide the following:</i>		PA	FA
SS-03-01a_02	Scaled drawings and calculations to demonstrate compliance with the relevant prescriptive requirements of the light coloured high-albedo materials on non-roof impervious surfaces.	✓	✓
SS-03-01a_03	Material catalogues/test reports showing albedo values of the surface materials.	-	✓
SS-03-01a_04	A schedule of external materials, their proposed finishes treatments, and albedo requirements of the materials.	✓	✓
SS-03-01a_05	Tender specifications on the albedo requirements of the materials	✓	-
<i>For SS-03-01a (2) & (3), please provide the following:</i>		PA	FA
SS-03-01a_06	Scaled drawings and calculations to demonstrate compliance with relevant prescriptive requirements of the SBD Guidelines	✓	✓

<i>For SS-03-01a (2), please provide the following:</i>		PA	FA
SS-03-01a_07	Tender specifications on the SRI requirement of the roof materials (if applicable)	✓	-
SS-03-01a_08	Material catalogues/ test reports showing SRI values of the roof materials (if applicable)	-	✓
<i>For SS-03-01a (3), please provide the following:</i>		PA	FA
SS-03-01a_09	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-03-01a_10	Live load calculation of roof (if planting is provided on the roof)	✓	✓
SS-03-01a_11	Maintenance plan of the greenery	-	✓
SS-03-01a_12	Dated photos of the as-built soft landscape works	-	✓
# For SS-03-01a for project with site area < 1,000 m ² , the supporting document is not required in FA if the credit is achieved in PA			

(b) Tree Coverage

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-03-01b_00	BEAM Plus NDC submission template for SS-03-01b	✓	✓
SS-03-01b_01	Landscape plans, sections, planting schedules and extracts of relevant supporting documents showing the soft landscape layout of all planted areas for trees	✓	✓
SS-03-01b_02	Summary for the total and breakdowns of tree coverage areas and evidence for tree diameters prediction	✓	✓
SS-03-01b_03	Live load calculation of roof (if tree planting is provided on the roof)	✓	✓
SS-03-01b_04	Maintenance plan of the trees	-	✓
SS-03-01b_05	Dated photos of the as-built soft landscape works	-	✓

(c) Air Ventilation Assessment (AVA)

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-03-01c_00	BEAM Plus NDC submission template for SS-03-01c	✓	✓
<i>For Compliance Route 1, please provide the following:</i>		PA	FA
SS-03-01c_01	Air Ventilation Assessment Report	✓	✓#
SS-03-01c_02	Validation Report of the simulation software	✓	✓#
SS-03-01c_03	CV of the professional as per requirements in the assessment	✓	✓#
<i>For Compliance Route 2, please provide the following:</i>		PA	FA
SS-03-01c_04	Wind Tunnel Test Report	✓	✓#
# The supporting documents are not required in FA if the credit is achieved in PA			

(d) Intra Urban Heat Land Study

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-03-01d_00	BEAM Plus New DCs submission template for SS-03-01d	✓	✓
SS-03-01d_01	Intra-urban Heat Island Study report	✓	✓#
SS-03-01d_02	CV of the professional as per requirements in the assessment	✓	✓#
SS-03-01d_03	Landscape plans, sections planting schedules and extracts of relevant supporting documents showing soft landscape layout of all planted areas for trees	✓	✓#
SS-03-01d_04	Summary for the total and breakdowns of tree coverage areas and evidence for tree diameters prediction	✓	✓#
SS-03-01d_05	Validation Report of the simulation software	✓	✓#
SS-03-01d_06	Dated photos of the as-built soft landscape works	-	✓
# The supporting documents are not required in FA if the Bonus credits are achieved in PA			

Remarks**(a) Additional Information**

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

[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

[3] RAMS wind data. [ONLINE]. Available at:
http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html
[Accessed Aug 2021].

[4] Feasibility Study for Establishment of Air Ventilation Assessment System Final Report, Department of Architecture, Chinese University of Hong Kong, Nov 2005

[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.

[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 Aug 2021].

[10] Hong Kong Observatory (Averaged data from 2009 to 2013)

Hong Kong Herbarium on Hong Kong plant species. [ONLINE]. Available at:
http://www.herbarium.gov.hk/Search_Form.aspx
[Accessed Aug 2021].

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-01-01 Pedestrian-oriented and Low Carbon Transport

The related credit head encourages the shading of main pedestrian paths by trees.

SS-02-02 Biodiversity Enhancement

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

WU-01-02 Water Efficient Irrigation

The related credit head considers water efficient irrigation for greenery provided within the site.

HWB-01-02 Biophilic Design

The related credit head encourages human-nature connection for building occupants.

3 Sustainable Site	SS-03 Bioclimatic Design
	SS-03-02 Immediate Neighbourhood Wind Environment
Extent of Application	Whole building DC developments
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.
Credit Point(s) Attainable	1
Credit Requirement	1 credit point 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	<ol style="list-style-type: none"> 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 DC. 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: <ol style="list-style-type: none"> 3.1. <u>Compliance Route 1: CFD Simulation</u> <ol style="list-style-type: none"> 3.1.1. 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. 3.1.2. A software validation report from the software developer should be provided to ensure the accuracy of simulation by the software. 3.1.3. The below requirements should be fulfilled in the CFD simulation: <ol style="list-style-type: none"> a) Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department, the Government of HKSAR; b) 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; c) 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 d) For practical reasons, the geometry can be simplified to blocks. 3.1.4. 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 of HKSAR) or experimental site wind data from wind tunnel test).

- 3.1.5. 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:

$$\text{Power Law } \left(\frac{u_z}{U_\delta}\right) = \left(\frac{z}{\delta}\right)^\alpha \quad \text{Log Law } u_z = \frac{u_*}{\kappa} \ln\left(\frac{z-d}{z_0}\right)$$

u_z Velocity at height z from ground

U_δ Velocity at reference height (boundary layer depth)

z Height z from ground

δ Reference height (boundary layer depth)

α Power law exponent

κ Von Karman constant = 0.4

z_0 Roughness length

u_* Friction velocity

d zero-plane displacement height

Terrain crossed by approaching wind	α	δ	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

- 3.1.6. These coefficients serve as reference only. Applicants should justify the suitability of coefficients for the project.
- 3.1.7. 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). For the Detailed Study, wind from all 16 directions and their probability of occurrences must be accounted for, and wind profiles(s) obtained from wind tunnel experiments should be used to conduct the study, and when calculating the Wind Velocity Ratio.
- 3.1.8. The simulation report should be endorsed by a locally qualified professional with 3 years of relevant experience in CFD simulation.

3.2. Compliance Route 2: Wind Tunnel Test

- 3.2.1. Demonstrate compliance by submitting a wind tunnel test report.
- 3.2.2. 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.
- 3.2.3. 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).
- 3.2.4. The wind profile can be created by the Power Law or the Log Law with appropriate coefficients.
- 3.2.5. 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). For the Detailed Study, wind from all 16 directions and their probability of occurrences must be accounted for, and wind profiles(s) obtained from wind tunnel experiments should be used to conduct the study, and when calculating the Wind Velocity Ratio

3.3. Test Point Locations for Both Routes

- 3.3.1. 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
- 3.3.2. Test points shall be placed 2m above pedestrian level within the assessment area
- 3.3.3. 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
- 3.3.4. 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
- 3.3.5. Additional test points shall be placed in outdoor recreational areas, open spaces and pedestrian paths within the project site.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
SS-03-02_00	BEAM Plus NDC submission template for SS-03-02	✓	✓
<i>For <u>Compliance Route 1</u>, please provide the following:</i>		PA	FA
SS-03-02_01	Wind Environment Report	✓	✓#
SS-03-02_02	Validation Report of the simulation software	✓	✓#
SS-03-02_03	CV of the professional as per requirements in the assessment	✓	✓#
<i>For <u>Compliance Route 2</u>, please provide the following:</i>		PA	FA
SS-03-02_04	Wind Tunnel Test Report	✓	✓#
# The supporting documents are not required in FA if the credit is achieved in PA			

Remarks**(a) Additional Information**

Feasibility Study for Establishment of Air Ventilation Assessment System Final Report, Department of Architecture, Chinese University of Hong Kong, Nov 2005

Hong Kong Observatory (Averaged data from 2009 to 2013)

RAMS wind data. [ONLINE]. Available at:
http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html
 [Accessed Aug 2021].

(b) Related Credits

None

3 Sustainable Site SS-03 Bioclimatic Design

SS-03-03 Outdoor Thermal Comfort

Extent of Application Whole Building DCs Development with a site area of 1,000 m² or more

Objective Ensure adequate thermal comfort of outdoor environment within the Site.

Credit Point(s) Attainable 2 Bonus

Credit Requirement **(a) Shaded or Covered Routes**

1 Bonus credit point is achieved 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 Bonus credit point is achieved 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 sub-head applies to passive open space(s) 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 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; and

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.

Time	Global Horizontal Irradiance, GHI (W/m ²)	Direct Normal Irradiance, DNI (W/m ²)	Diffuse Horizontal Irradiance, DHI (W/m ²)	Air Temp., Ta (°C)	Relative Humidity, RH (%)
3PM	525	340	254	31.0	72

7. Demonstrate credit compliance by following one of the below routes:

7.1. Compliance Route 1: Thermal Sensation Index (TSI)

7.1.1. TSI can be established using the following formula:

$$TSI = 1.7 + 0.118 \times T_a + 0.0019 \times SR - 0.322 \times WS - 0.0073 \times RH + 0.0054 \times ST$$

Where,

T_a = air temperature (°C)

SR = horizontal solar radiation (W/m²)

WS = wind speed (m/s)

RH = relative humidity (%)

ST = surrounding ground surface temperature (°C)

7.1.2. TSI should be based on the following:

- Refer to reference environmental conditions shown in Table above, which outlines solar irradiation, air temperature, and relative humidity to assess outdoor thermal comfort
- Surrounding ground surface temperature (ST) of Air Temperature plus 3°C, (i.e., $T_a + 3^\circ\text{C}$) should be used in the TSI equation;
- 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 studies shall refer to Air Ventilation Assessment (AVA) Technical Circular and Technical Guide;

- d) Thermal comfort assessment shall consider the effect of shading from immediate surroundings, for example, trees, shading devices, self-shading from buildings; and
- e) The calculations should be based on an area breakdown in the range between 1m² and 100m²

7.1.3. 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	

7.2. Compliance Route 2: Physiological Equivalent Temperature (PET)

- 7.2.1. PET should be used to assess the outdoor thermal comfort. Mean radiant temperature, T_r (Air Temperature plus 3°C, (i.e. $T_a + 3^\circ\text{C}$) shall be used.

Thermal Perception	Thermal Perceptions Classification (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	Thermally Acceptable Range
Neutral	≥ 26 to < 30	
Slightly Warm	≥ 30 to < 34	
Warm	≥ 34 to < 38	Too Hot
Hot	≥ 38 to < 42	
Very Hot	≥ 42	

- 7.2.2. 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 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 selected methodology was used and accepted by professionals in the field.

Submittals

(a) Shaded or Covered Routes

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-03-03a_00	BEAM Plus NDC submission template for SS-03-03a	✓	✓
SS-03-03a_01	Site plan highlighting at least one shaded or covered pedestrian route	✓	✓#
SS-03-03a_02	Schematics of shades or cover	✓	✓#
SS-03-03a_03	Daylight simulation results to justify shape of shades/cover (if applicable)	✓	✓#
# The supporting documents are not required in FA if the credit is achieved in PA			

(b) Shaded or Covered Routes

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-03-03b_00	BEAM Plus NDC submission template for SS-03b-03	✓	✓
SS-03-03b_01	Outdoor thermal comfort report	✓	✓#
SS-03-03b_02	CV of professional as described in credit requirement	✓	✓#
# The supporting documents are not required in FA if the credit is achieved in PA			

Remarks**(a) Additional Information**

Hong Kong Observatory (Averaged data from 2009 to 2013)

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.

Housing, Planning and Lands Bureau, and Environment, Transport and Works Bureau 2006, Technical Circular No. 1/06: air ventilation assessments.

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.

Planning Department – Hong Kong Planning Standards and Guidelines Chapter 4 : Recreation, Open Space and Greening

(b) Related Credits

None

3 Sustainable Site

SS-04 Climate Resilience and Adaptability

SS-04-01 Stormwater Management

Extent of Application	Whole Building DCs Development with a 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.
Credit Point(s) Attainable	1 + 1 Bonus
Credit Requirement	<p>1 credit point 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.</p> <p>1 additional Bonus credit point for the adopted measures that are able to cater at least 40mm/event for the site in its post-developed conditions.</p>
Assessment	<p>1. Calculate the stormwater detention storage volume on site required to cater the total volume of runoff for one hour using the following formula.</p> $V = 10 \times H \times \sum \phi \times A / 10,000$ <p>V: Stormwater storage volume on site required (in m³)</p> <p>H: Rainfall intensity (30mm or 40mm for the credit/ bonus respectively) per event</p> <p>ϕ: Runoff coefficients of various surfaces/ substrates (please refer to the following table)</p> <p>A: Areas of various surfaces/ substrates (in m²)</p>

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°C 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:

- The above information has made reference to the design guides for stormwater management/runoff control GB50014 and DB11/685 of PRC.
- 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 Appendices.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-04-01_00	BEAM Plus NDC submission template for SS-04-01	✓	✓
SS-04-01_01	Report for stormwater management with a summary of volume/ area calculations, layout drawings and typical construction details/sections of infiltration measures	✓	✓
SS-04-01_02	Catalogue and test report of surfaces/ substrates (if alternative runoff coefficients are used)	✓	✓

Remarks**(a) Additional Information**

Pervious Pavement. [ONLINE]. Available at:
<http://www.asphaltpavement.org/index.php>
 [Accessed August 2021]. Water Permeable Brick (JCT 945 – 2005).

Sponge City Construction Technical Guide by Ministry of Housing and Urban-Rural Development of PRC

Technical Guide for On-site Stormwater Detention Tank Systems. [ONLINE]. Available at:
<https://www.pub.gov.sg/Documents/detentionTank.pdf>
 [Accessed Aug 2021].

(b) Related Credits

SS-01-01 Pedestrian-oriented and Low Carbon Transport

The related credit head encourages the shading of main pedestrian paths by trees.

SS-02-02 Biodiversity Enhancement

The related credit head encourages preservation/enhancement of existing habitat within the site.

SS-03-03 Outdoor Thermal Comfort

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

WU-03-01 Water Harvesting and Recycling

The related credit head considers harvesting of rainwater provided within the site. Stormwater collected under SS-04-01 could only be discharged

HWB-01-02 Biophilic Design

The related credit head encourages human-nature connection for building occupants

3 Sustainable Site	SS-04	Climate Resilience and Adaptability
	SS-04-02	Design for Climate Change Adaptation
Extent of Application	Whole Building DCs Development	
Objective	Encourage reviewing the impact of the projected climate change scenarios on the development and consider strategies to improve climate resilience.	
Credit Point(s) Attainable	2 Bonus	
Credit Requirement	<p>1 Bonus credit point 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.</p> <p>1 additional Bonus credit point for including quantitative calculation to support the resilience design which is technically eligible and cost effective.</p>	
Assessment	<ol style="list-style-type: none"> 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. 5. Climate Resilience proposal should include a minimum of 10 A4 pages with sections below: <ol style="list-style-type: none"> 5.1. Description of project annual climate change; 5.2. Impact Identification; 5.3. Proposal of the Climate Resilience Strategies; 5.4. Effectiveness of the proposed strategies; and 5.5. Cost effectiveness (for additional Bonus credit point). 	

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
SS-04-02_00	BEAM Plus NDC submission template for SS-04-02	✓	✓
SS-04-02_01	Climate resilience proposal	✓	✓#
# The supporting documents are not required in FA if the Bonus / additional Bonus credit(s) is/are achieved in PA			

Remarks**(a) Additional Information**

[1] Hong Kong Observatory - Climate Projections for Hong Kong. [ONLINE]. Available at:
https://www.hko.gov.hk/en/climate_change/future_climate.htm
 [Accessed Aug 2021].

Environment Bureau - Hong Kong Climate Change Report 2015. [ONLINE]. Available at:
<http://www.enb.gov.hk/sites/default/files/pdf/ClimateChangeEng.pdf>
 [Accessed Aug 2021].

EPD – Climate Change. [ONLINE]. Available at:
http://www.epd.gov.hk/epd/english/climate_change/
 [Accessed Aug 2021].

GovHK – Global Environment Climate Change. [ONLINE]. Available at:
<http://www.gov.hk/en/residents/environment/global/climate.htm>
 [Accessed Aug 2021].

(b) Related Credits

None

4 Materials and Waste

In construction, operation, 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 Materials and Waste**MW-00****Prerequisite****MW-00-P1****Minimum Waste Handling Facilities****Extent of Application**

All DC.

Objective

Reduce waste generation at source, reduce pressure on landfill sites and help to preserve non-renewable resources by promoting recycling of waste materials.

Credit Point(s) Attainable

Prerequisite

Credit Requirement

Prerequisite achieved for meeting minimum provisions of waste recycle facilities for the collection, sorting, storage, recycling (recovered material) and disposal (waste).

Assessment**For Whole Building DC Developments**

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.

1. Recycle & Waste Management Strategy Plan

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 adequate numbers of general refuse bin(s) and in particular, recycling bin(s) provided to cater for the general waste and recyclables generated from the development as per the waste stream calculation mentioned in 1.1;
- 1.3. Demonstrate compliance with the space requirement of waste recycling facilities (for waste storage, sorting and recycling), including sufficient size to cope with the numbers of general refuse bins and recycling bins as listed in 2);
- 1.4. Elaborate the storage for recycling of, as a minimum, materials listed in 3); and
- 1.5. 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.

2. Waste Recycling Facilities

Refuse storage and material recovery chambers (RS&MRC) Provision

- 2.1. Demonstrate RS&MRC of adequate size to cope with the waste generated. Prescribed space requirements are listed below:

Overall floor space of RS&MRC [#]
1m ² per 925m ² UFS
Remarks: <ul style="list-style-type: none"> • UFS = Usable Floor Space • 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.

- 2.2. Mechanical ventilation and air purifying facilities for every RS&MRC is statutorily-required under Reg.12A of B(RS&MRC&RC)R.

3. Minimum Types of Recyclables to be Collected

- 3.1. Metal;
- 3.2. Plastics;
- 3.3. Paper/ Cardboard; and
- 3.4. Glass.

For DC Developments located in part of building

1. Recycle & Waste Management Strategy Plan

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 storage for recycling of, as a minimum, materials listed in 3); and;
- 1.3. 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.

2. Waste Recycling Facilities

The Applicant shall provide at least one (1) storage facility with the capacity for paper, plastic and metal materials. The facility shall be placed in prominent location (i.e. cannot be located in a car park or other non-occupied areas), but not necessarily within the project space. The storage facility size and collection frequency are not regulated.

A waste collection firm employed by either the Applicant or property management company shall collect all materials. Where the host building provides such facility at prominent location, the Applicant is not required to duplicate the provision if the host building management could provide the required information for Assessment.

3. Minimum Types of Recyclables to be Collected

3.1. Metal;

3.2. Plastics;

3.3. Paper/ Cardboard; and

3.4. Glass

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-00-P1_00	BEAM Plus NDC submission template for MW-00-P1	✓	✓
MW-00-P1_01	Recycle & Waste Management Strategy Plan	✓	✓
<i>For Whole Building DC Developments, please provide the following:</i>			
MW-00-P1_02	Drawings showing the locations of the waste handling facilities	✓	✓
MW-00-P1_03	Calculation showing the adequacy of the space requirement for the waste handling facilities	✓	✓
MW-00-P1_04	Master layout plan or extract of relevant page(s) from the GBP to substantiate the exemption from the requirements of this prerequisite	✓	✓
MW-00-P1_05	Purchase orders or undertaking letter from the project owner to substantiate the provision of general refuse bins and recycling bins	-	✓
<i>For DC Developments located in part of building, please provide the following:</i>			
MW-00-P1_06	Information of responsible person	✓	✓
MW-00-P1_07	Drawings showing the locations of the waste handling facilities in host building	✓	✓
MW-00-P1_08	As-fitted drawings	-	✓
MW-00-P1_09	Record photographs	-	✓

MW-00-P1_10	<p>Collection organisation/ recycler information, including:</p> <ol style="list-style-type: none"> 1) Company name, address and contact information; 2) Collection frequency; and 3) Collection agreement signed by the Recycling firm and Applicant. Where the Applicant adopts the host building facility, the host building Collection Agreement (or an equivalent letter by the Property Manages organisation) 	-	✓
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Remarks**(a) Additional Information**

Buildings Department. Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineer. PNAP 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 Aug 2021]

(b) Related Credits

MW-03-02 Enhanced Waste Handling Facilities

This credit head encourages enhanced provisions for recyclables collection, recycling facilities and waste treatment equipment.

4 Materials and Waste

MW-01 Use of Materials

MW-01-01 Building Re-use

Extent of Application Whole Building DC Developments

Objective Encourage the reuse of major elements of existing building structures, to reduce demolition waste, conserve resources and reduce environmental impacts during construction.

Credit Point(s) Attainable 3 Bonus

Credit Requirement 1 to 3 Bonus credit points for the reuse of at least 20%, 40% or 90% (by mass or volume) of existing structures (sub-structure and superstructure).

- Assessment**
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.
 2. Existing major building elements to be reused include:
 - 2.1. Sub-structure (including foundation);
 - 2.2. Superstructure; and
 - 2.3. Enclosure materials (excluding windows, doors and similar assemblies)

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
MW-01-01_00	BEAM Plus NDC submission template for MW-01-01	✓	✓
MW-01-01_01	Pre and post construction details, structural drawings that demonstrate the re-use of the sub-structure and superstructure	✓	✓
MW-01-01_02	Calculation showing the percentage of sub-structure and superstructure being reused	✓	✓

Remarks	(a) Additional Information
	None
	(b) Related Credits
	None

4 Materials and Waste**MW-01****Use of Materials****MW-01-02****Modular and Standardised Design**

This credit head is not applicable under BEAM Plus NDC.

4 Materials and Waste**MW-01****Use of Materials****MW-01-03****Prefabrication**

This credit head is not applicable under BEAM Plus NDC.

4 Materials and Waste
MW-01 Use of Materials**MW-01-04 Design for Durability and Resilience**

This credit head is not applicable under BEAM Plus NDC.

4 Materials and Waste MW-02 Selection of Materials

MW-02-01 Sustainable Forest Products

Extent of Application All DC, except DC 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.

Credit Point(s) Attainable 1 + 1 Bonus

Credit Requirement 1 credit point for demonstrating at least 50% of all timber and composite timber products used for DC are from sustainable sources/ recycled timber.

1 additional Bonus credit point for 90% or more.

- 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]. The Client shall demonstrate compliance with the specification for timber products with the recommended certifications (e.g. FSC, AFPA, PEFE or “known licensed sources”).
 3. In PA, provide extracts of tender documents (e.g. specifications) highlighting the clause specifying the use of sustainable timber.
 4. The reuse of timber or composite timber products from other sites is acceptable. Transfer notes and site photos records should be kept and submitted to show the originating old timber source, the quantity and the date of transfer of the timber products between the despatch work site and the project site (recipient). The transfer notes should bear the detailed name and address of the work sites concerned and duly signed by both the despatch and recipient parties undertaking the transfer (i.e. site representative / stores officer in managerial position), together with company chops.
 5. In the event the timber products are not purchased from a supplier who is an “accredited company”, the following basic evidence should be provided to demonstrate the products:
 - 5.1. conform to sustainable forestry practice guidelines;
 - 5.2. be accredited by recognised organisations; and
 - 5.3. in compliance with the specification set down by the organisation.

6. Provided that the timber products are sourced from a supplier already accredited by the Approval Organisations, i.e. FSC, AFPA, PEFC or other "known licensed sources" according to the respective protocol (accredited company), and the timber products purchased are issued with the Certificate under the CoC (Chain of Custody) system, it is acceptable that the following documents as proof to demonstrate the timber products as purchased from the timber supplier and used in the project site are from a sustainable source:
- 6.1. Invoice plus Delivery Note (DN) from the supplier of the timber products purchased - on the invoice & DN, it should be marked with the reference Certificate No.; a note which has the effect of confirming the products in the invoice and delivery note are certified; the pack no. of the timber products [5] [6];
- 6.2. A copy of the CoC Certificate of the certified timber supplier; and
- 6.3. Photographic evidence of the timber products.
- 6.4. For timber products made from recycled timber, supporting documents quantifying the timber and composite timber products installed in the project site such as invoices plus delivery notes should be provided. Also, certificates (e.g. FSC Recycled) (if any), declaration letter or other supporting documents should be provided to show the timber and composite timber products are made from timber recycled by recognised recyclers.
7. In the case of buildings with an insignificant amount of timber products being adopted, the material schedule or an undertaking letter from the Project Owner/ Developer should be provided to substantiate that only an insignificant amount of timber products is used in the project.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
MW-02-01_00	BEAM Plus NDC submission template for MW-02-01	✓	✓
MW-02-01_01	Material schedule [or] Undertaking letter from the Project Owner/ Developer confirming that only an insignificant amount of timber products will be used in the project. (Substantiation for non-applicability only)	✓	✓
MW-02-01_02	Specifications specifying the use of sustainable timber	✓	-
MW-02-01_03	Timber product compliance certificate (Applicable to Timber and Composite Timber Product Type* [b] and [c] only)	-	✓
MW-02-01_04	Invoices plus delivery notes quantifying the timber and composite timber products installed in the project site.	-	✓

	(Applicable to Timber and Composite Timber Product Type* [a], [b] and [d] only)		
MW-02-01_05	Chain of Custody Flow Chart (Applicable to Timber and Composite Timber Product Type* [c] only)	-	✓
MW-02-01_06	Substantiation to support each step in the Chain of Custody (CoC) [e.g. invoices, delivery notes, undertaking letter, etc.] (Applicable to Timber and Composite Timber Product Type* [c] only)	-	✓
MW-02-01_07	Supporting information showing the timber and composite timber products are made from recycled timber. (e.g. certificate of FSC/ PEFC Recycled, declaration letter, etc.) (Applicable to Timber and Composite Timber Product Type* [d] only)	-	✓
MW-02-01_08	Transfer notes showing the transfer of timber and composite timber products from other sites to the project site (Applicable to Timber and Composite Timber Product Type* [e] only)	-	✓
MW-02-01_09	Calculation or other supporting documents (if any) to substantiate the calculated weight or volume of timber and composite timber products, if weight or volume is used in the calculation of quantities of timber and composite timber products	-	✓
MW-02-01_10	Calculation on Sustainable Forest Product [Appendix B] with the endorsement from the main contractor.	-	✓
<p>*Timber and Composite Timber Product Types:</p> <p>[a] Timber and Composite Timber Products <u>NOT from Sustainable Sources nor Recycled Timber</u></p> <p>[b] Sustainable Timber and Composite Timber Products Sourced from <u>Supplier accredited by the Approval Organisations</u></p> <p>[c] Sustainable Timber and Composite Timber Products Sourced from <u>Supplier who is NOT an accredited company</u></p> <p>[d] Timber and Composite Timber Products made from <u>recycled timber</u>.</p> <p>[e] Timber and Composite Timber <u>Products reused from other project site(s)</u>.</p> <p>Remark: Photo records of timber products shall be kept and submitted for assessment upon request.</p>			

Remarks**(a) Additional Information**

[1] Forest Stewardship Council. [ONLINE]. Available at:
<http://www.fsc.org/>
 [Accessed Aug 2021]

[2] American Forest and Paper Association. [ONLINE]. Available at:
<http://www.afandpa.org/>
 [Accessed Aug 2021].

[3] Programme for the Endorsement of Forest Certification. [ONLINE]. Available at:
<https://www.pefc.org/>
 [Accessed Aug 2021].

[4] Architectural Services Department, General Specifications for Building 2017, Section 13, Carpentry and Joinery. [ONLINE]. Available at:
https://www.archsd.gov.hk/media/publications-publicity/general-specification-for-building/general_specification_for_building_2017_edition-20191223.pdf
 [Accessed Aug 2021].

[5] BEAM Society Limited. [ONLINE]. Available at:
https://www.beamsociety.org.hk/files/download/20191129_FAQ_MA_Attachment_a1.pdf
 [Accessed Aug 2021].

[6] BEAM Society Limited. [ONLINE]. Available at:
https://www.beamsociety.org.hk/files/download/20191129_FAQ_MA_Attachment_a2.pdf
 [Accessed Aug 2021].

Buildings Department PNAP 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.

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.

(b) Related Credits

IDCM-00-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

MW-02 Selection of Materials

MW-02-02 Recycled Materials

Extent of Application All DC

Objective Promote the use of recycled materials in order to reduce the consumption of virgin resources

Credit Point(s) Attainable 1 + 2 Bonus

Credit Requirement 1 credit point for using recycled materials for any one of the building components listed below.

1 additional Bonus credit point for compliance with all the listed building components.

2 additional Bonus credit points for achieving 50% or more of all materials used for the listed building components are materials with recycled content.

Building Components:

- i) Outside Surface Works and Structures;
- ii) Building Façade and Structural Components; and
- iii) Interior Non-structural Components.

- Assessment**
1. Outside Surface Works and Structures:
 - 1.1. Demonstrate at least 10% of all materials used for site exterior surface works, structures and features are materials with recycled content.
 - 1.2. Provide all of the following supporting documents:
 - a) List the materials/ items/ products used that contain recycled material (minerals, plastics, etc.); and
 - b) Demonstration for the target percentage of materials/ items/ products with recycled content as compared to all used for exterior surfacing works and structures.
 - 1.3. Exterior surfacing works and structures include paths, surfaces for recreational areas, structures such as seating, playground features, etc.
 - 1.4. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit.
 2. Building Façade and Structural Components:
 - 2.1. Demonstrate 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%.

2.2. Provide all of the following supporting documents:

- a) List the materials/ items/ products used that contain recycled materials; and
- b) Demonstration for the target percentage of materials/ items/ products with recycled content as compared with all used for facade and structural components.

2.3. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit item.

2.4. 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.

2.5. Steel and glass which normally consist of recycled content will not be considered as materials with recycled content for this credit.

3. Interior Non-structural Components:

3.1. Demonstrate at least 10% of all materials used for interior non-structural components are materials with recycled content.

3.2. Provide all of the following supporting documents:

- a) List the materials/ items/ products used that contain recycled material; and
- b) Demonstration for the target percentage of materials/ items/ products with recycled content as compared with all materials used for interior non-structural components.

3.3. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
MW-02-02_00	BEAM Plus NDC submission template for MW-02-02	✓	✓
MW-02-02_01	Calculation Sheet on Materials Used with endorsement from the main contractor	✓ -	✓ ✓
MW-02-02_02	Specifications specifying the use of recycled materials	✓	-
MW-02-02_03	Catalogues or information to demonstrate that the outside surface works and structures, building façade and structural	-	✓

	components and/or interior non-structural components are made from recycled materials		
MW-02-02_04	Drawings that demonstrate the use of materials for outside surface works and structures, building façade and structural components and/ or interior non-structural components	✓	✓

Remarks**(a) Additional Information**

[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.

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.

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 Aug 2021].

CIC & HKCI's study on PFA. [ONLINE]. Available at:
<http://www.hongkongci.org/wp-content/uploads/2016/06/Better-Utilization-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 Aug 2021].

(b) Related Credits

None

4 Materials and Waste **MW-02** **Selection of Materials****MW-02-03** **Ozone Depleting Substances**

Extent of Application All Building Equipment & insulation servicing the Assessed DC.

Objective Reduce the release of harmful ozone-depleting substances into the atmosphere.

Credit Point(s) 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:

$$LCGWP + LCODP \times 10^5 \leq 13$$

$$LCGWP = [GWPr \times (Lr \times Life + Mr) \times Rc] / Life$$

$$LCODP = [ODPr \times (Lr \times Life + Mr) \times Rc] / Life$$

$$GWPr = \text{Global Warming Potential of Refrigerant}$$

$$ODPr = \text{Ozone Depletion Potential of Refrigerant (0 to 0.2kg CFC 11/kg r)}$$

$$Lr = \text{Refrigerant Leakage Rate (0.5\% to 2.0\%; default of 2\% unless otherwise demonstrated)}$$

$$Mr = \text{End-of-life Refrigerant Loss (2\% to 10\%; default of 10\% unless otherwise demonstrated)}$$

$$Rc = \text{Refrigerant Charge}$$

$$Life = \text{Equipment Life (default based on equipment type as listed in table below, unless otherwise demonstrated)}$$

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:

$$[\sum (LCGWP + LCODP \times 10^5) \times Q_{unit}] / Q_{total} \leq 13$$

Q_{unit} = Gross ARI rated cooling capacity of an individual air-conditioning or refrigeration unit (kW)

Q_{total} = 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 manufacturer. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-02-03a_00	BEAM Plus NDC submission template for MW-02-03a	✓	✓
MW-02-03a_01	Specifications specifying the use of refrigerants	✓	-
MW-02-03a_02	Endorsed Air-conditioning and Refrigeration Equipment Worksheet	✓	✓
MW-02-03a_03	CV of the professional as per the requirements in the assessment	✓	✓
MW-02-03a_04	Equipment schedule of HVAC&R equipment showing the refrigerants employed	-	✓
MW-02-03a_05	Catalogues of HVAC&R equipment showing the refrigerants employed	-	✓
MW-02-03a_06	Catalogues of refrigerants or statement from manufacturer demonstrating that the products are free from CFC and HCFC	-	✓

(b) Ozone Depleting Materials

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-02-03b_00	BEAM Plus New DCs submission template for MW-02-03b with	✓	✓
	Ozone Depleting Materials Worksheet endorsed by the main contractor	-	✓
MW-02-03b_01	Specifications specifying the use of insulation materials	✓	-
MW-02-03b_02	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 hydrochlorofluorocarbons (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]
<i>Hydrofluorocarbons</i>		
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
<i>Hydrochlorofluorocarbons</i>		
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	MW-02	Selection of Materials
	MW-02-04	Regional Materials
Extent of Application	All DC	
Objective	Encourage the use of materials originated locally so as to reduce the environmental impacts arising from transportation.	
Credit Point(s) Attainable	1 + 2 Bonus	
Credit Requirement	<p>1 credit point for the use of regional materials meeting prescribed requirement, which contribute at least 10% of all building materials used in the project.</p> <p>1 to 2 additional Bonus credit points for at least 20% or 50%.</p>	
Assessment	<ol style="list-style-type: none"> Provide all of the following supporting documents: <ol style="list-style-type: none"> In PA, extracts of tender documents (e.g. specifications) highlighting the clause specifying the use of regionally manufactured materials; List of the materials satisfying the requirements; Quantification for the value of materials originated locally in percentage of the total value of the materials used; Supporting documents from the suppliers listing the name of the manufacturer; and Demonstration for the point of raw materials and manufacture within the prescribed radius of the HKSAR. The unit may be mass/ volume/ dollar value but shall be consistent throughout the assessment of this credit. Raw materials (constituents) used for making the claimed building materials shall fulfil the assessment requirements. 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. Mechanical and electrical systems components are excluded in the calculation. Plumbing products however may be included at the discretion of the project team. 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. 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. 	

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-02-04_00	BEAM Plus NDCs submission template for MW-02-04 with	✓	✓
	Estimated Summary of Regional Materials from Foundation Works (if any) and Superstructure Works	✓	-
	Summary of Regional Materials from Foundation Works (if any) and Superstructure works endorsed by contractor(s)	-	✓
MW-02-04_01	Specifications specifying the use of regionally manufactured materials	✓	-
MW-02-04_02	Supporting documents from the suppliers listing the name of the manufacturer and the location of the manufacturing plant	-	✓
MW-02-04_03	Maps showing the point of raw materials and the manufacture, and the distance from the site	-	✓

Remarks**(a) Additional Information**

None

(b) Related Credits

None

4 Materials and Waste **MW-02 Selection of Materials****MW-02-05 Use of Green Products****Extent of Application** All DC**Objective** To encourage the purchase of certified green products that have low environmental impacts.**Credit Point(s) Attainable** 2 + 4 Bonus**Credit Requirement** **(a) Certified Green Products**

1 or 2 credit points for having at least 5% certified green products in 1 or 2 of the listed categories (i.e., outside surface works, building façade and structures, interior non-structural components, and building services components).

1 or 2 additional Bonus credit points for having at least 5% or 25% of certified green products under Construction Industry Council (CIC) Green Product Certification in 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 or 2 Bonus credit points for 5% or 25% of all building materials/ products of interior non-structural components in the project is rapidly renewable materials.

Assessment **(a) Certified Green Products**

1. Outside Surface Works:

- 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.
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1.2. Provide all of the following supporting documents:

- a) Demonstrate the percentage calculation (by mass, volume, exposed finishing surface area or dollar value) of all the items including certified green products;
- b) Include a summary table listing the product type, product name/ serial no., manufacturer, certification body, calculation and reference source; and
- c) 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. Building Façade and Structures:

- 2.1. Use of certified green products contributing to at least 5% of all materials as listed below.

Building Façade and Structures	<ul style="list-style-type: none"> i. Cement ii. Concrete iii. Reinforcing bar iv. Structural steel v. Extruded aluminium product vi. Glazing vii. Alternative elements proposed by the applicant.
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- 2.2. Provide all of the following supporting documents:

- a) Demonstrate the percentage calculation (by mass, volume, area or dollar value) of all the items including certified green products;
- b) Include a summary table listing the product type, product name/ serial no., manufacturer, certification body, calculation and reference source;
- c) Certificate(s) of the green products; and
- d) 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 list 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.

3. Interior Non-structural Components:

- 3.1. Use of certified green products contributing to at least 5% of each of the any 5 items as listed below.

Interior Non-structural Components	<ul style="list-style-type: none"> 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
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	ix. Block for internal partition x. Synthetic carpet xi. Thermal insulation xii. Alternative elements proposed by the applicant.
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3.2. Provide all of the following supporting documents:

- a) Demonstrate the percentage calculation (by mass, volume, exposed finishing surface area or dollar value) of all the items including certified green products;
- b) Include a summary table listing the product type, product name/serial no., manufacturer, certification body, calculation and reference source;
- c) Certificate(s) of the green products; and
- d) 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 list 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

4. Interior Non-structural Components:

4.1. Use of certified green products contributing to at least 5% of any 5 items as listed below.

Building Services Components	Lighting & electrical installation	i. LED lighting ii. CFL iii. Electronic ballast iv. Cable & wire v. Alternative elements proposed by the applicant.
	Air-conditioning systems	i. Chiller ii. VRF split type system iii. AHU iv. FCU v. Cooling tower vi. Alternative elements proposed by the applicant.
	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 documents:

- a) Demonstrate the percentage calculation (by mass, volume, quantity or dollar value) of all the items including certified green products;
- b) Include a summary table listing the product type, product name/ serial no., manufacturer, certification body, calculation and reference source;
- c) Certificate(s) of the green products; and
- d) Record photographs.

4.3. For certified green products as specified in CIC Green 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 list 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**(b) Rapidly Renewable Materials**

1. Outside Surface Works:

1.1. 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	<ol style="list-style-type: none"> i. Flooring ii. Panel/ partitions iii. Cabinetry/ built-in furniture iv. Insulation v. Alternative elements proposed by the applicant
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1.2. Provide all of the following supporting documents:

- a) Demonstrate the percentage calculation (by mass, volume, exposed finishing surface area or dollar's value) of all the items including rapidly renewable materials;
- b) Include a summary table listing the product type, product name/ serial no., rapidly renewable material content, manufacturer, calculation and reference source;
- c) Supporting documents of rapidly renewable materials; and
- d) Record photographs.

1.3. No material specified shall present a fire hazard when installed.

Submittals**(a) Certified Green Products**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-02-05a_00	BEAM Plus DCs submission template for MW-02-05a	✓	✓
MW-02-05a_01	Calculation sheet on materials used for: Outside Surface Works; and/ or Building Façade and Structures; and/ or Interior Non-structural Components; and/ or Building Services Components	✓	✓
MW-02-05a_02	Specifications specifying the use of green products	✓	-
MW-02-05a_03	Drawings showing the provision	-	✓
MW-02-05a_04	Certificate(s) of the green products	-	✓
Remarks: Photo records of installed certified green products shall be kept and submitted for assessment upon request.			

(b) Certified Green Products

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-02-05b_00	BEAM Plus NDC submission template for MW-02-05b	✓	✓
MW-02-05b_01	Calculation sheet on rapidly renewable materials used for interior non-structural components	✓	✓
	with endorsement from the main contractor	-	✓
MW-02-05b_02	Specifications specifying the rapidly renewable materials	✓	-
MW-02-05b_03	Drawings showing the provision	-	✓
MW-02-05b_04	Supporting documents the rapidly renewable materials	-	✓
Remarks: Photo records of installed rapidly renewable materials shall be kept and submitted for assessment upon request.			

Remarks**(a) Additional Information**

CIC Green Product Certification [ONLINE]. Available at:
<http://cicgpc.hkgbc.org.hk>
[Accessed Aug 2021].

HKGBC's Eco-Product Directory [ONLINE]. Available at:
<http://epdir.hkgbc.org.hk/textdisplay.php?serial=32>
[Accessed Aug 2021].

(b) Related Credits

None

4 Materials and Waste MW-02 Selection of Materials

MW-02-06 Life Cycle Assessment

Extent of Application Whole Building DC Developments

Objective Encourage the design of structural elements and choice of materials that results in lower embodied energy

Credit Point(s) Attainable 1

Credit Requirement 1 credit point for demonstrating the embodied energy in the major elements of the building structure of the DC has been studied and optimised through a Life Cycle Assessment (LCA).

Alternatively,

- *1 credit point for demonstrating the embodied carbon in the major elements of the building structure of the building has been studied and optimised by using the CIC Carbon Assessment Tool or similar assessment tools.*

- 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 CO₂e;
 - 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 SO₂;
 - 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. **Alternatively**, demonstrate that the materials used for (a) permanent works - substructure and (b) permanent works - superstructure have lower embodied carbon in the proposed case than the baseline case, with the result of the study generated from the "Design Input" module of the CIC Carbon Assessment Tool or similar assessment tool.

6. Prepare an LCA/ embodied carbon assessment report, including the following contents:
 - 6.1. Quantity of the building materials
 - 6.2. Assumptions made
 - 6.3. Methodologies
 - 6.4. Screenshots of input parameters
 - 6.5. Results
 - 6.6. Conclusions

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-02-06_00	BEAM Plus NDC Submission template for MW-02-06	✓	✓
MW-02-06_01	LCA report/ Embodied Carbon Assessment Report	✓	✓#
# The supporting document is not required in FA if the credit is achieved in PA			

Remarks**(a) Additional Information**

None

(b) Related Credits

None

4 Materials and Waste**MW-03****Waste Reduction****MW-03-01****Adaptability and Deconstruction**

This credit head is not applicable under BEAM Plus NDC.

4 Materials and Waste	MW-03	Waste Reduction
	MW-03-02	Enhanced Waste Handling Facilities
Extent of Application	All DC Part (b) is applicable only when Municipal Solid Waste Charing Scheme is activated.	
Objective	To encourage best practice for the management of waste, including sorting, recycling and disposal of waste	
Credit Point(s) Attainable	2 + 2 Bonus	
Credit Requirement	<p>(a) Additional Recyclables Collection</p> <p>1 credit point for the provision of facilities for collection, sorting, storage and disposal of 2 other recyclable streams in addition to those described in MW-00-P1.</p> <p>(b) Additional Facility Provisions to Enable enhanced Municipal Solid Waste (MSW) Charing Scheme</p> <p>1 credit point for additional facilities for collection, sorting, storage and disposal of recyclables in addition to those described in MW-00-P1 and MW-03-02 part (a).</p> <p>(c) Waste Treatment Equipment</p> <p>1 Bonus credit point for providing at least one set of waste treatment equipment.</p> <p>(d) Alternatives to Recycling Facilities</p> <p>1 Bonus credit point for providing alternative means of waste collection systems.</p>	
Assessment	<p>(a) Additional Recyclables Collection</p> <ol style="list-style-type: none"> 1. Provide an Operational Waste Management Plan that demonstrates the adequacy of 2 additional recyclables, in addition to prescribed recyclables in MW-00-P1, to be collected, such as food waste, organic landscape waste, beverage carton recyclable and other (fluorescent light tubes, electronic products etc.). The plan should include the following in addition to the items required under MW-00-P1: <ol style="list-style-type: none"> 1.1. Identify and estimate the quantities of expected waste streams for the additional recyclables of the development by waste stream calculation; 1.2. Demonstrate with calculation that there are sufficient capacity and provision for the additional recyclables generated from the development based on the waste stream calculation; and 1.3. Elaborate the management plan, accessibility and hygiene for the additional recyclables. It includes what is the collection and separation methodology of recyclables; and how the building users dispose recyclables and janitor staffs collect and deliver to refuse storage and material recovery chambers (RS&MRC) & refuse chutes. 	

(b) Enhanced Waste Handling Facilities

1. Provide an Operational Waste Management Plan 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. Demonstrate that the location and design of the facility have considered accessibility of building users, and operation and maintenance of the recycling facilities, cleaning staff/ contractors and for waste recycling and collection companies.
2. Drawing is required to indicate the additional facility for enabling municipal solid waste management.
3. Detail documents (e.g. specification or as-built information) of the additional recycling/ design features for enabling the MSW charging scheme.

(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) Enhanced Waste Handling 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. The plan should include the following in addition to the items required under MW-00-P1:
 - 1.1. Provide narrative on the alternative recycling facilities (e.g. automated waste collection systems and separate chutes);
 - 1.2. Demonstrate with calculation that there are sufficient capacity and spaces of the alternative recycling facilities for different waste types generated in the development based on the waste stream calculation; and

- 1.3. Demonstrate management plan, accessibility and hygiene for the alternative recycling facilities. It includes the outlines of what is the collection and separation methodology of waste and recyclables; and how the building users dispose refuses and recyclables and janitor staffs collect and deliver to refuse storage and material recovery chambers (RS&MRC) & Refuse Chutes, if the proposed alternatives to recycling facilities are separated from the RS&MRC.

Submittals**(a) Waste Management Plan**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-03-02a_00	BEAM Plus NDC submission template for MW-03-02a	✓	✓
MW-03-02a_01	Operational Waste Management Plan	✓	✓
MW-03-02a_02	Drawings showing the locations of all waste handling facilities with indications of additional recyclable collections	✓	✓
MW-03-02a_03	Master layout plan or extract(s) of the General Building Plan to substantiate the exemption from the requirements of this credit	✓	✓

(b) Enhanced Waste Handling Facilities

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-03-02b_00	BEAM Plus NDC submission template for MW-03-02b	✓	✓
MW-03-02b_01	Operational Waste Management Plan	✓	✓
MW-03-02b_02	Drawings showing the locations of all waste handling facilities with indications of the additional recycling facility provision to enable MSW charging	✓	✓
MW-03-02b_03	Specification of the additional recycling/ design features for enabling the MSW charging scheme	✓	-
MW-03-02b_04	As-built information of the additional recycling/ design features for enabling the MSW charging scheme	-	✓
MW-03-02b_05	Master layout plan or extract(s) of the General Building Plan to substantiate the exemption from the requirements of this credit	✓	✓

(c) Waste Treatment Equipment

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-03-02c_00	BEAM Plus NDC submission template for MW-03-02c	✓	✓
MW-03-02c_01	Operational Waste Management Plan	✓	✓
MW-03-02c_02	Drawings showing the locations of all waste handling facilities with indications of the waste processing facilities	✓	✓
MW-03-02c_03	Calculation to justify the waste processing facilities achieve the credit required target	✓	✓
MW-03-02c_04	Catalogues/ information of the waste processing facilities	-	✓

(d) Alternatives to Recycling Facilities

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
MW-03-02d_00	BEAM Plus NDC submission template for MW-03-02d	✓	✓
MW-03-02d_01	Operational Waste Management Plan	✓	✓
MW-03-02d_02	Drawings showing the locations of all waste handling facilities with indications of the alternative recycling facilities	✓	✓

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 Aug 2021].

(b) Related Credits

MW-00-P1 Minimum Waste Handling Facilities

The Prerequisite requires the minimum provisions of waste recycle facilities for the collection, sorting, storage, recycling (recovered material) and disposal (waste).

4 Materials and Waste MW-04 Best Practice on Material Usage**MW-04-01 Best Practice on Material Usage****Extent of Application** All DC**Objective** Encourage the efficient use of material through adoption of green DC best practices**Credit Point(s) Attainable** 2**Credit Requirement** 2 credit points for demonstrating the adoption of at least 4 best practices relating to the efficient use of materials as mentioned in the Green Data Centre Practice Guide published by BEAM Society Limited (BSL).

Assessment

1. Demonstrate the adoption of best practice on efficient use of material as mentioned in the Green DC Practice Guide.
2. The adopted best practice should be from the following aspects as listed in the Green DC Practice Guide:
 - 2.1. Green Construction; and
 - 2.2. Green Disposal.
3. Prepare a technical report detailing the following:
 - 3.1. List of each adopted best practice;
 - 3.2. Detailed description of each adopted best practice and explanation on how it could benefit the DC development; and
 - 3.3. Evidences showing the adoption of the best practice including specifications specifying the application of the best practice, on-site photograph records, drawings, calculation, etc.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
MW-04-01_00	BEAM Plus NDC submission template for MW-04-01	✓	✓
MW-04-01_01	Technical report summarising the adopted best practice	✓	✓

Remarks (a) Additional Information

None

(b) Related Credits

None

5 Energy Use

The Information and Communication Technology (ICT) sector including DCs generates up to 2% of the global CO₂ emissions and data centres are estimated to have the fastest growing carbon footprint from across the whole ICT sector, mainly due to new business such as cloud computing and the rapid growth of the use of Internet services.

An objective of BEAM Plus DCs is to encourage thorough evaluation of the performance of DC and services system designs, and greater investments into measures that will help to improve the energy performance of new DCs, so as to reduce energy consumption and the associated environmental impacts, and to reduce summer peak electricity demand.

The assessment of the building and engineering systems is performance based as far as possible, but credits are also given for features which have proven to contribute to energy efficiency and conservation. Credits are given where management, operation and maintenance practices are such as to seek continual improvements in energy performance.

5 Energy Use	EU-00	Prerequisite
	EU-00-P1	Minimum Energy Performance
Extent of Application	All DC	
Objective	To establish the minimum level of energy performance for the building services systems in DCs.	
Credit Point(s) Attainable	Prerequisite	
Credit Requirement	<p>Demonstrate (a) performance improvement against the latest edition of Building Energy Code (BEC) and (b) Maximum Power Usage Effectiveness (PUE).</p> <p>(a) Performance against the <u>latest</u> edition of BEC</p> <p>Demonstrate compliance with the latest edition of BEC [1] on:</p> <ol style="list-style-type: none"> 1. Air-conditioning equipment efficiency (full load COP and 75% load for VSD equipment); and 2. Lighting power density for listed space type in the code. <p>(b) Maximum Power Usage Effectiveness (PUE)</p> <p>The data centre must have a design PUE at full IT load condition of no more than 2.0.</p>	
Assessment	<p>(a) Performance against the <u>latest</u> edition of BEC</p> <ol style="list-style-type: none"> 1. Air-conditioning System <ol style="list-style-type: none"> 1.1. The 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). 1.2. The performance of the selected air conditioning unit types should refer to the corresponding equipment COP tables stipulated in the latest edition of BEC. 1.3. 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), F_{csp}. 1.4. DCs using district cooling system and project without any air-conditioning installation (or not newly installed with any air-conditioning system) are not assessed under this criteria. 2. Indoor Lighting Systems <ol style="list-style-type: none"> 2.1. The LPD must comply with the maximum allowable values of the listed space type listed in the latest edition of BEC. 	

2.2. For space that without a listed space type suitable for calculation from the BEC code, LPD must be the same as the design value.

2.3. LPD requirements for this prerequisite follows the **latest** edition of BEC. Exclude the lighting installations that are outside the scope of application of BEC as stated in the latest edition of BEC Technical Guideline [2].

(b) Maximum Power Usage Effectiveness (PUE)

1. Whole building energy simulation should be carried out in a prescribed methodology as listed below in order to demonstrate the proposed DC performance meet the prerequisite requirement.
2. Refer to **Appendix 9.2** for Energy Modelling Guideline
3. Determine PUE at full IT load condition under Hong Kong climatic conditions.
4. Prepare a building energy simulation report to demonstrate the compliance of the Prerequisite requirement.
5. The report should be endorsed by a locally qualified professional who has at least 8-year of relevant experience in building energy modelling.

Submittals

(a) Performance against the latest edition of BEC

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-00-P1_00	BEAM Plus NDC submission template for EU-00-P1	✓	✓
EU-00-P1_01	Summary of energy performance for air-conditioning equipment; and/or	✓	✓
	Summary of energy performance for indoor lighting	✓	✓
EU-00-P1_02	Air-conditioning system equipment schedule, air-side and water-side schematic drawings highlighting all the air-conditioning equipment	✓	✓
EU-00-P1_03	Air-conditioning equipment and lighting specifications	✓	-
EU-00-P1_04	Catalogue of air-conditioning equipment highlighting the COP at full load; and	-	✓
	Lighting schedule with luminaire	-	✓
EU-00-P1_05	E&M layout drawing highlighting the space type	-	✓
EU-00-P1_06	Space area schedule	✓	✓

(b) Maximum Power Usage Effectiveness (PUE)

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-00-P1_00	BEAM Plus NDC submission template for EU-00-P1	✓	✓
EU-00-P1_07	Endorsed Building Energy Simulation Report	✓	✓
EU-00-P1_08	CV of the professional as per requirements in the assessment	✓	✓
EU-00-P1_09	Input and Output Simulation Summary	✓	✓
EU-00-P1_10	<p>Supporting documents for input, based on project development status, including:</p> <ul style="list-style-type: none"> i. OTTV calculation sheet based on the requirements of Buildings Department for 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. System and equipment specifications (for PA) and schedules (and catalogues) (PA and FA): <ul style="list-style-type: none"> a) All air-conditioning equipment highlighting COP, cooling/ heating capacity, input power, flow rate, etc., as well as energy recovery appliance highlighting efficiency; b) All lift and escalator highlighting capacity, motor power and energy saving control system; c) All water heater (if applicable) highlighting installed power; d) All ventilation fans highlighting input power and flow rate; e) All lighting fixtures highlighting designed space-specified LPD and/or input lighting power; f) Design IT Equipment Loads; and 	✓	✓

	<p>g) Other system (e.g. on-site renewable energy system) highlighting the key energy performance parameters</p> <p>iv. Pre-input calculation for modelling (if any), including but not limited to:</p> <p>a) Simplified Fan Power input; and</p> <p>b) Lighting Power Density.</p> <p>v. Exceptional calculation;</p> <p>vi. Schematics drawings for building services systems; and</p> <p>vii. Layout plan for building services systems (optional for PA).</p>		
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Remarks**(a) Additional Information**

[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 [Accessed Aug 2021].

[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/beco/en/pee/BEC_2018.pdf [Accessed Aug 2021]

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

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](https://www.emsd.gov.hk/energylabel/en/doc/2018%20CoP%20(English).pdf) [Accessed Aug 2021]

(b) Related Credits

None

5 Energy Use EU-01 Energy Reduction and Control**EU-01-01 Low Carbon Passive Design****Extent of Application**

All DC

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.

Credit Point(s) Attainable

3

Credit Requirement

Passive designs that can reduce building HVAC load and maximise daylight will be rewarded in this credit head under **either** prescriptive path **or** performance path.

Option 1: Prescription Path

1 to 2 credit points for incorporating 1 or 2 of the passive design strategies listed below:

- i) Optimum Spatial Planning
- ii) External Overhang (fix/ movable)
- iii) Vegetated Building Envelope
- iv) Daylighting Provision

Option 2: Performance Path

1 to 3 credit points for incorporating up to 3 of the passive design strategies listed below:

HVAC Load Reduction**1. Built Form and orientation**

1 credit point for reducing building envelope load from a hypothetical case with at least 22.5° difference in orientation with justification by simulation.

2. Optimum Spatial Planning

1 credit point for demonstrating consideration of optimum spatial planning to enhance energy conservation with justification by simulation.

3. External Shading Devices

1 credit point 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 point for the provision of vegetated building envelope with justification by calculation.

Daylight

5. Space Layout for Daylight Penetration

1 credit point 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: Prescription Path

Prepare a **passive building design report** with calculation, building elevations and drawings to demonstrate the compliance of adopting two (2) selected strategies.

1. Optimum Spatial Planning

Demonstrate the space planning complying with the following requirements:

1.1. For Non-open planned design:

- 1.1.1. 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:

- 1.2.1. 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,
- 1.2.2. 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 façade.

2.2. To document this strategy, the passive building design report should include the following information:

- 2.2.1. Facade design drawings with highlighted overhangs; and
- 2.2.2. 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:

- 3.3.1. Drawings demonstrating the area of vegetation on the roof area (or external wall area);
- 3.3.2. Drawings demonstrating the roof area of conditioned space (or the external wall area of conditioned space).
- 3.3.3. Calculation demonstrating the percentage of compliance;
- 3.3.4. Demonstration of reduction in U-value when compare with the project roof material (or external wall material); and
- 3.3.5. Maintenance contract or undertaking statement from project owner that landscape maintenance personnel/ company will be employed for the maintenance of building envelope vegetation.

4. Daylight Provision

Demonstrate greenery are provided for project envelop:

- 4.1. Provide window for each normally occupied space with each window height $> 50\%$ of the corresponding normally occupied space depth;
- 4.2. To document this strategy, the passive building design report should include the following information:
 - 4.2.1. Drawings of typical floors sections (or typical spaces design sections);
 - 4.2.2. Drawings highlighting the height of windows;
 - 4.2.3. Drawings highlighting the depth of normally occupied space; and
 - 4.2.4. Calculation demonstrating the percentage of compliance.

Option 2: Performance Path

Prepare a **passive building design report** with calculation, building elevations and drawings to demonstrate the compliance of adopting three (3) selected strategies.

1. Built Form and Orientation

- 1.1. Conduct a DC total energy analysis to demonstrate that the design DC has incorporated a better build form and orientation. Evaluation is carried out by rotating the design DC building. The selected baseline condition (hypothetic case) should be at least 22.5° different from the designed DC building in orientation. A passive building design report should be provided to document the analysis and result:
- 1.2. To document this strategy, a passive building design report should include the following information:
 - 1.2.1. A summary of simulation result;
 - 1.2.2. Baseline case building energy consumption;
 - 1.2.3. Design case building energy consumption;
 - 1.2.4. Demonstration of the orientation angle difference between hypothetic and design case;
 - 1.2.5. Hourly data (i.e. 8,760 hours) of building energy consumption for both the baseline case and the design case; and
 - 1.2.6. Input and output report generated by the simulation software
- 1.3. 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.
 - 1.3.1. Capable to perform hourly simulation (8,760 hours per year);
 - 1.3.2. Capable to provide hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat set points, and HVAC system operation;
 - 1.3.3. Capable to model 10 or more thermal zones;
 - 1.3.4. 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;
 - 1.3.5. 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;
 - 1.3.6. Capable to model part-load performance curves for mechanical equipment;
 - 1.3.7. Capable to model capacity and efficiency correction curves for mechanical heating and cooling equipment; and

1.3.8. Capable to model air-side economizers with integrated control.

2. Optimum Spatial Planning

2.1. Demonstrate at least 20% of building façade irradiation is taken up by the façade of non-conditioned space.

2.2. To document this strategy, the passive building design report should include the following information:

2.2.1. Annual solar irradiation on each building elevation;

2.2.2. Table summarising external wall area of non-conditioned space on each orientation of building elevation;

2.2.3. Calculation demonstrating the design case compliance in irradiation gain reduction; and

$$\frac{\sum \text{Façade Irradiation of Non - conditioned Façade Area}}{\text{Overall Façade Irradiation}} \geq 20\%$$

2.2.4. Input and output report generated by the simulation software.

3. Fixed or Movable Horizontal / Vertical External 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 at least 2% lower than the baseline (hypothetic) case without a shading device.

3.3. To document this strategy, the passive building design report should include the following information:

3.3.1. Simulation result of solar irradiation on each building elevation for both design case and hypothetic case;

3.3.2. Drawings illustrating the solar shading design; and

3.3.3. Input and output report generated by the simulation software.

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**

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

4.2. Only permanent plantation is considered as vegetation area

4.3. To document this strategy, the passive building design report should include the following information:

- 4.3.1. Drawings that demonstrate the area of vegetation on the roof area (or external wall area);
- 4.3.2. Drawings that demonstrate the roof area of conditioned space (or the external wall area of conditioned space);
- 4.3.3. Calculation for demonstrating the percentage of compliance;
- 4.3.4. Calculation for demonstrating a reduction in U-value when compare to the project roof material (or external wall material); and;
- 4.3.5. 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 Daylight Penetration

- 5.1. Demonstrate that 25% of normally occupied space achieves spatial Daylight Autonomy_{300/25%} (sDA_{300/25%}). 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.
- 5.2. Compliance with the assessment criteria by demonstrating through daylight simulation satisfying the below requirements:
 - 5.2.1. Normally occupied spaces shall be assessed (including normally occupied spaces without window);
 - 5.2.2. Internal doors within a unit are assumed to be fully opened;
 - 5.2.3. Calculation grids shall be no more than 0.6m²;
 - 5.2.4. Assessment plane shall be placed at 0.8m above F.F.L. horizontally;
 - 5.2.5. 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;
 - 5.2.6. Annual sky file referencing a local climate file, such as an EnergyPlus weather format data file (*.epw), shall be used for sky model;
 - 5.2.7. 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;
 - 5.2.8. 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;
 - 5.2.9. 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 [1]. 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;

- 5.2.10. Surrounding buildings and terrain shall be included in the model based on the GIS information from Lands Department;
- 5.2.11. 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
- 5.2.12. 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 x 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.
- 5.3. To document this strategy, the passive building design report should include the following information:
- 5.3.1. The industrial guidance/publications for arriving the adopted design criteria for the project;
- 5.3.2. Software validation report; (if the simulation software is not on the list in Annex 4 of PNAP APP-130);
- 5.3.3. Simulation results of the spaces which have fulfilled the daylight illuminance requirements;
- 5.3.4. Calculation for demonstrating the percentage of compliance; and;
- 5.3.5. Input and output report generated by the simulation software.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-01-01_00	BEAM Plus NDC submission template for EU-01-01	✓	✓
EU-01-01_01	Passive building design report	✓	✓

Remarks**(a) Additional Information**

[1] CIBSE - LG10/14 Lighting Guide 10: Daylighting - a Guide for Designers - LG10

(b) Related Credits

None

5 Energy Use EU-01 Energy Use Reduction and Control**EU-01-02 Reduction of CO₂ Emissions****Extent of Application**

All DC

Objective

Reduce the consumption of non-renewable energy and the associated carbon dioxide (CO₂) emissions to the atmosphere.

Credit Point(s) Attainable

15 + 2 Bonus

Credit Requirement

Predicted Power Usage Effectiveness (PUE)

Demonstrate and quantify the proposed DC energy performance operating under Hong Kong climatic conditions at 75% of the design IT load and express them in terms of Power Usage Effectiveness (PUE).

1 to 15 credit points for design PUE value between 1.77 and 1.52.

1 to 2 additional Bonus credit points for design PUE value lower than 1.5 and 1.4, respectively.

Credit point(s)	PUE at 75% Design IT Load
1	1.77
2	1.74
3	1.71
4	1.68
5	1.65
6	1.62
7	1.60
8	1.59
9	1.58
10	1.57
11	1.56
12	1.55
13	1.54
14	1.53
15	1.52
15 + 1B	1.50
15 + 2B	1.40

Assessment**1. Power Usage Effectiveness (PUE)**

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 to achieve the most efficient design.

- 1.1. Determine PUE at 75% of the IT load under Hong Kong climatic conditions.
- 1.2. The IT equipment energy shall be measured at Power Distribution Unit (PDU) Output, i.e. PUE Level 2.
- 1.3. The energy performance improvements could be come from the following aspects:
 - 1.3.1. DC infrastructure design;
 - 1.3.2. Selection of highly efficient equipment;
 - 1.3.3. Equipment capacities and part load characteristics;
 - 1.3.4. System configuration; and
 - 1.3.5. Operational and control sequencing.

2. DC Energy Model Set-up

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.

2.1. Simulation Software

Simulation program used for energy modelling should meet the following criteria:

- 2.1.1. Tested with industry standard methods: ANSI/ASHRAE Standard 140- 2017 or equivalent;
- 2.1.2. Capable to perform hourly analysis (i.e. 8,760 hours per year);
- 2.1.3. Provide hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat set points, and HVAC system operation;
- 2.1.4. Capable to model 10 or more thermal zones;
- 2.1.5. 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;
- 2.1.6. Capable to perform design load calculations to determine the required air-conditioning equipment capacities and air and water flow rates for the proposed DC building;
- 2.1.7. Capable to model part-load performance curves for mechanical equipment;
- 2.1.8. Capable to model capacity and efficiency correction curves for mechanical heating and cooling equipment; and
- 2.1.9. Capable to model air-side economizers with integrated control.

2.2. DC Energy Model Set-up

- 2.2.1. Develop the corresponding proposed DC building performance according to modelling set up guideline in **Appendix 9.2** for different building types.

2.3. Exceptional Calculation Methods (ECM)

- 2.3.1. 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.
- 2.3.2. For any claim of non-regulated load saving or strategies it is required to submit a narrative and provide ECM calculation.
- 2.3.3. 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.

2.4. On-site Renewable Energy

- 2.4.1. On-site renewable energy generation is included in the proposed case calculation to further reduce the whole building CO₂ emission/ PUE.

3. DC Energy Simulation Report

3.1. The content should include the following:

3.1.1. Executive Summary

- a) Energy saving measures summary
- b) PUE at 75% design IT load

3.1.2. Introduction

- a) Methodology of energy performance assessment, including the details of the energy simulation software and ECM (if any) used
- b) Project information

3.1.3. Description of Energy Saving Measures

3.1.4. Modelling Parameters

- a) Operating schedule
- b) Input parameters summary table with reference

3.1.5. Results and Discussion

- a) Detail calculation of the design PUE at 75% IT load.

b) Provide DC energy breakdown diagrams

3.1.6. Conclusions

a) Conclude the major reasons for achieving design PUE.

3.2. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-01-02_00	BEAM Plus NDC submission template for EU-01-02	✓	✓
EU-01-02_01	Endorsed DC Energy Simulation Report	✓	✓
EU-01-02_02	CV of the professional as per requirements in the assessment	✓	✓
EU-01-02_03	Input and Output Simulation Summary	✓	✓
EU-01-02_04	Supporting documents for input, based on project development status, including: <ul style="list-style-type: none"> i. OTTV calculation sheet based on the requirements of Buildings Department for 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. System and equipment specifications (for PA) and schedules (and catalogues) (PA and FA): <ul style="list-style-type: none"> a) All air-conditioning equipment highlighting COP, cooling/ heating capacity, input power, flow rate, etc., as well as energy recovery appliance highlighting efficiency; b) All lift and escalator highlighting capacity, motor power and energy saving control system; c) All water heater (if applicable) highlighting installed power; d) All ventilation fans highlighting input power and flow rate; 	✓	✓

	<ul style="list-style-type: none"> e) All lighting fixtures highlighting designed space-specified LPD and/ or input lighting power; f) Design IT Equipment Load; and g) Other system (e.g. on-site renewable energy system) highlighting the key energy performance parameters <ul style="list-style-type: none"> iv. Pre-input calculation for modelling (if any), including but not limited to: <ul style="list-style-type: none"> a) Simplified Fan Power input; and b) Lighting Power Density. v. Exceptional calculation; vi. Schematics drawings for building services systems; and vii. Layout plan for building services systems (optional for PA). 		
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Remarks**(a) Additional Information**

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

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
[Accessed Aug 2021].

Electrical and Mechanical Services Department, Technical Guidelines on Building Energy Code 2018 Edition (TG-BEC 2018) [ONLINE]. available at:
https://www.emsd.gov.hk/beco/en/pee/BEC_2018.pdf
[Accessed Aug 2021]

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](https://www.emsd.gov.hk/energylabel/en/doc/2018%20CoP%20(English).pdf)
[Accessed Aug 2021]

(b) Related Credits

None

5 Energy Use EU-01 Energy Use Reduction and Control**EU-01-03 Peak Electricity Demand Reduction**

This credit head is not applicable under BEAM Plus NDC.

5 Energy Use EU-01 Renewable and Alternative Energy Generation**EU-01-04 Metering and Monitoring****Extent of Application** All DC**Objective** Enable DC operators to measure, monitor and develop measures to improve the performance of the building's engineering systems.**Credit Point(s) Attainable** 2 + 1 Bonus**Credit Requirement (a) Fundamental Metering and Monitoring**

1 credit point for providing energy monitoring system for equipment and systems in spaces.

(b) Metering and Monitoring for PUE

1 credit point for energy metering to provide total facility power and energy usage and total IT equipment power and energy at the output of Power Distribution Units (PDUs) for determining instantaneous and average PUE data at Level 2.

1 additional Bonus credit point for providing metering that allows monitoring of individual IT equipment output at data hall racks for determining Level 3 PUE.

Assessment (a) Fundamental Metering and Monitoring**1. Metering Coverage**

1.1. Energy monitoring provision covers the energy consumption (both electricity and gas) of the equipment, unit in (kWh).

1.2. 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.

1.2.1. Each equipment in HVAC water-side system (e.g. chiller plant, heating plant & heat rejection plant);

1.2.2. Each equipment in HVAC air-side system (e.g. Air handling unit);

1.2.3. Each equipment in Fresh Air system (e.g. Primary air unit); and

1.2.4. Each gas equipment in cooling or heating plant (e.g. Absorption chiller plant, centralised boiler plant).

1.3. Provide energy monitoring system for all the following end-use in landlord's controlled area (Allow a minimum of one single meter for each end-use):

1.3.1. Variable refrigerant volume air-conditioner energy consumption;

- 1.3.2. Car park ventilation system energy consumption;
- 1.3.3. Toilet ventilation system energy consumption;
- 1.3.4. Lift system energy consumption;
- 1.3.5. Escalator system energy consumption;
- 1.3.6. Lighting and receptacle power energy consumption; and
- 1.3.7. Plumbing and drainage system energy consumption.

1.4. Requirements of monitoring coverage are summarised as below:

Table EU-01-04:

System (if applicable)		Energy monitoring
HVAC System	Each Equipment in HVAC (Water Side) <ul style="list-style-type: none"> - Chillers - Heat pumps - Pumps - Heat Rejection 	(a) Electricity (kW and kWh)
	Each Equipment in HVAC (Water Side) <ul style="list-style-type: none"> - Absorption Chiller - Boiler 	(b) Fuel (kW and kWh)
	Each Equipment in HVAC (Air Side) <ul style="list-style-type: none"> - Primary Air/ Air Handling Unit Fans - Ventilation Fans 	(c) Electricity (kW and kWh)
	VRV and Unitary System	(d) Electricity (kW and kWh)
	Exhaust System <ul style="list-style-type: none"> - Carpark Exhaust Ventilation - Toilet Exhaust Ventilation (>2.5kW each) 	(e) Electricity (kW and kWh)
Lighting System	Lighting and receptacle system	(f) Electricity (kW and kWh)
Plumbing and Drainage System	Equipment in Plumbing and Drainage	(g) Electricity (kW and kWh)
Lift and Escalators System	Each Lift and Escalators	(h) Electricity (kW and kWh)
* A single meter monitoring the entire lift/ escalator system and plumbing & drainage system are acceptable, provided that the monitoring system can provide individual reading of each lift and escalator.		

2. Monitoring Provision Requirement (Datapoint, Sensors or Meters)
 - 2.1. Electricity metering should comply with BS EN [1] accuracy class 1 or equivalent.
 - 2.2. Sensors for performance sub-metering should meet the minimum accuracy requirements in ASHRAE Standard 114 [2] or similar equivalent.
3. Interval and Recording
 - 3.1. Monitoring record should be at intervals of one hour or less and capable to record the item as required.
 - 3.2. 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 12 months.

(b) Metering and Monitoring for PUE

1. PUE Level 2
 - 1.1. All forms of energy related to PUE calculation shall be measured and tracked over time.
 - 1.2. Energy meters should be provided to measure and track the energy usage at the following system in order to provide real-time display and data collection of PUE, and to compute the annual average PUE at Intermediate Level, i.e. Level 2.
 - 1.2.1. Total facility energy;
 - 1.2.2. Total IT equipment energy at each Uninterruptible Power Supply (UPS); and
 - 1.2.3. Total IT equipment energy at each Power Distribution Unit (PDU) output.
 - 1.3. The Monitoring provision, Interval and Recording Requirement should follow the criteria set out in EU-01-04a.
2. PUE Level 3
 - 2.1. Energy meters should be provided at each individual piece of IT equipment within the DCs, either by metered rack PDUs (i.e. plug strips) that monitor at the strip or receptacle level or by the IT device itself; and
 - 2.2. The Monitoring provision, Interval and Recording Requirement should follow the criteria set out in EU-01-04a.

Submittals (a) Fundamental Metering and Monitoring

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-01-04a_00	BEAM Plus NDC submission template for EU-01-04a	✓	✓
EU-01-04a_01	Electrical schematics highlighting all locations of metering	✓	✓
EU-01-04a_02	Control diagrams of central chiller plant monitoring system	✓	✓
EU-01-04a_03	Specifications of all metering and measurement equipment	✓	-
	[OR] Catalogues of all metering and measurement equipment	-	✓
EU-01-04a_04	Specifications of BMS or data collection facilities (if applicable)	✓	-
	[OR] Catalogues of BMS or data collection facilities (if applicable)	-	✓

(b) Metering and Monitoring for PUE

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-01-04b_00	BEAM Plus NDC submission template for EU-01-04b	✓	✓
EU-01-04b_01	Electrical schematics highlighting all locations of metering	✓	✓
EU-01-04b_02	Specifications of all metering and measurement equipment	✓	-
	[OR] Catalogues of all metering and measurement equipment	-	✓
EU-01-04b_03	Specifications of BMS or data collection facilities (if applicable)	✓	-
	[OR] Catalogues of BMS or data collection facilities (if applicable)	-	✓

Remarks**(a) Additional Information**

[1] British Standard BS EN 62053-11:2003. Electricity metering equipment (a.c.). Particular requirements. Electromechanical meters for active energy (classes 0.5, 1 and 2)

[2] ASHRAE. Standard 114-1986: Energy Management Control Systems Instrumentation, American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., USA. 1987

Code of Practice for Building Energy Audit – Electrical and Mechanical Services Department HKSAR, 2018

(b) Related Credits

IDCM-03-01 Digital Facility Management Interface

While this credit head assesses the electricity consumption metering and monitoring system in the building, IDCM-03-01 encourages processing the data collected to useful information for facility managers' and occupants' use.

5 Energy Use EU-02 Renewable and Alternative Energy Generation**EU-02-01 Renewable and Alternative Energy Systems****Extent of Application** All DC**Objective** Encourage the wider application of renewable energy sources in DCs.**Credit Point(s) Attainable** 4**Credit Requirement (a) Solar Energy Feasibility Study**

1 credit point for evaluating the building roof's potential for harnessing solar energy.

(b) Renewable Energy Application**Option 1**

1 to 3 credit points for using on-/ off-site renewable energy systems to offset annual building energy consumption for non-data centre subsystem, i.e. Building Service systems servicing non-data hall areas, plant rooms, personal office areas and personal office loads, etc. to offset 0.4%, 0.6% or 0.8% energy consumption.

Option 2

1 to 3 credit points where the minimum percentage of 40%, 60% or 80% of the building footprint is being covered/ used by PV panels respectively and/or other renewable power facility generation with equivalent renewable power output.

Assessment (a) Solar Energy Feasibility Study

1. 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.

- 1.1. Consideration of PV, BIPV or Solar thermal potential installation

- 1.1.1. Number of potential surfaces;

- 1.1.2. Potential surfaces area;

- 1.1.3. Height variation between roofs;

- 1.1.4. Potential shading from the surroundings including trees and adjacent buildings;

- 1.1.5. Potential shading from on-site building services equipment; and

- 1.1.6. Other (proposed)

1.2. Technical generation potential of solar energy

1.2.1. Expected solar peak capacity;

1.2.2. Expected annual yield; and

1.2.3. Project DC building PUE and the estimated percentage of reduction.

1.3. Economics of solar energy

1.3.1. Upfront installation costs;

1.3.2. Anticipated maintenance cost;

1.3.3. Anticipated annual electricity bills;

1.3.4. Anticipated cost saving; and

1.3.5. Payback period

1.4. Conclusions

1.4.1. Conclude whether the harnessing of solar energy is feasible for the project.

1.5. Roll-out plan (if concluded to be feasible)

1.5.1. Propose access and safety measures if solar energy is to be harnessed;

1.5.2. Propose recommendations to refine the roof design to maximise the usable roof space for M&E equipment;

2. The feasibility should be endorsed by a locally qualified professional who has at least 3 years of relevant experience in renewable energy.

3. Note that the feasibility study imposes no obligation for implementation but encourages consideration of solar energy harnessing.

(b) Renewable Energy Application**Option 1**1. Calculate the percentage of annual building energy consumption for Non-data centre subsystem obtained from all the on-site renewable energy sources with reference to the design value calculated in EU-01-02 Reduction of CO₂ emissions.

$$\frac{\text{Annual energy generated by Onsite renewable energy systems (kWh)}}{\text{Annual energy use (kWh)}}$$

2. Non-data centre subsystems refer to the following:
 - 2.1. Building Service systems servicing non-data hall areas;
 - 2.2. Plant rooms;
 - 2.3. Personal office areas;
 - 2.4. Personal office load; and
 - 2.5. Other sub-systems that are not serving data hall areas.
3. The calculation of annual energy provided by the on-site renewable energy systems should take into account of the following:
 - 3.1. Diurnal and seasonal variations in the external environmental conditions; and;
 - 3.2. Energy used and lost by the renewable energy systems should be discounted from the systems output.
4. The annual energy use figure should be derived from the design case as stated in EU-01-02. The tenant's electrical loads, which are not controlled or influenced by the applicant, should be excluded from the annual energy use.
5. 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.
6. 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.
7. Examples of renewable energy systems accepted include:
 - 7.1. Solar photovoltaic (PV) system;
 - 7.2. Solar water heating system;
 - 7.3. Wind power system;
 - 7.4. Bio-gas heating / electricity generation; and
 - 7.5. Biofuel.
8. Off-site renewable energy system refers to the purchasing of local Renewable Energy Certificates (REC).
9. DCs should demonstrate continuous purchasing of local REC for at least 5 years.
10. The calculation/ report should be endorsed by a locally qualified professional who has at least 3 years of relevant experience in renewable energy.

Option 2

1. Technical report providing details of the installations, and calculations showing the percentage of the building footprint is being covered/ used by PV panels and/or other renewable power facility generation equivalent renewable power output.
2. The calculation/ report should be endorsed by a locally qualified professional who has at least 3 years of relevant experience in renewable energy.

Submittals**(a) Solar Energy Feasibility Study**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-02-01a_00	BEAM Plus NDC submission template for EU-02-01a	✓	✓
EU-02-01a_01	Endorsed Feasibility study report	✓	✓*
EU-02-01a_02	CV of the professional as per requirements in the assessment	✓	✓*
*If the credit is achieved in PA, no further submission is required in FA			

(b) Renewable Energy Application

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-02-01b_00	BEAM Plus NDC submission template for EU-02-01b	✓	✓
EU-02-01b_01	Specifications of on-site renewable energy system	✓	-
	Catalogues of on-site renewable energy system	-	✓
EU-02-01b_02	Elevation and layout plan highlighting the location of each on- site renewable energy system	✓	✓
EU-02-01b_03	Schematic diagram of each renewable energy system	✓	✓
EU-02-01b_04	Declaration letter confirming the commitment to purchasing of local Renewable Energy Certificates	✓	-
	5 years of valid local Renewable Energy Certificates	-	✓
EU-02-01b_05	Endorsed calculation of annual yield of each on-site renewable energy system and assumptions	✓	✓
EU-02-01b_06	Endorsed calculation of percentage of annual building energy consumption obtained from on-site renewable energy sources	✓	✓

EU-02-01b_07	For Option 2 Technical report providing details of the installations, and calculations showing the percentage of the building footprint is being covered/used by PV panels and/or other renewable power facility generation equivalent renewable power output.	✓	✓
EU-02-01b_08	CV of the professional as per requirements in the assessment	✓	✓

Remarks**(a) Additional Information**

EMSD – HK RE Net. [ONLINE]. Available at:
http://re.emsd.gov.hk/english/gen/overview/over_intro.html
 [Accessed Aug 2021].

EMSD – Energy Land. [ONLINE]. Available at:
http://www.energyland.emsd.gov.hk/en/energy/energy_use/application.html
 [Accessed Aug 2021].

EMSD – New & Renewable Energy. [ONLINE]. Available at:
http://www.emsd.gov.hk/en/energy_efficiency/new_renewable_energy
 [Accessed Aug 2021].

GovHK – Renewable Energy. [ONLINE]. Available at:
<https://www.gov.hk/en/residents/environment/renewable/index.htm>
 [Accessed Aug 2021].

HKSAR Government, CLP Power Hong Kong Ltd. and Castle Peak Power Company Ltd. Scheme of Control Agreement. [ONLINE]. Available at:
http://www.enb.gov.hk/sites/default/files/en/node66/new_CLP_SCA_eng.pdf
 [Accessed August 2021].

HKSAR Government, Hongkong Electric Co. Ltd. and HK Electric Investments Ltd. Scheme of Control Agreement. [ONLINE]. Available at:
http://www.enb.gov.hk/sites/default/files/en/node66/new_HKE_SCA_eng.pdf
 [Accessed Aug 2021].

(b) Related Credits

EU-01-01 Low Carbon Passive Design and

EU-01-02 Reduction of CO₂ Emissions

BEAM Plus appreciates comprehensive energy saving measures. Thorough consideration of passive design, active design and renewable energy will help DCs achieve significant reduction in energy consumption.

5 Energy Use EU-03 Energy Efficient Equipment**EU-03-01 Air-Conditioning Units**

This credit head is not applicable under BEAM Plus NDC.

5 Energy Use EU-03 Energy Efficient Equipment**EU-03-02 Clothes Drying Facilities**

This credit head is not applicable under BEAM Plus NDC.

5 Energy Use	EU-03	Energy Efficient Equipment
	EU-03-03	Energy Efficient Appliances
Extent of Application	EU-03-03a: All DC EU-03-03b: DCs with operational control over the IT Equipment.	
Objective	To recognise and encourage the procurement of energy-efficient equipment to ensure optimum performance and energy savings.	
Credit Point(s) Attainable	2	
Credit Requirement	<p>(a) Use of Efficient UPS</p> <p>1 credit point for demonstrating that the Uninterruptible Power Supplies (UPS) is procured in accordance with certified energy efficient products scheme.</p> <p>(b) Use of Sustainable IT Equipment</p> <p>1 credit point for demonstrating that the IT Equipment for the running and operating of the DC of is procured in accordance with certified energy efficient products scheme.</p>	
Assessment	<p>(a) Use of efficient UPS</p> <ol style="list-style-type: none"> 1. Demonstrate all the installed Uninterruptible Power Supplies (UPS) have achieved USEPA ENERGY STAR Rated or certified under an equivalent labelling scheme. 2. Provide a schedule of UPS including the location, quantity, model and the rated power. <p>(b) Use of Sustainable IT Equipment</p> <ol style="list-style-type: none"> 1. This credit assesses only the IT Equipment provided by the developer. 2. Demonstrate at least 80% of total rated power of the installed IT Equipment listed below have achieved USEPA ENERGY STAR Rated or certified under an equivalent labelling scheme. <ol style="list-style-type: none"> 2.1. Servers; 2.2. Data Centre Storage; 2.3. Small Network Equipment; and 2.4. Large Network Equipment. 3. Provide a schedule of all IT Equipment including the location, quantity, model and the rated power. 	

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-03-03_00	BEAM Plus NDC submission template for EU-03-03	✓	✓
EU-03-03_01	Schedule of all UPS	✓	✓
	Schedule of all IT Equipment	✓	✓
EU-03-03_02	Specifications that demonstrated the control of purchasing energy efficient label for the project	✓	-
EU-03-03_03	Catalogues of all IT Equipment highlighting the compliance of USEPA Energy Star	-	✓
EU-03-03_04	Electrical schematic drawing(s) highlighting all IT efficient appliances	✓	✓
EU-03-03_05	Justification report for the equivalent label used in the assessment	✓	✓
EU-03-03_06	Photographic evidence confirming installation of compliant IT equipment	-	✓

Remarks**(a) Additional Information**

USEPA ENERGY STAR website [ONLINE] Available at:
https://www.energystar.gov/products/data_center_equipment/uninterruptible_power_supplies
 [Accessed Aug 2021].

USEPA ENERGY STAR website [ONLINE] Available at:
https://www.energystar.gov/products/data_center_equipment
 [Accessed Aug 2021].

(b) Related Credits

None

5 Energy Use	EU-03	Energy Efficient Equipment
	EU-03-04	Cooling System Efficiency
Extent of Application	All DC	
Objective	Encourage the use of high efficiency cooling system in equipment and system configuration to minimise the energy consumption.	
Credit Point(s) Attainable	2	
Credit Requirement	<p>(a) <u>For Air-cooled Cooling System</u></p> <p>1 to 2 credit points for demonstrating the total cooling system efficiency serving data hall is of 0.85 kW/ton and 0.78 kW/ton, respectively.</p> <p>OR</p> <p>(b) <u>For Water-cooled Cooling System</u></p> <p>1 to 2 credit points for demonstrating the total cooling system efficiency serving data hall is of 0.8 kW/ton and 0.75 kW/ton, respectively.</p> <p>Note: For DC equipped with combined system type, the assessment will be based on the dominated plant, i.e., at least 75% of actual cooling consumption by the dominated system.</p>	
Assessment	<p>(a) Air-cooled Cooling System</p> <ol style="list-style-type: none"> To demonstrate compliance of the credit, technical report with detail calculation of the total cooling system efficiency is required. The prescribed system efficiency shall be achieved at 75% of the design IT load. The system efficiency calculation should include the following components: <ol style="list-style-type: none"> Air Cooled Chilled-Water Plant: <ol style="list-style-type: none"> Air-cooled chiller Chilled water pump Unitary Air-Conditioners: <ol style="list-style-type: none"> Variable Refrigerant Flow (VRF) system Single-Split unit Multi-Split unit The report should be endorsed by a locally qualified professional who has at least 5-year of relevant experience in Building Service Design. 	

(b) Water-cooled Cooling System

1. To demonstrate compliance of the credit, technical report with detail calculation of the total cooling system efficiency is required.
2. The prescribed system efficiency shall be achieved at 75% of the design IT load.
3. The system efficiency calculation should include the following components:
 - 3.1. Water Cooled Chilled-Water Plant:
 - 3.1.1. Water-cooled chiller
 - 3.1.2. Chilled water pump
 - 3.1.3. Condenser water pump
 - 3.1.4. Cooling tower or heat rejection unit
4. The report should be endorsed by a locally qualified professional who has at least 5-year of relevant experience in Building Service Design.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-03-04_00	BEAM Plus NDC submission template for EU-03-04	✓	✓
EU-03-04_01	Endorsed technical report	✓	✓
EU-03-04_02	Design report showing the design IT load	✓	✓
EU-03-04_03	Cooling system equipment schedule showing all technical information of the system components	✓	✓
	Catalogue of all the system components	-	✓
EU-03-04_04	Water-side schematic and layout drawings highlighting all the system components.	✓	✓
EU-03-04_05	Test and Commissioning records	-	✓
EU-03-04_06	CV of the professional as per requirements in the assessment	✓	✓

Remarks**(a) Additional Information**

None

(b) Related Credits

None

5 Energy Use EU-03 Energy Efficient Equipment**EU-03-05 Air Management System****Extent of Application** All DC**Objective** Encourage the use of high efficiency air distribution system to minimise the energy consumption.**Credit Point(s) Attainable** 2**Credit Requirement** 1 to 2 credit points for demonstrating the total air flow efficiency of the air distribution system serving all data hall, from supply to return, is of 0.9 kW/m³/s and 0.8 kW/m³/s, respectively.**Assessment**

- To demonstrate compliance of the credit, technical report with detail calculation of the air flow efficiency in all data halls is required.
- The calculation air flow efficiency should include both the supply and return air flows serving each data hall, and expressed in the following:

$$\text{Airflow efficiency} = \frac{\text{Total fan power (supply and return), kW}}{\text{Total fan airflow, (supply and return), m}^3/\text{s}}$$

- The prescribed air flow efficiency shall be achieved at 75% of the design IT load.
- The report should be endorsed by a locally qualified professional who has at least 5-year of relevant experience in Building Service Design.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
EU-03-05_00	BEAM Plus NDC submission template for EU-03-05	✓	✓
EU-03-05_01	Endorsed technical report	✓	✓
EU-03-05_02	Data hall layout plan	✓	✓
EU-03-05_03	Data hall air-distribution system equipment schedule showing the information of fan power and flow rate	✓	✓
	Catalogue of all the supply and return fans	-	✓
EU-03-05_04	Data hall Air-side schematic and layout drawings highlighting all the supply and return fans	✓	✓
EU-03-05_05	Test and Commissioning records	-	✓
EU-03-05_06	CV of the professional as per requirements in the assessment	✓	✓

Remarks (a) Additional Information

None

(b) Related Credits

None

5	Energy Use	EU-04	Energy Management and Monitoring
		EU-04-01	Best Practices on Energy Use
	Extent of Application	All DC	
	Objective	Encourage the adoption of green DC best practices to achieve better energy-efficiency DCs.	
	Credit Point(s) Attainable	5	
	Credit Requirement	<p>(a) Best Practices for Major Controls</p> <p>1 to 3 credit points for incorporating at least 2 best practices under each of the following aspect in the Green DC Practice Guide published by BEAM Society Limited:</p> <ul style="list-style-type: none"> i) Cooling System; ii) Air Flow Management; iii) Operating at Higher Temperature and Humidity; iv) Cooling Management; and v) Power System. <p>(b) Best Practices for Other Controls</p> <p>2 credit points for incorporating at least 6 best practices across the following aspects as listed in the Green DC Practice Guide published by BEAM Society Limited:</p> <ul style="list-style-type: none"> i) Design of Resilience; ii) Monitoring and Managing Energy Efficiency; iii) IT Equipment Deployment; iv) IT Application System and IT Service Deployment; and v) Telecommunications and Network Cabling. 	
	Assessment	<p>(a) Best Practices for Major Controls</p> <p>1. At least 2 best practices under each of the following individual aspect as listed in the Green DC Practice Guide published by BEAM Society Limited:</p> <ul style="list-style-type: none"> i) Cooling System; ii) Air Flow Management; iii) Operating at Higher Temperature and Humidity; iv) Cooling Management; and v) Power System. 	

2. 1 credit point will be awarded for successfully demonstrating at least 2 best practices from individual aspect. Maximum 3 credit points will be awarded for this section.
3. Prepare a technical report detailing the following:
 - 3.1. List of each adopted best practice;
 - 3.2. Detailed description of each adopted best practice and explanation on how it could benefit the DC development; and
 - 3.3. Evidences showing the adoption of the best practice including specifications specifying the application of the best practice, on-site photograph records, drawings, calculation, etc.

(b) Best Practices for Other Controls

1. At least 6 best practices should be adopted across the following aspects as listed in the Green DC Practice Guide published by BEAM Society Limited:
 - i) Design of Resilience;
 - ii) Monitoring and Managing Energy Efficiency;
 - iii) IT Equipment Deployment;
 - iv) IT Application System and IT Service Deployment; and
 - v) Telecommunications and Network Cabling.
2. 2 credit points will be awarded for successfully demonstrating at least 6 best practices from the abovementioned aspects.
3. Prepare a technical report detailing the following:
 - 3.1. List of each adopted best practice;
 - 3.2. Detailed description of each adopted best practice and explanation on how it could benefit the DC development; and
 - 3.3. Evidences showing the adoption of the best practice including specifications specifying the application of the best practice, on-site photograph records, drawings, calculation, etc.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
EU-04-01_00	BEAM Plus NDC submission template for EU-04-01	✓	✓
EU-04-01_01	Technical report summarising the adopted best practice	✓	✓

Remarks

(a) Additional Information

None

(b) Related Credits

None

6 Water Use

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 Water Use WU-00 Prerequisite**WU-00-P1 Minimum Water Saving Performance**

This prerequisite is not applicable under BEAM Plus NDC.

6 Water Use WU-01 Water Conservation**WU-01-01 Annual Water Use****Extent of Application**

All DC.

Objective

To reduce the consumption of potable water through the application of water saving devices that have proven performance and reliability.

Credit Point(s) Attainable

3 + 1 Bonus

Credit Requirement

1 to 3 credit points for demonstrating that the use of water efficient devices leads to an estimated annual saving of 20%, 25% or 30%.

1 additional Bonus credit point for demonstrating that the use of water efficient devices leads to an estimated annual saving of 40%.

Assessment

1. Prepare a Potable Water Use Report which should include the following contents:
 - 1.1. Schedule including the types of fixtures with the location and number of each type of fixture;
 - 1.2. Calculation of potable water use following the guidance in 2) below and;
 - 1.3. Percentage of annual potable water saving.
2. The calculation of potable water use should be based on the following methodology:
 - 2.1. Users
 - 2.1.1. 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 (9m²/person) and male to female ratio (1:1)
 - 2.1.2. 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].
 - 2.1.3. The same number of users should be applied to both the baseline case and the project design case.
 - 2.2. Operational Days
 - 2.2.1. Specify the number of operational days per annum. Alternatively, assume full year operation (365 days).
 - 2.2.2. The same operational days should be applied to both the baseline case and the project design case.
 - 2.3. Number of Use, Product Flow Rate and Duration of Use

- 2.3.1. Establish a baseline case for water consumption by the assumptions outlined in the following table. The calculation should only consider the listed fixtures.

Fixture Type	Flow Rate (L/min)	Operation Time (sec)	Number of Use per Occupant per day
Shower	12	300	0.1
Non-mixing Type Water Taps (shower rooms and toilets)	4	10	5
Mixing Type Water Taps (shower rooms and toilets)	7	10	5

- 2.3.2. Establish the project design case and identify the fixture flowrate at 5 bar.
- 2.3.3. 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.
- 2.3.4. The same number of use should be applied to both the baseline case and the project design case.

3. Annual Potable Water Percentage Saving

- 3.1. Add up the total annual potable water use for both baseline and design. The annual potable water percentage saving can be calculated as follows:

$$1 - \frac{\text{Annual potable water use (design)}}{\text{Annual potable water use (baseline)}} \times 100\%$$

4. Any fixtures (other than commercial kitchen fixtures) that is not considered in the calculation should demonstrate that the water taps are rated grade 1 [2] by the WSD voluntary Water Efficiency Labelling Scheme.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
WU-01-01_00	BEAM Plus NDC submission template for WU-01-01	✓	✓
WU-01-01_01	Technical Information on Water Fixtures and Annual Potable Water Use Calculation	✓	✓
WU-01-01_02	General Building Plan (GBP) highlighting the sanitary fitting schedule and the male to female ratio [or] Calculation of no. of users using the default occupancy density (9m ² /person) and male to female ratio (1:1)	✓	✓

WU-01-01_03	Plumbing schematic drawing(s) and plumbing layout drawings (in WSD submission standard)	✓	✓
WU-01-01_04	Specifications of each type of fixture counted in the calculation showing the specified flow rate at 5 bar	✓	-
WU-01-01_05	Catalogues of each type of fixture counted in the calculation showing the flow rate at 5 bar	-	✓
WU-01-01_06	Specification of automation control of water fixtures (if applicable)	✓	-
WU-01-01_07	Catalogues of automatic control of water fixtures (if applicable)	-	✓

Remarks**(a) Additional Information**

[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 Aug 2021].

[2] Water Supplies Department - Voluntary Water Efficiency Labelling Scheme. [ONLINE]. Available at:
<https://www.wsd.gov.hk/en/plumbing-engineering/water-efficiency-labelling-scheme/index.html>
 [Accessed Aug 2021].

‘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%20to%20Application%20for%20Water%20Supply%20-%20Nov%202020.pdf
 [Accessed Aug 2021].

[https://www.wsd.gov.hk/filemanager/en/content_1804/Technical%20Requirement%20for%20Plumbing%20Works%20in%20Buildings%20\(November%202020\)_final.pdf](https://www.wsd.gov.hk/filemanager/en/content_1804/Technical%20Requirement%20for%20Plumbing%20Works%20in%20Buildings%20(November%202020)_final.pdf)
 [Accessed Aug 2021].

(b) Related Credits

None

6 Water Use WU-01 Water Conservation**WU-01-02 Water Efficient Irrigation**

Extent of Application All DC with permanent greenery and permanent irrigation system

Objective Reduce the reliance on potable water for irrigation.

Credit Point(s) Attainable 2 + 1 Bonus

Credit Requirement 1 to 2 credit points for reducing 25% or 50% of potable water consumption for irrigation in comparison with the baseline.

1 additional Bonus credit point for achieving 100% reduction.

Assessment 1. Specify the area of each landscape type which makes up the total greenery area in the project. For each landscape type, calculate the annual irrigation demand using the following formula.

$$ID = \sum_{\text{January}}^{\text{December}} \frac{ET \times K_L \times A \times CE}{IE}$$

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 (m²)

CE : Efficiency of controller serving the landscape type

IE : Efficiency of irrigation method serving the landscape type

2. 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].
3. 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 the manual for calculation reference.
4. Justification is needed for any proposed value.
5. Refer to the below table for landscape coefficient. Vertical greenery type should refer to the same table per plant type:

5.1. 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

6. 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

6.1. Baseline

- 6.1.1. The composition of landscape type making up the permanent greenery in the project should be the same as design case.
- 6.1.2. Assume all landscape types are irrigated manually (i.e., IE = 0.5) and no controller is used (i.e., CE = 1).
- 6.1.3. Assume no reused or recycled water is used.

6.2. Design

- 6.2.1. Specify the irrigation method and controller (if used) for each landscape type and calculate the ID correspondingly.
- 6.2.2. If controllers, including weather-based and moisture sensor-based, are used, the CE should be supported by manufacturer's documentation.
- 6.2.3. 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-03-01.

6.3. Demonstrate sufficient collection tank (or retention pond) capacity:

6.3.1. Harvested rainwater: 10 days or more [2] of supply, considering the month with the peak rainfall (assume 30 days in a month).

6.3.2. Recycled grey water: 8-10 hours of storage

6.4. The percentage reduction in annual irrigation demand that uses potable water can be calculated as follows:

$$1 - \frac{\text{ID (design)}}{\text{ID (baseline)}} \times 100\%$$

Alternatively,

- 2 credit points if all permanent greenery area is formed by self-sustained plants, which do not require irrigation beyond their establishment period (maximum two years). Justification to explain why no irrigation will be required based on local rainfall and plants' water demands is required. The justification should be endorsed by a professional landscape architect or ecologist.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
WU-01-02_00	BEAM Plus NDC submission template for WU-01-02	✓	✓
WU-01-02_01	Calculation of demand of potable water for irrigation in both baseline and project design cases and percentage reduction as detailed in the credit assessment	✓	✓
WU-01-02_02	Plumbing schematic diagrams or layout drawings showing the provisions of the water leakage detectors	✓	✓
WU-01-02_03	Calculation demonstrating sufficient tank (or retention pond) storage capacity	✓	✓
WU-01-02_04	Plumbing schematic drawing(s) and plumbing layout drawings, highlighting the rainwater harvesting system and/ or the grey water recycling system (if applicable)	✓	✓
WU-01-02_05	Specifications of controllers (if applicable)	✓	-
WU-01-02_06	Catalogues of controllers (if applicable)	-	✓
WU-01-02_07	Justification report for self-sustain plants that require no irrigation beyond their establishment period (Alternative approach only)	✓	✓
WU-01-02_08	CV of the professional endorsing the justification report (Alternative approach only)	✓	✓
WU-01-02_09	Extract of relevant page(s) from the GBP showing no permanent greenery within the Site (Substantiation for non-applicability only)	✓	✓

Remarks**(a) Additional Information**

[1] Hong Kong Observatory - 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

[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 Aug 2021].

(b) Related Credits

WU-03-01 Water Harvesting and Recycling

Calculation method of amount of harvested rainwater and recycled grey water should be consistent with WU-03-01.

6 Water Use WU-01 Water Conservation

WU-01-03 Water Efficient Appliances

This credit head is not applicable under BEAM Plus NDC.

6 Water Use WU-01 Water Conservation**WU-01-04 Water Leakage Detection****Extent of Application**

All DC with potable tank room(s)

Objective

To identify water leakage once detected for the arrangement of maintenance work.

Credit Point(s) Attainable

1

Credit Requirement

1 credit point for installing water leakage detection systems in all municipal potable water tank rooms and data halls.

Assessment

1. 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 and all data halls.
2. Water tank rooms which consists of only non-potable water tank and/ or fire services tank are not assessed.
3. Water tank rooms which have multiple water tanks should have at least one leakage detection system.
4. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
WU-01-04_00	BEAM Plus NDC submission template for WU-01-04	✓	✓
WU-01-04_01	Drawing(s) highlighting the provisions of water leakage detection systems in all water tank rooms and data halls OR showing that there are no potable water tank rooms in the DC if this credit is deemed to be not applicable.	✓	✓
WU-01-04_02	BMS drawings or other form of supporting (e.g., catalogue, manufacturer's information, etc.)	✓	✓

Remarks**(a) Additional Information**

None

(b) Related Credits

None

6 Water Use WU-01 Water Conservation**WU-01-05 Twin Tank System**

Extent of Application All DC (including DC 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.

Credit Point(s) Attainable 1

Credit Requirement 1 credit point for providing twin tank for potable water supply system and flushing water supply system.

Assessment

1. Twin tanks are installed for potable and flushing supply water systems for all buildings in the assessment boundary.
2. Two compartment tank and two separate identical tanks are accepted as twin tank.
3. Each compartment/ tank of the twin-tank shall be equipped with:
 - 3.1. A duplicated set of inlet, outlet and associated overflow and drainage pipework;
 - 3.2. 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
 - 3.3. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
WU-01-05_00	BEAM Plus NDC submission template for WU-01-05	✓	✓
WU-01-05_01	Plumbing schematic drawing(s) and plumbing layout drawings, highlighting the provisions of the twin tank system for potable water and flush water systems, and the associated installations as stated in items (1) to (3) in the assessment criteria.	✓	✓

Remarks**(a) Additional Information**

None

(b) Related Credits

None

6 Water Use WU-01 Water Conservation**WU-01-06 Cooling Tower Water**

Extent of Application All DC with cooling tower using potable water as make up water

Objective To reduce the fresh water consumption for cooling tower makeup.

Credit Point(s) Attainable 1 + 1 Bonus

Credit Requirement 1 credit point for reducing fresh water consumption by installing water treatment system which can achieve minimum **7** cycles of concentration with acceptable water quality.

1 additional Bonus credit point for **8** or more cycles of concentration with acceptable water quality.

- Assessment**
1. The Applicant shall install the water treatment system and conduct the water sampling. Where the ratio between the concentration of dissolved solids in the cooling water and the make-up water is larger than 7 (for 1 credit point) or equal to 8 or more (for 2 credit points), the assessment criteria are fulfilled.
 2. All cooling tower using potable water within the assessment boundary should comply with this requirement.
 3. Submit cooling tower water treatment proposal developed in accordance with 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.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
WU-01-06_00	BEAM Plus NDC submission template for WU-01-06	✓	✓
WU-01-06_01	Water treatment proposal highlighting the design cycles of concentration	-	✓
WU-01-06_02	Specifications of cooling tower, water treatment equipment and make-up water pumps	✓	-
WU-01-06_03	Catalogues of cooling tower, water treatment equipment and make-up water pumps	-	✓
WU-01-06_04	MVAC schematic drawings showing: The fresh water cooling tower(s) with designation [or] No fresh water cooling tower is installed for the project (Substantiation for non-applicability)	✓	✓

Remarks**(a) Additional information**

[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 2021].

(b) Related credits

None

6 Water Use WU-02 Effluent**WU-02-01 Effluent Discharge to Foul Sewers****Extent of Application**

All DC

Objective

To reduce the volumes of sewage discharged from buildings, thereby reducing burdens on municipal sewage services and treatment facilities.

Credit Point(s) Attainable

1

Credit Requirement

1 credit point for demonstrating a reduction in annual sewage volumes by 20% or more.

Assessment

1. The Applicant shall demonstrate that the flushing systems are water efficient with the following criteria:

1.1. Occupancy

1.1.1. 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 (9m²/person) and male to female ratio (1:1).

1.1.2. 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].

1.1.3. The same number of users should apply to both the baseline case and the project design case.

1.2. Operational days

1.2.1. Specify the number of operational days per annum. Alternatively, assume a full year operation (i.e. 365 days).

1.2.2. The same operational days should apply to both the baseline case and the project design case.

1.3. Number of users

1.3.1. The same number of uses should apply to both the baseline case and the project design case.

Fixture type	Number of uses per day
Male WC Single Flush	1
Male WC Dual Flush	1 full flush volume
Female WC Single Flush	5
Urinal	4
Female WC Dual Flush	1 full and 4 low volume

1.4. Flushing Volume

- 1.4.1. Based on the above, establish a baseline case for flushing water consumption with the following assumptions. If 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

- 1.4.2. 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.

2. Annual Effluent Discharge Reduction Percentage

- 2.1. 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 <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
WU-02-01_00	BEAM Plus NDC submission template for WU-02-01	✓	✓
WU-02-01_01	Technical Information and Calculation for Effluent Discharge	✓	✓
WU-02-01_02	General Building Plan (GBP) sanitary fitting schedule and male to female ratio [or] Calculation of no. of users using the default occupancy density (9m ² /person) and male to female ration (1:1)	✓	✓
WU-02-01_03	Plumbing and/ or drainage schematic and layout drawings (in WSD submission standard)	✓	✓
WU-02-01_04	Specifications of each type of fixture illustrating the flush volume per flush	✓	-
WU-02-01_05	Catalogues of each type of fixture illustrating the flush volume per flush	-	✓

Remarks

(a) Additional Information

[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 Aug 2021].

(b) Related Credits

None

6 Water Use WU-03 Water Harvesting and Recycling**WU-03-01 Water Harvesting and Recycling****Extent of Application**

All DC

Objective

To encourage harvesting of rainwater and recycling of grey water in order to reduce the consumption of potable water.

Credit Point(s) Attainable

2 + 1 Bonus

Credit Requirement**(a) Harvested Rainwater**

1 credit point for harvesting of rainwater that achieves a reduction of 5% or more in the consumption of potable water.

(b) Recycled Grey Water

1 credit point for recycling grey water that achieves a reduction of 5% or more in the consumption of potable water.

(c) Exemplary Water Recycling

1 additional Bonus credit point where (a) harvested rainwater, (b) 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. Calculation of the monthly harvested rainwater yield

- 1.1. 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:

$$Y_r = A_c \times R_m \times C_r$$

Y_r : the monthly average rainwater yield (litre/month)

A_c : the collection area (m²)

R_m : the monthly mean of rainfall in Hong Kong between 1981-2010 (mm) [2]

C_r : the run-off coefficient

If an in-line filter is installed to the rainwater collection system, a filter efficiency, N_f , should be incorporated into the above equation, which can be assumed to be 0.9.

- 1.2. Surfaces run off coefficients are provided in the 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°C for permeable paving/ construction should be 1.0×10^{-2} cm/s)	0.25
At-grade softscape	0.15
Earth-covered (soil depth more than 500mm) basement	0.15

Notes:

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.

2. Calculation of the monthly demand for harvested rainwater

- 2.1. Calculate the monthly demand for harvested rainwater throughout the year which includes only the activities which originally would have used potable water but is then replaced by harvested rainwater in the project.
- 2.2. Accepted activities include flushing, irrigation, water features, car washing, external cleaning, fire-fighting and industrial processes.

3. Comparison of yield and demand

- 3.1. Compare the total yield and the total demand, month by month, to calculate the amount of potable water replaced by harvested rainwater.
- 3.2. 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.

4. Calculation of the annual amount of potable water replaced by harvested rainwater

- 4.1. Add up the replaced water throughout the year to show the annual amount. This is the numerator for the calculation of percentage reduction.
5. Calculation of the percentage reduction in potable water use replaced by harvested rainwater
 - 5.1. The denominator should at least include the annual potable water use for irrigation and flushing (figures should be consistent with WU-01-02 design case and WU-02-01 design case respectively, without deducting any reused/ recycled water), 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.
6. Sufficient tank storage capacity
 - 6.1. Demonstrate the collection tank(s) (or retention pond) has sufficient capacity.
 - 6.2. Harvested rainwater: 10 days or more [1] of supply, considering the month with the peak rainfall (assume 30 days in a month).
 - 6.3. Demonstrate the harvested rainwater, after treatment, meet the recommended water quality standards prescribed in in the WSD Technical Specifications.

(b) Recycled Grey Water

1. Calculation of the monthly recycled greywater yield
 - 1.1. Accepted grey water sources are wash basins, baths, showers, dishwashers, laundry machines, kitchen sinks, cooling tower bleed-off water and air conditioning condense [1].
 - 1.2. Follow the calculation method specified in Section 3.4 in WSD Technical Specifications on Grey Water Reuse and Rainwater Harvesting [1]. Provide further calculation for air conditioning condense.
2. Calculation of the monthly demand for recycled greywater yield
 - 2.1. 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.
 - 2.2. Accepted activities include flushing, irrigation, water features, car washing, external cleaning, fire-fighting and industrial processes.
3. Comparison of yield and demand
 - 3.1. Compare the yield and the demand, month by month, to calculate the amount of potable water replaced by recycled greywater.
 - 3.2. 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.
4. Calculation of the annual amount of potable water replaced by recycled greywater

- 4.1. Add up the replaced water throughout the year to show the annual amount. This is the numerator for the calculation of percentage reduction.
5. Calculation of the percentage reduction in potable water use replaced by recycled greywater
 - 5.1. The denominator should at least include the annual potable water use for irrigation and flushing. The figures should be consistent with: WU-01-02 design case and WU-02-01 design case respectively, without deducting any reused/ recycled water. Only if recycled greywater is used for the activity, the annual potable water use for water features, car washing, external cleaning, fire-fighting and industrial processes.
6. Sufficient tank storage capacity
 - 6.1. Demonstrate the collection tank(s) has sufficient capacity. Recycled grey water: 8-10 hours of storage.
7. Water quality standards
 - 7.1. Demonstrate the recycled grey water, after treatment, meet the recommended water quality standards prescribed in Table 1-1 in the WSD Technical Specifications [1].

(c) Exemplary Water Recycling

1. In addition 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

Submittals

(a) Harvested Rainwater

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
WU-03-01a_00	BEAM Plus NDC submission template for WU-03-01a	✓	✓
	Calculation of Yield and Demand for Harvested Rainwater;	✓	✓
	Information of Collection Tanks for Rainwater Harvesting;	✓	✓
	Water Quality Measurement for Rainwater Harvesting System	-	✓
WU-03-01a_01	Calculation of reduction in demand of potable water from rainwater harvesting system (with breakdown of yield and demand by each end use, as well as details of input parameters/ assumptions)	✓	✓
WU-03-01a_02	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-03-01a_03	Catchment area plan including area break-down, type of surface and surface coefficient adopted	✓	✓
WU-03-01a_04	Plumbing schematic drawing(s) and plumbing layout drawings	✓	✓
WU-03-01a_05	Rainwater harvesting system schematic drawing(s)	✓	✓
WU-03-01a_06	Specification for provision of water quality testing methodology, measurement and report	✓	-
WU-03-01a_07	Water quality measurement report	-	✓
WU-03-01a_08	Product catalogues of surfaces/ substrates to substantiate the run-off coefficient (if non-default value is used)	✓	✓
WU-03-01a_09	Product catalogue of the in-line filter highlighting the efficiency (if non-default value is used)	✓	✓
WU-03-01a_10	Calculation demonstrating sufficient tank (or retention pond) storage capacity for harvested rainwater	✓	✓

(b) Recycled Grey Water

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
WU-03-01b_00	BEAM Plus NDCs submission template for WU-03-01b	✓	✓
	Calculation of Yield and Demand for Recycled Grey Water	✓	✓
	Information of Collection Tanks for Recycled Grey Water	✓	✓
	Water Quality Measurement for Grey Water Recycling System	-	✓
WU-03-01b_01	Calculation of reduction in demand of potable water from grey water system (with breakdown of yield and demand by each end use as well as details of input parameters/ assumptions))	✓	✓
WU-03-01b_02	Plumbing schematic drawing(s) and plumbing layout drawings, highlighting the grey water recycling system	✓	✓
WU-03-01b_03	Specification for provision of water quality testing methodology, measurement and report	✓	-
WU-03-01b_04	Water quality measurement report	-	✓
WU-03-01b_05	Calculation demonstrating sufficient tank storage capacity for recycled grey water	✓	✓

(c) Exemplary Water Recycling

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
WU-03-01c_00	BEAM Plus NDC submission template for WU-03-01c	✓	✓
	Calculation of Yield and Demand for Harvested Rainwater (if applicable);	✓	✓
	Calculation of Yield and Demand for Recycled Grey Water (if applicable);	✓	✓
	Information of Collection Tanks for Rainwater Harvesting (if applicable);	✓	✓
	Information of Collection Tanks for Recycled Grey Water (if applicable);	✓	✓
	Water Quality Measurement for Rainwater Harvesting System (if applicable);	-	✓
	Water Quality Measurement for Grey Water Recycling System (if applicable)	-	✓
WU-03-01c_01	Calculation of reduction in demand of potable water from rainwater harvesting system (with breakdown of yield and demand by each end use as well as details of input parameters/ assumptions)	✓	✓
WU-03-01c_02	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-03-01c_03	Catchment area plan including area break-down, type of surface and surface coefficient adopted	✓	✓
WU-03-01c_04	Calculation of reduction in demand of potable water from grey water system (with breakdown of yield and demand by each end use as well as details of input parameters/ assumptions)	✓	✓
WU-03-01c_05	Plumbing schematic drawing (s) and plumbing layout drawings, highlighting the rainwater harvesting system and the grey water recycling system (if applicable)	✓	✓
WU-03-01c_06	Specification for provision of water quality testing methodology, measurement and report	✓	✓
WU-03-01c_07	Water quality measurement report	-	✓
WU-03-01c_08	Product catalogues of surfaces/ substrates to substantiate the run-off coefficient (if non-default value is used)	✓	✓

WU-03-01c_09	Product catalogue of the in-line filter for the rainwater harvesting system highlighting the efficiency (if non-default value is used)	✓	✓
WU-03-01c_10	Calculation demonstrating sufficient tank (or retention pond) storage capacity for harvested rainwater (if applicable)	✓	✓
WU-03-01c_11	Calculation demonstrating sufficient tank storage capacity for recycled grey water (if applicable)	✓	✓

Remarks**(a) Additional Information**

[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 2021]

[2] Hong Kong Observatory, Monthly Meteorological Normals for Hong Kong. [ONLINE]. Available at: https://www.hko.gov.hk/en/cis/normal/1981_2010/normals.htm
[Accessed Aug 2021]

(b) Related Credits

None

6 Water Use WU-04 Water Management**WU-04-01 Smart Water Metering****Extent of Application**

All DC with more than one water system.

Objective

To provide opportunity to reduce the water use by tracking the water consumption records on different water systems.

Credit Point(s) Attainable

1

Credit Requirement

1 credit point for provision of permanent smart water meter for cooling towers water use and indoor plumbing fixtures and fittings, **and**

at least 2 of the other water systems, which are able to display metered data, trending of water consumption and relevant parameters.

Assessment

1. Permanent installation of smart water meters for cooling towers water and Indoor plumbing fixtures and fitting, **and**

at least 2 of the following water systems:

- 1.1. Irrigation (if applicable);
- 1.2. Cleansing;
- 1.3. Water features/ pools; and
- 1.4. Other process water.

2. The smart meters should be able to display metered data, trending of water consumption and relevant parameters, and with data logging capability/ connected to Building Management System (BMS).

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
WU-04-01_00	BEAM Plus NDC submission template for WU-04-01	✓	✓
WU-04-01_01	Technical Report detailing description of the water metering system.	✓	✓
WU-04-01_02	Plumbing schematic diagrams and layout drawings highlighting all location of water meter	✓	✓
WU-04-01_03	Specification of all metering and measurement equipment	✓	-
	Catalogues of all metering and measurement equipment	-	✓
WU-04-01_04	On-site photographs of the water meters	-	✓

Remarks **(a) Additional Information**

None

(b) Related Credits


None

7 Health and Wellbeing

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.

Given that on average people in Hong Kong spend around 85% of their time indoors, indoor environmental quality (IEQ) 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.

Indoor environmental quality (IEQ) includes indoor air quality and ventilation provisions that safeguard health. Considerations of these issues include thermal comfort, lighting, acoustics and noise, impact on well-being, comfort and productivity.

7 Health and Wellbeing	HWB-00	Prerequisite
	HWB-00-P1	Minimum Ventilation Performance 
Extent of Application	All normally occupied spaces in DC, except the naturally ventilated spaces.	
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.	
Credit Point(s) Attainable	Prerequisite	
Credit Requirement	<p>(a) On-site Outdoor Air Quality</p> <p>Measure outdoor air pollutants on-site prior to building design to understand the site conditions.</p> <p>(b) Minimum Ventilation</p> <p>Demonstrate the project is in compliance with the minimum ventilation quantity in relation to its designed ventilation mode.</p>	
Assessment	<p>(a) On-site Outdoor Air Quality</p> <ol style="list-style-type: none"> Engage an IAQ certified issuing body [1] to measure the quality of outdoor air. Measurements should be taken for the following outdoor air pollutants: <ol style="list-style-type: none"> Carbon monoxide (CO) Nitrogen dioxide (NO₂) Ozone (O₃); and Respirable suspended particulates (PM₁₀) Report from accredited inspection bodies for indoor air quality inspection is acceptable. One sample 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 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.
- The on-site outdoor air pollutant measurement shall be conducted at the early design stage, i.e., before commencement of foundation works.

(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 9.3 of this Manual.
- Specify the system 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.
- Provide a report demonstrating compliance with the minimum ventilation rate stipulated in ASHRAE Standard 62.1-2019 [4] in all normally occupied spaces.
- For DC with bare shell provision, (i.e., the responsibility of providing the fresh air equipment to supply fresh air into indoor space will rest on the future users/ tenants), the project proponent shall ensure that there will be adequate fresh air louvre(s) to draw outdoor air into the project's indoor space. The project proponent shall make reference to an authoritative source, such as the criteria for louvre sizing specified under ASHRAE Fundamentals Handbook, when determining the actual number and size of louvre(s) to be provided at the façade of the development

Submittals

(a) On-site Outdoor Air Quality

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-00-P1a_00	BEAM Plus NDC submission template for HWB-00-P1a with	✓	✓
	Summary of On-site Outdoor Air Quality Measurement	✓	✓#

HWB-00-P1a_01	Rectifying plan describing the design of air purification strategies if air quality is not achieved	✓	✓#
HWB-00-P1a_02	HKIAS endorsed report showing measurements of all required outdoor air pollutants	✓	✓#
# The supporting document(s) is/ are not required in FA if the credit(s) is/ are achieved in PA.			

(b) Minimum Ventilation

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-00-P1b_00	BEAM Plus NDC submission template for HWB-00-P1b	✓	✓
HWB-00-P1b_01	Summary of Ventilation Performance	✓	✓
HWB-00-P1b_02	Schedule of all spaces present in the building	✓	✓
HWB-00-P1b_03	Report demonstrating compliance with the minimum ventilation rate stipulated in ASHRAE Standard 62.1-2019 in all mechanically ventilated normally occupied spaces	✓	✓
HWB-00-P1b_04	MVAC fan schedule, air side schematics	✓	✓
HWB-00-P1b_05	MVAC layout plan	-	✓
HWB-00-P1b_06	Technical Data	-	✓
HWB-00-P1b_07	Layout Drawing showing the location and size of the fresh air louvre(s); and Fresh Air Calculation (applicable to projects where fresh air equipment is NOT provided by the project proponent)	✓	✓
HWB-00-P1b_08	Declaration Letter endorsed by the project proponent declaring that the project will NOT be provided with fresh air equipment and only louvre(s) for fresh air intake will be provided OR Tenant Guideline specifying the recommended amount of fresh air to be provided into the indoor space (applicable to projects where fresh air equipment is NOT provided by the project proponent)	-	✓

Remarks**(a) Additional Information**

[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 2021].

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

[Accessed Aug 2021].

[3] Environmental Protection Department – IAQ Certification Scheme. [ONLINE]. Available at:

<https://www.iaq.gov.hk/en/iaq-certification-scheme.aspx>

[Accessed Aug 2021].

[4] ANSI/ASHRAE Standard 62.1-2019. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

(b) Related Credits

HWB-03-05 Indoor Air Quality

Carrying out on-site outdoor analysis provides useful information for the operation of ventilation system to ensure a good air quality provision.

7 Health and Wellbeing	HWB-01	Design for Green Living
	HWB-01-01	Healthy and Active Living
Extent of Application	All DC	
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.	
Credit Point(s) Attainable	1 Bonus	
Credit Requirement	1 Bonus credit point for scoring at least 3 items of all applicable design measures for healthy and active living.	
Assessment	<p>Provide a report demonstrating compliance of at least 3 of all relevant applicable design measures for healthy and active living at indoor/ semi-outdoor communal areas of building development as listed in below item 1.1, 2.1-2.3 and 3:</p> <ol style="list-style-type: none"> 1. Improving living and/ or working experience of communal use by building occupants <ol style="list-style-type: none"> 1.1. 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. 2. Integrating physical activities in the design for an active lifestyle <ol style="list-style-type: none"> 2.1. 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). 2.2. Install at least 1 circulation stair in communal area meeting the following requirements: <ol style="list-style-type: none"> a) Riser to be not more than 150mm and tread to be at least 300mm; b) Individual flight of stair not to exceed 1800mm nor a total of more than 12 risers; c) Placed visually before lifts upon entering the building main entrance; d) Connecting at least 3 storeys; and e) Stair width to be at least 1350mm. 2.3. Install at least 1 provision for physical activities in communal areas, for example exercise stations, jogging tracks, cycling etc. 3. Additional or alternative design features may be included. Justification on achievement in credit objectives should be demonstrated. 	

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-01-01_00	BEAM Plus NDC submission template for HWB-01-01	✓	✓
HWB-01-01_01	Specifications of the design measures	✓	-
HWB-01-01_02	Drawings showing design measures and/or amenity features	✓	✓
HWB-01-01_03	Report showing justifications and details for each design measures and/or amenity features provided	✓	✓
HWB-01-01_04	Catalogues/ information of design measures provided OR Photograph	-	✓

Remarks**(a) Additional Information**

None

(b) Related Credits

SS-01-01 Pedestrian-oriented and Low Carbon Transport

The related credit promotes 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 buildings are required.

SS-01-02 Neighbourhood Amenities

The related credit encourages DC developments to have adequate amenities for its users within or in the vicinity of the Site.

7 Health and Wellbeing **HWB-01** **Design for Green Living****HWB-01-02** **Biophilic Design****Extent of Application** All DC**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.**Credit Point(s) Attainable** 2 Bonus**Credit Requirement** 1 or 2 Bonus credit points for demonstrating visual connection with nature and/ or biophilic design features at an assessment space with Visual Quality Score (VQS) of at least 2 or 3.

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 VQ Study under this credit should address the visual connection with nature and/ or biophilic design features at an assessment space meeting the following requirements.
 - 2.1. 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.
 - 2.2. A demarcation plan of the normally occupied spaces for assessment and the justification of the highest occupancy (or the second highest occupancy) within the development based on relevant building codes shall be provided.
 - 2.3. 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-01-02-1

Weighting Factor	Representation	Visual connection to nature and/ or <i>biophilic design</i> 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

3. Options

3.1. Option 1 – Projection

- a) 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 3.2 c).

OR

3.2. Option 2 - Simulation

- a) 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 list in b) below.
- b) Viewpoint in 3D Model at PA stage:

Path 1:

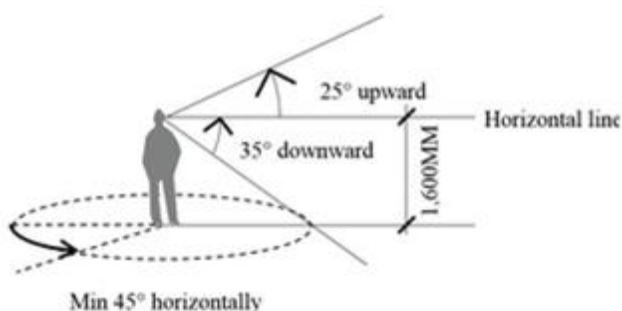
Vertical elevation of camera for viewpoints in 3D model	1,600mm above ground/ finished floor
Vertical upward angle	25°
Vertical downward angle	35°

Path 2:

Vertical elevation of camera for viewpoints in 3D model	1,600mm above ground/ finished floor
Equivalent lens focal length or focal length	27mm

- c) 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



d) Important notes:

- i. No fisheye or image distortion before or after picture taking; and
- ii. No zooming or pan function shall be used.

e) Number and location of viewpoints:

- i. A minimum of ONE viewpoint shall be placed within the selected assessment space, and
- ii. 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).

f) Number of Frames:

- i. A series of frames from 3 different directions at 45° interval should be taken using landscape orientation.

g) Methodology:

- i. For each frame, assign weighting factors from 1 to 5 to different portions of the frame depending on the quality of the view;
- ii. Calculate the Visual Quality Score of the frame using Area Weighting Methodology;
- iii. Repeat the process for each frame; and
- iv. Calculate the average Visual Quality Score for the viewpoint.

h) Primary Tools:

- i. 3D model using any appropriate 3D visualisation software at PA stage
- ii. Physical photographs taken from the site at FA stage.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-01-02_00	BEAM Plus NDC submission template for HWB-01-02	✓	✓
HWB-01-02_01	Visual Quality Study Report	✓	-
HWB-01-02_02	Visual Quality Study Report (photographic evidence)	-	✓

Remarks**(a) Additional Information**

Biophilic Design Case Studies. Terrapin Bright Green. [ONLINE]. Available at: <https://www.terrapinbrightgreen.com/report/biophilic-design-case-studies/> [Accessed Aug 2021].

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.

Patterns of Biophilic Design. Terrapin Bright Green. [ONLINE]. Available at: <https://www.terrapinbrightgreen.com/report/14-patterns/> [Accessed Aug 2021].

Wilson, E.O. 1984, "Biophilia", Harvard University Press: Cambridge, MA, USA.

(b) Related Credits

SS-02-02 Biodiversity Enhancement

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

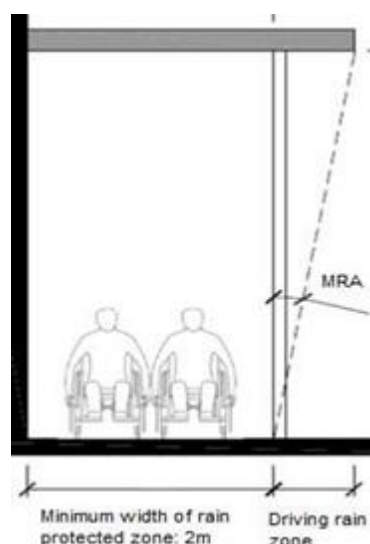
SS-03-01 Urban Heat Island Mitigation

The related credit head encourages higher overall site coverage of greenery.

HWB-01-01 Healthy and Active Living

The related credit head encourages urban farm as a means to improve the living and / or working experience of building occupants.

7 Health and Wellbeing	HWB-02	Inclusive Design
	HWB-02-01	Inclusive Design
Extent of Application	All DC	
Objective	Encourage well integrated weather protection and user-friendliness in the DC design for outdoor or semi-outdoor communal / private space design at various levels of a DC.	
Credit Point(s) Attainable	1 + 1 Bonus	
Credit Requirement	<p>(a) Universal Accessibility</p> <p>1 credit point for providing at least 5 applicable enhanced provisions as stipulated in the “Recommended Design Requirements” of BFA 2008 [1].</p> <p>(b) Weather Protection and Family Friendly Features</p> <p>1 Bonus credit point for providing prescribed weather protection and at least 2 family friendly facilities features.</p>	
Assessment	<p>(a) Universal Accessibility</p> <p>1. Provide a report detailing at least 5 applicable enhanced provisions as stipulated in the “Recommended Design Requirements” of BFA 2008.</p> <p>(b) Weather Protection and Family Friendly Features</p> <p>1. Provide weather protection features against wind-driven rain for all covered semi-outdoor communal areas within the building, allowing a minimum width of 2m protected zone from driving rain.</p> <p>2. Minimum driving rain angles (MRA) from edges of rain protection features shall be calculated based on the following equation:</p> $\text{MRA} = \tan^{-1} (u / 4.5 I^{0.107})$ <p>Where,</p> <p>u = Hourly mean wind speed affecting the rain (m/s)</p> <p>I = Intensity of rainfall (mm/hr)</p> <p>3. 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).</p> <p>4. 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.</p>	



5. Family Friendly Facilities:

- 5.1. At least one shaded rest area with seating for care-takers near play equipment for children. This accounts for 1 inclusive design feature.
- 5.2. 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.
- 5.3. At least one baby-care facility/ breast feeding room in the communal areas of the building. This accounts for 1 inclusive design feature.
- 5.4. Additional or alternative inclusive design features may be included, which achievement in credit objectives should be demonstrated.

Submittals

(a) Universal Accessibility

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
HWB-02-01a_00	BEAM Plus NDC submission template for HWB-02-01a	✓	✓
HWB-02-01a_01	Summary table listing the enhanced provisions, and their locations	✓	✓
HWB-02-01a_02	Location plan to indicate the facilities/ services	✓	✓
HWB-02-01a_03	Report showing justifications and details for each design measures and/or amenity features provided	✓	✓
HWB-02-01a_04	Catalogues/ information of design measures provided OR record photographs	-	✓

(b) Weather Protection and Family Friendly Features

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-02-01b_00	BEAM Plus NDC submission template for HWB-02-01b	✓	✓
HWB-02-01b_01	Drawings showing design measures and/or amenity features	✓	✓
HWB-02-01b_02	Report showing justifications and details for each design measures and/ or amenity features provided	✓	✓
HWB-02-01b_03	Catalogues/ information of design measures provided OR record photographs	-	✓

Remarks**(a) Additional Information**

[1] Buildings Department. Design Manual - Barrier Free Access 2008. [ONLINE] Available at:
http://www.bd.gov.hk/english/documents/code/e_bfa2008.htm
 [Accessed Aug 2021]

[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 Aug 2019]

Buildings Department, PNAP ADV-32, Provision of Babycare Rooms and Lactation 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 2021].

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.

(b) Related Credits

SS-01-01 Pedestrian-oriented and Low Carbon Transport

The related credit head promotes convenient and barrier-free pedestrian environment in site planning of the outdoor spaces

7 Health and Wellbeing	HWB-03	Indoor Environmental Quality
	HWB-03-01	Enhanced Ventilation
Extent of Application	All DC	
Objective	Maintain effective ventilation and prevent exposure to concentrated indoor pollutant sources to support occupants' health and wellbeing	
Credit Point(s) Attainable	2 + 1 Bonus	
Credit Requirement	<p><u>Fresh air provision in normally occupied spaces</u></p> <p>1 credit point for demonstrating that all normally occupied spaces in the DC are provided with increased ventilation.</p> <p><u>Fresh air provision in not normally occupied spaces</u></p> <p>1 credit point for demonstrating that all not normally occupied spaces in the DC are provided with adequate ventilation.</p> <p><u>On-site Measurements</u></p> <p>1 additional Bonus credit point for conducting on-site measurements to verify the ventilation performance for all normally occupied spaces.</p>	
Assessment	<p>Fresh Air Provision</p> <p>Prepare a schedule of all spaces present in the DC. Categorise the spaces into normally occupied, not normally occupied and unoccupied according to the space type matrix in Appendix 9.3 of this manual.</p> <p>Specify the system (mechanical or natural) used to ventilate the spaces.</p> <p>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.</p> <ol style="list-style-type: none"> 1. Fresh air provision in normally occupied spaces <ol style="list-style-type: none"> 1.1. Provide a report demonstrating compliance with the minimum ventilation rates stipulated in ASHRAE Standard 62.1-2019 [1] in all normally occupied spaces is exceeded by at least 30%. 2. Fresh air provision in not normally occupied spaces <ol style="list-style-type: none"> 2.1. Demonstrate compliance with the minimum ventilation rates stipulated in ASHRAE Standard 62.1-2019 in all not normally occupied spaces. 3. On-site measurements <ol style="list-style-type: none"> 3.1. 1 additional Bonus credit point will be granted only if the credit point for "Fresh air provision in normally occupied spaces" (part 1) has been achieved. 	

- 3.2. Prepare a measurement methodology which includes the proposed measurement locations and methodology.
- 3.3. Demonstrate, by measurement, the required amount of outdoor air corresponding to the design outdoor air flow rate is provided. Accepted measurement methods include the following:
- a) ASHRAE 111; OR
 - b) Tracer gas techniques in accordance with ASTM E 741.
- 3.4. At least one sampling point should be present in each normally occupied space usage.
- 3.5. If the measurement results demonstrate unmet requirement in part 1 (i.e. measurement results showing ventilation rate of normally occupied space not exceeding 30% of the minimum ventilation rate), the credit point in both part 1 and part 3 will not be awarded.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-01_00	BEAM Plus NDC submission template for HWB-03-01	✓	✓
HWB-03-01_01	Summary of Fresh Air Provision in Normally Occupied Spaces	✓	✓
HWB-03-01_02	Summary of Fresh Air Provision in Not Normally Occupied Spaces	✓	✓
HWB-03-01_03	Schedule of all spaces present in the building	✓	✓
HWB-03-01_04	Mechanical Ventilation Report	✓	✓
HWB-03-01_05	MVAC fan schedule and air side schematics	✓	✓
	MVAC equipment catalogue	-	✓
HWB-03-01_06	MVAC layout plan	✓	✓
HWB-03-01_07	Specification on provision of measurement methodology, measurement and report	✓	-
HWB-03-01_08	Measurement methodology	-	✓
HWB-03-01_09	Measurement results	-	✓

Remarks**(a) Additional Information**

[1] ANSI/ASHRAE Standard 62.1-2019. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

ASTM International. E 741-11. Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution.

Chartered Institute of Building Services Engineers – CIBSE Guide B Heating, Ventilating, Air Conditioning and Refrigeration 2016

World Health Organization – Health and sustainable development – Natural Ventilation. [ONLINE]. Available at:
<https://www.who.int/teams/environment-climate-change-and-health/air-quality-and-health/sectoral-interventions/housing/strategies>
[Accessed Aug 2021].

Whole Building Design Guide, National Institute of Building Sciences. Natural Ventilation. [ONLINE]. Available at:
<https://www.wbdg.org/resources/natural-ventilation>
[Accessed Aug 2021].

(b) Related Credits

EU-01-02 Reduction CO₂ Emissions

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

HWB-03-05 Indoor Air Quality

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

7 Health and Wellbeing**HWB-03****Indoor Environmental Quality****HWB-03-02****Waste Odour Control**

This credit head is not applicable under BEAM Plus NDC.

7 Health and Wellbeing	HWB-03	Indoor Environmental Quality
	HWB-03-03	Acoustics and Noise
Extent of Application	All spaces where speech intelligibility is important within the DC	
Objective	Ensure the DC building are in comfortable acoustic environment.	
Credit Point(s) Attainable	3	
Credit Requirement	(a) Data Hall Noise Control 1 credit point for demonstrating the internal noise level at data hall area are maintained at an appropriate level.	
	(b) Noise Isolation 1 credit point for demonstrating airborne noise isolation between rooms, spaces and premises fulfils the prescribed criteria.	
	(c) Background Noise 1 credit point for demonstrating background noise levels within the prescribed criteria (including traffic noise and external building service equipment that are within the project boundary).	
Assessment	(a) Data Hall Noise Control 1. Demonstrate that the internal noise level at data hall area are maintained at an appropriate level and meets the below criteria. 1.1. Criteria: 5 dB(A) better than First Action Level - a daily personal noise exposure (LEP, d) of 85 dB(A). 2. Compliance should be demonstrated by (a) detailed calculations or (b) 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. 3. Internal noise calculations or site measurements should include all data halls, taking account into the worst case condition of exposure to noise sources to the space, and undertaken during periods appropriate to the usage pattern for the data hall. 4. Measurements during commissioning shall use the method given in ISO 3382 or equivalent. The measurements locations should be evenly distributed within the data hall. Data hall without design (e.g. finishes, system) should provide endorsed acoustic calculation to support the potential achievement in both PA and FA submission. 5. The assessment should take into account noise from all IT equipment and building services equipment installed in data hall, under normal operation mode.	

6. 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:

- 6.1. a Corporate Member of Hong Kong Institute of Acoustics; or
- 6.2. a corporate/ certified/ full member of other international acoustic institution; or
- 6.3. a member of HKIE (Building Services, Mechanical or Environmental discipline) with relevant experience in Acoustic/ Vibration Design.

(b) Noise Isolation

1. Compliance should be demonstrated by a) computer simulation, b) detailed calculations, or c) 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 below table. The computer simulation report, acoustic calculations or the measurement report should be endorsed by:

- 1.1. a Corporate Member of Hong Kong Institute of Acoustics; or
- 1.2. a corporate/ certified/ full member of other international acoustic institution; or
- 1.3. a member of HKIE (Building Services Mechanical or Environmental discipline) with relevant experience in Acoustic/ Vibration Design

2. For measurement, measuring equipment shall conform to the accuracy requirements given in IEC 61672-1 [1] Class 1 requirements, or equivalent.

Type of Premises	Weighted SRI	Level Difference
Between offices/ conference rooms	R_w 44	$D_{nT,w}$ 38

3. The criteria apply to partition walls which are actually provided and potentially provided by the landlord.
4. In case where criteria appropriate to the type and use of premises/ spaces are not stated herein, the Applicant shall provide evidence as to the suitability of the criteria adopted.

(c) Background Noise

1. Demonstrate the background noise levels from both external sources and external building services equipment of project building are within the below criteria.

- 1.1. Criteria:

Internal noise level (NR and NC value should be consistently used in the project):

Office type premises: NR/NC 40

2. Based on the nature of the building, alternative appropriate criteria with sufficient justification and evidence provided by the applicant will be allowed.
3. Compliance should be demonstrated by computer simulation, detailed calculations or measurements depending on the applicant's preference. The acoustic simulation, calculation or measurement report should be endorsed by:
 - 3.1. a Corporate Member of Hong Kong Institute of Acoustics; or
 - 3.2. a corporate/ certified/ full member of other international acoustic institution; or
 - 3.3. a member of HKIE (Building Services, Mechanical or Environmental discipline) with relevant experience in Acoustic/ Vibration Design.
4. 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 [1] Class 1 requirements, or equivalent.
5. The assessment should take into account noise from building services equipment under normal operation mode.
6. For spaces where speech intelligibility is NOT important, or rooms with special acoustical nature, a schedule of spaces present in the building and relevant justifications is required.

(a) Data Hall Noise Control**Submittals**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-03a_00	BEAM Plus NDC submission template for HWB-03-03a	✓	✓
HWB-03-03a_01	Schedule of spaces cross-referencing to the GBP showing the data hall present in the building.	✓	✓
HWB-03-03a_02	Data hall noise calculation report at representative locations with supporting documents including noise data of the installed IT equipment and Building Service Equipment in data hall	✓	✓
HWB-03-03a_03	Data hall noise measurement report at representative locations with supporting documents including noise data of the installed IT equipment and Building Service Equipment in data hall	-	✓
HWB-03-03a_04	CV of the professional as per requirements in the assessment	✓	✓

(b) Noise Isolation

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-03b_00	BEAM Plus NDC submission template for HWB-03-03b	✓	✓
HWB-03-03b_01	Schedule of spaces cross-referencing to the GBP showing the types of premises present in the building.	✓	✓
HWB-03-03b_02	Airborne noise isolation computer simulation/ calculation report (Applicable to computer simulation/ calculation route only)	✓	✓
HWB-03-03b_03	Endorsed report on airborne noise isolation measurement at representative locations (Applicable to measurement route only)	-	✓
HWB-03-03b_04	CV of the professional as per requirements in the assessment	✓	✓

(c) Background Noise

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-03c_00	BEAM Plus NDC submission template for HWB-03-03c	✓	✓
HWB-03-03c_01	Schedule of spaces cross-referencing to the GBP showing the types of premises present in the building	✓	✓
HWB-03-03c_02	Background noise computer simulation/ calculation report	✓	✓
HWB-03-03c_03	Endorsed background noise measurement report	-	✓
HWB-03-03c_04	CV of the professional as per requirements in the assessment	✓	✓

Remarks**(a) Additional Information**

[1] International Electrotechnical Commission. IEC 61672-1:2013 Electroacoustic – Sound level meters

Acoustic windows or other attenuation may contribute to mitigate background noise problem

ASTM International. Designation: E 1007 – 97. Standard test method for field measurement of tapping machine impact sound transmission through floor-ceiling assemblies and associated support structures

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 Aug 2021]

International Organization for Standardization – ISO 3382:2009 - Acoustics -- Measurement of room acoustic parameters.

International Electrotechnical Commission. IEC 61672-1:2013 Electroacoustic – Sound Level meters.

International Organization for Standardization. ISO 10140-1, Acoustics — Laboratory measurement of sound insulation of building elements — Part 1: Application rules for specific products

International Organization for Standardization. ISO 10140-3, Acoustics — Laboratory measurement of sound insulation of building elements — Part 3: Measurement of impact sound insulation

International Organization for Standardization. ISO 10140-5, Acoustics — Laboratory measurement of sound insulation of building elements — Part 5: Requirements for test facilities and equipment

International Organization for Standardization. ISO 140-7. Acoustics - Measurement of sound insulation in buildings and of building elements. Part 7: Field measurements of impact sound insulation of floors.

Labour Department. Guidance Notes on Factories and Industrial Undertakings (Noise at Work) Regulation. [ONLINE] Available at: <https://www.labour.gov.hk/eng/public/os/C/FIUNR.pdf>
[Accessed Aug 2021]

I.Sharland. Woods practical guide to noise control. Colchester, England

(b) Related Credits

None

7 Health and Wellbeing **HWB-03** **Indoor Environmental Quality****HWB-03-04** **Indoor Vibration****Extent of Application**

All DC with normally occupied spaces

Objective

Avoidance of excessive vibration from building services equipment and other external sources within site boundary.

Credit Point(s) Attainable

1

Credit Requirement

1 credit point for demonstrating vibration levels not exceeding the prescribed criteria.

Assessment

1. 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.
2. 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.
3. 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.
4. 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.
5. Calculation or measurement report should be endorsed by:
 - 5.1. a Corporate Member of Hong Kong Institute of Acoustics; or
 - 5.2. a corporate/ certified/ full member of other international acoustic institution; or
 - 5.3. a member of HKIE (Building Services, Mechanical or Environmental discipline) with relevant experience in Acoustic/ Vibration Design.

Submittals

Supporting Documents		PA	FA
<i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>			
HWB-03-04_00	BEAM Plus NDC submission template for HWB-03-04	✓	✓
HWB-03-04_01	Summary of Indoor Vibration Assessment	✓	✓
HWB-03-04_02	Endorsed calculations on the isolation efficiency	✓	✓

HWB-03-04_03	Layout drawings showing the location(s) of sensitive receiver(s) and vibration source(s)	✓	✓
HWB-03-04_04	Endorsed calculation report on vibration level; or	✓	✓
	Endorsed vibration measurement report	-	✓
HWB-03-04_05	CV of the professional endorsing the calculation/ measurement report	✓	✓
HWB-03-04_06	Schedule of spaces cross-referencing to the GBP showing that the project has no normally occupied space (Substantiation for non-applicability only)	✓	✓

Remarks**(a) Additional Information**

[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: <https://www.environment.nsw.gov.au/resources/noise/vibrationguide0643.pdf> [Accessed Aug 2021]

(b) Related Credits

None

7 Health and Wellbeing	HWB-03	Indoor Environmental Quality
	HWB-03-05	Indoor Air Quality
Extent of Application	All DC	
Objective	Demonstrate that airborne contaminants do not give rise to unacceptable levels of air pollution in the DCs.	
Credit Point(s) Attainable	3 + 1 Bonus	
Credit Requirement	Indoor Air Quality in Occupied Spaces Demonstrate compliance in one of the following options:	
	(a) Option 1 2 credit points 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 point for demonstrating compliance with the prescribed limits for Airborne bacteria and conduct the Mould assessment in the sampled occupied spaces.	
	(b) Option 2 3 credit points for submitting a valid IAQ Certification Scheme (Good Class) certificate issued by the Environmental Protection Department (EPD) covering the whole building. 1 additional Bonus credit point for achieving Excellent Class.	
Assessment	Indoor Air Quality in Occupied Spaces (a) Option 1 <ol style="list-style-type: none"> 1. Prepare a measurement protocol prepared by a IAQ Certificate Issuing Body (CIB) [1] following guidance stated in Step 1 to Step 4 in A Guide on Indoor Air Quality Certification Scheme for Offices and Public Spaces [2]. 2. Measurements should be taken in occupied spaces served by MVAC System (including normally occupied spaces and not normally occupied spaces) following the guidelines specified in A Guide on Indoor Air Quality Certification Scheme for Offices and Public Spaces and the limits are specified below. 3. 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 [2]
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

4. Provide a CIB endorsed IAQ test report which shall include:
 - 4.1. Layout plan showing the locations of the air quality measurement points;
 - 4.2. Description of the measuring equipment used;
 - 4.3. Date, time and duration of measurements;
 - 4.4. Measurement results;
 - 4.5. Calibration certificate of the measuring equipment; and
 - 4.6. Photos taken during measurements (at least one photo per sampling point).
5. Given the floor plan of the building has not been changed, the sampling points agreed during PA will remain the same for FA. Otherwise, if the floor plan has undergone major change, the sampling points will be re-assessed during FA.

(b) Option 2

1. Submit a valid certificate issued by the Environmental Protection Department (EPD) covering the whole building. The whole building should be fully furnished.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-05_00	BEAM Plus NDC submission template for HWB-03-05a	✓	✓
	Summary of Indoor Air Quality Measurement (for Path 1 only)	-	✓
HWB-03-05_01	CIB endorsed checklist for Mould Assessment (prescribed checklist in Annex 3 of A Guide on Indoor Air Quality Certification Scheme for Offices and Public Places 2019) (for Path 1 only)	-	✓
HWB-03-05_02	Specification requiring a CIB to provide an endorsed IAQ measurement methodology, IAQ measurement and test reports (for Path 1 & 2)	✓	-
	CIB endorsed IAQ measurement methodology (for Path 1 & 2)	-	✓
HWB-03-05_03	CIB endorsed IAQ test reports (for Path 1 & 2)	-	✓
HWB-03-05_04	Valid certificate issued by the Environmental Protection Department (EPD) covering the whole building (for Path 2 only)	-	✓

Remarks**(a) Additional Information**

[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 Aug 2021].

[2] Indoor Air Quality Management Group, A Guide on Indoor Air Quality Certification Scheme for Offices and Public Spaces 2019. [ONLINE]. Available at:
https://www.iaq.gov.hk/media/65346/new-iaq-guide_eng.pdf
 [Accessed Aug 2021].

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 Aug 2021].

(b) Related Credits**EU-01-02 Reduction of CO₂ 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	HWB-03	Indoor Environmental Quality
	HWB-03-06	Thermal Comfort
Extent of Application	All DC	
Objective	Ensure that DC and systems are tested practicable and the specified thermal comfort conditions can be achieved under conditions of normal occupancy and expected heat gains.	
Credit Point(s) Attainable	2	
Credit Requirement	<p>(a) Temperature Performance in Data Halls</p> <p>1 credit point for sustaining the air temperature at the design value within $\pm 2.0^{\circ}\text{C}$ when air side system in data halls is operating at steady state.</p> <p>(b) Temperature Performance in Normally Occupied Areas</p> <p>1 credit point for sustaining the air temperature at the design value within $\pm 1.5^{\circ}\text{C}$ when air side system in normally occupied areas is operating at steady state under normal occupied periods.</p>	
Assessment	<p>(a) Temperature Performance in Data Halls</p> <ol style="list-style-type: none"> For PA stage, a Thermal Comfort Measurement Methodology demonstrating compliance with the assessment criteria. The methodology should include: <ol style="list-style-type: none"> Proposed sampling locations; Design report/ specification showing the air temperature design value of concerned spaces; and Measurement method statement, proposed equipment catalogue, calibration certificate, etc. Record the main physical parameters including indoor air temperature, indoor mean radiant temperature, indoor relative humidity 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: <ol style="list-style-type: none"> The measurement should not be taken on a rainy day; the measurements should be represented as 9-hour average in any period of a day; The measurement of indoor temperature and indoor relative humidity; The sensors used in the measurement survey shall have an accuracy that complies with ASHRAE 55-2013, ISO 7726:1998 or equivalent. The sensors shall have been properly calibrated and valid calibration certificates [e.g. accredited by Hong Kong Laboratory Accreditation Scheme (HOKLAS) or under its Mutual Recognition Arrangement Partners] should be provided; and 	

- 3.5. The measurement results shall demonstrate compliance with the prescribed design criteria, for a minimum of 90% of the prescribed locations.
4. For FA stage, submit a Thermal Comfort Measurement Report demonstrating compliance with the assessment criteria.
5. The report should include:
 - 5.1. Sampling locations;
 - 5.2. Design report/ specification showing the air temperature design value of concerned spaces;
 - 5.3. Measurement methodology, equipment catalogue, photo, calibration certificate, and results; and
 - 5.4. Calculations for thermal comfort.
6. The reports should be endorsed by a locally qualified professional who has at least 3 years of relevant experience.
7. Spaces without design (e.g. finishes, system) should provide endorsed calculation to support the potential achievement in both PA and FA submission.

(b) Temperature Performance in Normally Occupied Areas

1. For PA stage, a Thermal Comfort Measurement Methodology demonstrating compliance with the assessment criteria.
2. The methodology should include:
 - 2.1. Proposed sampling locations;
 - 2.2. Design report/ specification showing the air temperature design value of concerned spaces; and
 - 2.3. Measurement method statement, proposed equipment catalogue, calibration certificate, etc.
3. Record the main physical parameters including indoor air temperature, indoor mean radiant temperature, indoor relative humidity 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:
 - 3.1. The measurement should not be taken on a rainy day;
 - 3.2. the measurements should be represented as 8-hour average in the daytime or surrogate measurement;
 - 3.3. The measurement of indoor temperature and indoor relative humidity;
 - 3.4. The sensors used in the measurement survey shall have an accuracy that complies with ASHRAE 55-2013 [1], ISO 7726:1998 [2] or equivalent. The sensors shall have been properly calibrated and valid calibration certificates [e.g. accredited by Hong Kong Laboratory Accreditation Scheme (HOKLAS) or under its Mutual Recognition Arrangement Partners] should be provided; and

- 3.5. The measurement results shall demonstrate compliance with the prescribed design criteria, for a minimum of 90% of the prescribed locations.
4. For FA stage, submit a Thermal Comfort Measurement Report demonstrating compliance with the assessment criteria.
5. The report should include:
 - 5.1. Sampling locations;
 - 5.2. Design report/ specification showing the air temperature design value of concerned spaces;
 - 5.3. Measurement methodology, equipment catalogue, photo, calibration certificate, and results; and
 - 5.4. Calculations for thermal comfort.
6. The reports should be endorsed by a locally qualified professional who has at least 3 years of relevant experience.
7. Spaces without design (e.g. finishes, system) should provide endorsed calculation to support the potential achievement in both PA and FA submission.

Submittals**(a) Temperature Performance in Data Halls**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-06a_00	BEAM Plus NDC submission template for HWB-03-05a	✓	✓
HWB-03-06a_01	Thermal Comfort Measurement Methodology	✓	✓
HWB-03-06a_02	Endorsed Thermal Comfort Measurement Report	-	✓
HWB-03-06a_03	CV of the professional	✓	✓

(b) Temperature Performance in Normally Occupied Areas

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-06b_00	BEAM Plus NDC submission template for HWB-03-05b	✓	✓
HWB-03-06b_01	Thermal Comfort Measurement Methodology	✓	✓
HWB-03-06b_02	Endorsed Thermal Comfort Measurement Report	-	✓
HWB-03-06b_03	CV of the professional	✓	✓

Remarks**(a) Additional Information**

[1] American Society of Heating Refrigeration and Air Conditioning Engineers – ANSI/ASHRAE Standard 55-2013 Thermal Environmental Conditions for Human Occupancy.

[2] International Organization for Standardization – ISO 7726:1998 Ergonomics of the thermal environment — Instruments for measuring physical quantities Indoor Air Quality Management Group, the Government of the Hong Kong Special Administrative Region. Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places. Retrieved 01 August 2021, from https://www.iaq.gov.hk/media/65346/new-iaq-guide_eng.pdf [Accessed Aug 2021].

(b) Related Credits

None

7 Health and Wellbeing **HWB-03** **Indoor Environmental Quality**

HWB-03-07 **Artificial Lighting**

Extent of Application

All DC

Objective

Promote indoor lighting design which is comfortable for occupants' indoor activities.

Credit Point(s) Attainable

2

Credit Requirement

(a) Artificial lighting in Data halls

1 credit point for achieving the prescribed lighting performance in Data halls.

(b) Artificial lighting in normally occupied spaces, not normally occupied spaces and unoccupied spaces

1 credit point for achieving the prescribed lighting performance in normally occupied spaces, not normally occupied spaces and unoccupied spaces.

Assessment

(a) Artificial lighting in Data halls

1. This credit only assesses data hall areas with permanently installed lighting fixtures provided by the project owner. Data halls 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.
2. Demonstrate the achievement of the prescribed lighting performance in data hall 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.
3. Demonstrate compliance with the assessment criteria including **maintained illuminance** and **Unified Glare Rating limit** either by measurements using a standardised measurement protocol appropriate to the parameter being assessed, or by modelling.
4. 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-03-07-01

Surfaces	Reflectance of surfaces
Ceiling	0.6
Walls	0.3
Working planes	0.2
Floor	0.1

5. Submit an Artificial Lighting Performance Report, including the following content:
 - 5.1. Technical details of the installed lighting systems;
 - 5.2. Design criteria for data hall; and
 - 5.3. Results of measurements or simulation.

(b) Artificial lighting in normally occupied spaces, not normally occupied spaces and unoccupied spaces

1. This credit only assesses indoor normally occupied spaces, 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.
2. Demonstrate the achievement of the prescribed lighting performance in normally occupied spaces, not normally occupied spaces and unoccupied spaces regarding the lighting performance criteria adopted based on The SLL Code for Lighting 2012 Section 2.2.
3. Demonstrate compliance with the assessment criteria including **maintained illuminance, Unified Glare Rating limit and minimum illuminance uniformity (requirement of illuminance uniformity only applicable to normally occupied spaces)** either by measurements using a standardised measurement protocol appropriate to the parameter being assessed, or by modelling.
4. The typical surface reflectance can be adopted, i.e., referring to Table HWB-03-07-01. If different values are adopted, supporting documents (cut sheets/ catalogues/ laboratory reports) showing the corresponding information are required for justification.
5. Submit an Artificial Lighting Performance Report, including the following content:
 - 5.1. Technical details of the installed lighting systems;
 - 5.2. Design criteria for each room type; and
 - 5.3. Results of measurements or simulation.

Submittals**(a) Artificial Lighting in Data Hall**

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-07a_00	BEAM Plus NDC submission template for HWB-03-06a	✓	✓
HWB-03-07a_01	Summary of Artificial Lighting in data hall	✓	✓
HWB-03-07a_02	Lighting layout plan	-	✓
HWB-03-07a_03	Catalogues or other supporting documents showing the reflectance value (for computer modelling approach and if values other than those specified in Table HWB-03-07-01 have been adopted)	✓	✓
HWB-03-07a_04	Lighting fitting schedule	✓	✓
HWB-03-07a_05	Artificial Lighting Performance Report	✓	✓

(b) Artificial Lighting in normally occupied spaces, not normally occupied spaces and unoccupied spaces

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-07b_00	BEAM Plus NDC submission template for HWB-03-06b	✓	✓
HWB-03-07b_01	Summary of Artificial Lighting in Normally Occupied Spaces, Not Normally Occupied Spaces and Unoccupied Spaces	✓	✓
HWB-03-07b_02	Lighting layout plan	-	✓
HWB-03-07b_03	Catalogues or other supporting documents showing the reflectance value (for computer modelling approach and if values other than those specified in Table HWB-03-07-01 have been adopted)	✓	✓
HWB-03-07b_04	Light fitting schedule	✓	✓
HWB-03-07b_05	Artificial Lighting Performance Report	✓	✓

Remarks**(a) Additional Information**

[1] The Chartered Institution of Building Services Engineers (CIBSE) – The SLL Code for Lighting 2012

(b) Related Credits

None.

7 Health and Wellbeing**HWB-03****Indoor Environmental Quality****HWB-03-08****Daylight**

This credit head is not applicable under BEAM Plus NDC.

7 Health and Wellbeing	HWB-03	Indoor Environmental Quality
	HWB-03-09	Biological Contamination
Extent of Application	All DC	
Objective	To reduce the risk of biological contamination from the operation of the HVAC and water systems.	
Credit Point(s) Attainable	1	
Credit Requirement	1 credit point for complying with the recommendations given in the Code of Practice for Prevention of Legionnaires' Disease 2021 Edition in respect of Water Supply Systems, HVAC Systems and other Water Features.	
Assessment	<p>1. <u>Water Supply Systems</u></p> <p>Demonstrate compliance, if relevant items are present, with the following sections of the Code of Practice for Prevention of Legionnaires' Disease 2021 Edition [1]:</p> <p>1.1. Centralised Hot Water Supply Systems – Section 4.4.1</p> <p>1.2. Cold Water Supply Systems – Section 4.5</p> <p>2. <u>HVAC Systems</u></p> <p>Demonstrate compliance, if relevant items are present, with the following sections of the Code of Practice for Prevention of Legionnaires' Disease 2021 Edition:</p> <p>2.1. Cooling Tower – Section 4.2;</p> <p>2.2. Air Handling Unit/ Fan Coil Unit – Section 4.3.1;</p> <p>2.3. Air Duct and Air Filters – Section 4.3.2;</p> <p>2.4. Humidifiers – Section 4.3.3; and</p> <p>2.5. Air Washers – Section 4.3.4.</p> <p>3. <u>Other Water Features</u></p> <p>Demonstrate compliance, if relevant items are present, with the following sections of the Code of Practice for Prevention of Legionnaires' Disease 2021 Edition:</p> <p>3.1. Architectural Foundations – Section 4.6.</p>	

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
HWB-03-09_00	BEAM Plus New DCs submission template for HWB-03-08	✓	✓
HWB-03-09_01	Specifications of Water Supply Systems	✓	-
HWB-03-09_02	Schematic diagram of Water Supply Systems	✓	✓
HWB-03-09_03	Specifications of HVAC Systems	✓	-
HWB-03-09_04	Schematic diagram of HVAC Systems	✓	✓
HWB-03-09_05	Specifications of Other Water Features	✓	✓
HWB-03-09_06	Schematic diagram of Other Water Features with mark-up narratives	✓	✓
HWB-03-09_07	Drawing of installation details	-	✓

Remarks**(a) Additional Information**

[1] Prevention of Legionnaires' Disease Committee, EMSD. Code of Practice for the Prevention of Legionnaires' Disease in Hong Kong 2021 Edition. Retrieved 01 August 2021, from https://www.emsd.gov.hk/filemanager/en/content_645/COP-PLD_2021_en.pdf [Accessed Aug 2021].

(b) Related Credits

None

**8 Innovations
and
Additions**

BEAM Plus encourages innovative and/ or new techniques that are yet to find in the mainstream application in Hong Kong addressing sustainability objectives for new DCs.

This section allows the Applicant to submit for consideration for the award of Bonus credit point on any innovative techniques or performance enhancements which the Applicant deems to provide environmental benefits additional to those already covered in this Manual.

The Applicant shall be solely responsible to submit quantitative evidence for BSL TRC review and approval.

Generally the submission materials shall comprehensively detail the benefits, environmental impact averted, or exemplary performance achieved compared to existing criteria.

8 Innovations and Additions**IA-01 Innovations and Additions****Extent of Application** All DC**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 DCs.**Credit Point(s) Attainable** 10 Bonus

- 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 DCs:
 - Identify the sustainability objectives addressed by the proposed innovative applications.
 - Detail the method and criteria evaluating the benefits and effectiveness of the applications (quantifiable performance indicators to be proposed if applicable).
 - Justify the number of Bonus credits for the proposed applications.
 - Provide evidence of the implementation of the applications.
 - Evaluate preliminary achievements and any suggestion for improvement for the applications.

Submittals

Supporting Documents <i>Please provide softcopies with filename prefix as indicated on the leftmost column below.</i>		PA	FA
IA-01-01_00	BEAM Plus NDC submission template for IA-01-01	✓	✓
IA-01-01_01	A report on the objectives, evaluating method and criteria, and proposed number of Bonus credits for the innovative techniques	✓	✓
IA-01-01_02	A report on the evidence of implementation and evaluation of preliminary achievements / proposed improvements for the innovative techniques	-	✓
IA-01-01_03	Relevant technical documents, if necessary (e.g. drawings, specifications, product catalogues, test reports, etc.)	✓	✓

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 recognised 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.

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.

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

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.

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.

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 specialised application or feature within such area.

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 standardised 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 9.3 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 9.3 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 minimises 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, 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 socialisation 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.

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 9.3 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 simulate the potential air movement, pressure and turbulence around the object.

9 Appendices 9.2 Energy Modelling Guideline

9.2.1. Energy Modelling Methodology

Whole Building Energy Simulation is required for determine the energy performance of the DCs. The proposed DC energy model must cover all building energy components listed in this appendix. The simulation models for calculating proposed case DC should be developed in accordance with the modelling methodology and the requirements in the following sections.

Power Usage Effectiveness (PUE) is a metric for quantifying DCs efficiency using the total annual facility energy and total annual IT equipment energy.

The IT equipment energy shall be measured at Power Distribution Unit (PDU) Output, i.e. PUE Level 2.

Energy modelling shall be used to assess PUE and system efficiency at multiple design IT load conditions, i.e. 75% (EU-01-02 Reduction of CO₂ Emissions) and 100% (Prerequisite requirement for EU-00-P1).

The energy performance of a DC shall take into consideration of its unique design, such as N+1 or 2N design.

The system configurations must consider the redundant equipment and sequencing arrangements that enable the spare equipment capacity on “hot” standby, i.e. running together with base capacity.

Separate zones and schedules shall be modelled based on spaces with different temperature, such as raised floor, data hall and ceiling return.

The energy performance improvements could be come from the following aspects:

- i. DC infrastructure design;
- ii. Selection of high efficient equipment;
- iii. Equipment capacities and part load characteristics;
- iv. System configuration; and
- v. Operational and control sequencing.

Saving related to the energy use by the IT equipment will not be assessed in this credit.

9.2.2. Simulation Software

Simulation program used for energy modelling should meet the following criteria:

- i. Tested with industry standard methods: ANSI/ASHRAE Standard 140-2017 or equivalent;

- ii. Capable to perform hourly analysis (i.e. 8,760 hours per year);
- iii. Provide hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat setpoints, and HVAC system operation;
- iv. Capable to model 10 or more thermal zones;
- v. 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;
- vi. 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;
- vii. Capable to model part-load performance curves for mechanical equipment;
- viii. Capable to model capacity and efficiency correction curves for mechanical heating and cooling equipment; and
- ix. Capable to model air-side economizers with integrated control.

9.2.3. 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 methodology, 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.

9.2.4. On-site Renewable Energy

On-site renewable energy generation is included in the proposed case calculation for the non-data hall system to further reduce the whole building CO₂ emission. By providing annual energy generation estimation details in the proposed case, the percentage reduction of CO₂ emission is accounted by the percentage of reduction from baseline CO₂ emission.

9.2.5. Equivalent Carbon Dioxide Emissions

Electricity: 0.7kg CO₂ per kWh electricity consumed [1]

Town gas: 3.141 kg CO₂ per unit of town gas consumed (1 unit of town gas = 48 mega-joules consumed)

1 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.climate-ready.gov.hk/files/pdf/Guidelines_English_2010.pdf

Table-App 1 Modelling Requirements for Calculating Proposed DC Performance

Building Envelope
<ul style="list-style-type: none"> 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) b. 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: <ul style="list-style-type: none"> Building geometry and window design <i>Albedo</i> of the envelope Thermal properties for the external walls, roof, floors and fenestrations (vertical fenestration and skylight) SC and VLT for fenestrations c. 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. d. Permanent shading devices such as fins, overhangs and light shelves may be modelled.
Interior General Lighting System
<ul style="list-style-type: none"> a. 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 specialised application or feature within such area. All installed lighting shall be modelled in each thermal block. <ul style="list-style-type: none"> Lighting Power shall be determined in space by space method with same categorisation as the proposed design. 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. Lighting power shall include all power used by the luminaires, including lamps, ballasts, transformers and control devices. 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 Lighting equipment that additional to general lighting requirement for a space and is controlled by an independent control device is not included. Lighting that is integral to equipment or instrumentation and is installed by its manufacturer is not included in this assessment methodology Lighting installations in BEC TG-2018 ver.0 [2] clauses 5.1.2 are excluded. <p>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</p> b. For spaces where a complete lighting system designed (or installed) shall be consistent with design documents (or actual equipment used) 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.

² Technical Guidelines on Code of Practise for Energy Efficiency of Building Services Installation 2018 (Ver. 0) – Electrical and Mechanical Services Department HKSAR

Receptacle and Other Load (Process Load)
<p>a. 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 [3]</p> <p style="padding-left: 40px;">Office: 25W/m²</p> <p style="padding-left: 40px;">Data Centre: 900W/m²</p> <p>b. 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.</p>
IT Equipment Load
<p>a. The IT load comprises critical systems including servers, storage and networking power use, telecommunications and operation affecting monthly server CPU utilisation percentages.</p> <p>b. The proposed design must use the IT loads and schedule developed for the project.</p> <p>c. The IT load must be taken at the Power Distribution Unit (PDU) Output.</p> <p>d. Two models with design IT load at 100% and 75% should be developed.</p>
Miscellaneous
<p>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.</p> <ul style="list-style-type: none"> • Exterior Lighting System • Services Hot Water System • Lift & Escalator System • Irrigation, plumbing and drainable, fire services
Exterior Lighting System
<p>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)</p> <p>b. Where no exterior lighting has been specified in proposed case, no exterior lighting shall be modelled.</p>
Services Hot Water System
<p>a. 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 commercial purpose other than space heating and process requirements.</p> <p>b. 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).</p> <p>c. For building that will have no service hot-water loads, no service hot-water heating shall be modelled.</p>
Lift and Escalator System
<p>a. Where lift and escalator system has been specified (or installed), the system shall be modelled consistent with design documents (or actual system information)</p> <p>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.</p>

³ 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"

Irrigation, Plumbing and Drainage, Fire Services
No system to be modelled
On-site Power Generation
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)
HVAC system
<p>1. General</p> <p>Outdoor condition to be used for proposed case sizing shall reference to BEC 2018 Table 6.4.</p> <p>Indoor condition (s) to be used for proposed case shall be identical. Justification shall be provided else value in BEC 2018 Table 6.4 shall be used.</p> <p>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.</p> <p>3. Equipment Efficiencies</p> <p>All HVAC equipment in the proposed case shall be modelled consistent with design documents (or actual installed equipment information)</p> <p>For package type system the descriptor shall be broken down into its components so that supply fan energy can be modelled separately</p> <p>4. Performance impact due to pipe / duct loses and refrigerant pipe length are not considered in this assessment methodology.</p> <p>5. Space where complete HVAC system has been designed (or installed), the model shall consistent with design documents (or actual system type used).</p>
District cooling system (if applicable)
<p>a. Based on actual efficiency performance; or</p> <p>b. If project team cannot obtain actual performance data for main plant, it is permissible to use the following default average performance values:</p> <p>DCS cooling plant – COP of 4.4 for total cooling plant average efficiency (including cooling towers and primary pumps)</p> <p>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%</p>
Ventilation System
Carpark ventilation shall be consistent with design documents (or actual system installed)

Table-App 4 Default operation Schedule for Calculation

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 (1 - 2pm)	95	10	5	65/90	15	5	On	On	Off	54	19	9	48	13	0
15 (2 - 3pm)	95	10	5	65/90	15	5	On	On	Off	34	15	6	37	8	0
16 (3 - 4pm)	95	10	5	65/90	15	5	On	On	Off	33	12	4	37	4	0
17 (4 - 5pm)	95	10	5	65/90	15	5	On	On	Off	44	14	4	46	5	0
18 (5 - 6pm)	30	5	5	35/50	5	5	On	On	Off	26	7	4	62	6	0
19 (6 - 7pm)	10	5	0	30	5	5	On	Off	Off	21	7	4	20	0	0
20 (7 - 8pm)	10	0	0	30	5	5	On	Off	Off	15	7	4	12	0	0
21 (8 - 9pm)	10	0	0	20	5	5	On	Off	Off	17	7	4	4	0	0
22 (9 - 10pm)	10	0	0	20	5	5	On	Off	Off	8	9	7	4	0	0
23 (10 - 11pm)	5	0	0	10	5	5	Off	Off	Off	5	5	4	0	0	0
24 (11 - 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 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

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 (1 - 2pm)				100	100	50/100									
15 (2 - 3pm)				100	100	50/100									
16 (3 - 4pm)				100	100	50/100									
17 (4 - 5pm)				100	100	50/100									
18 (5 - 6pm)				100	50/100	50/100									
19 (6 - 7pm)				100	50/100	50/100									
20 (7 - 8pm)				100	50/100	50/100									
21 (8 - 9pm)				100	50/100	50/100									
22 (9 - 10pm)				100	50/100	50/100									
23 (10 - 11pm)				50/100	50/100	50/100									
24 (11 - 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 (1 - 2pm)	70	50	25	85/90	75/80	65/70	On	On	On	35	45	40	0	0	0
15 (2 - 3pm)	40	35	15	85/90	75/80	65/70	On	On	On	30	40	30	0	0	0
16 (3 - 4pm)	20	30	20	85/90	75/80	65/70	On	On	On	30	40	30	0	0	0
17 (4 - 5pm)	25	30	25	85/90	75/80	55/60	On	On	On	30	35	30	0	0	0
18 (5 - 6pm)	50	30	35	85/90	85/90	55/60	On	On	On	40	40	40	0	0	0
19 (6 - 7pm)	80	70	55	85/90	85/90	55/60	On	On	On	55	55	50	0	0	0
20 (7 - 8pm)	80	90	65	85/90	85/90	55/60	On	On	On	60	55	50	0	0	0
21 (8 - 9pm)	80	70	70	85/90	85/90	55/60	On	On	On	50	50	40	0	0	0
22 (9 - 10pm)	50	65	35	85/90	85/90	55/60	On	On	On	55	55	50	0	0	0
23 (10 - 11pm)	35	55	20	45/50	45/50	45/50	On	On	On	45	40	40	0	0	0
24 (11 - 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.

9 Appendices

9.3 Space Type

BEAM Plus considers indoor environmental quality (IEQ) as a key to sustain occupants' health and wellbeing. To assist the applicant in designing a more thorough and satisfactory IEQ strategies, BEAM Plus imposes high requirements on 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 examples of each space type. These examples are not exhaustive. If a space present in the applicant's DC 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 believes a space cannot be categorised according to the space type definitions.

Space Usage of normally occupied spaces

- | | |
|---------------------------------|--------------------|
| • Auditorium | • Meeting room |
| • Concourse | • Open office |
| • Conference room | • Private office |
| • Kitchens (commercial) | • Reception |
| • Food and beverage dining area | • Gallery area |
| • Front desk | • Information desk |
| • Gymnasium | |

Space Usage of not normally occupied spaces

- | | |
|-------------------------------------|--------------|
| • Break room | • Staircases |
| • Copy rooms | • Lift lobby |
| • Corridor | • Pantry |
| • Entrance lobby (other than hotel) | • Toilet |

Space Usage of Unoccupied spaces

- | | |
|-----------------------------------|--------------|
| • Emergency exit corridor | • Store room |
| • Mechanical and electrical rooms | • Warehouse |
| • Car park | |

9 Appendices

9.4 Stormwater Detention Systems O&M Checklist

Operation 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		