

BEAM Plus Existing Buildings

Version 2.0
(2016.03)

Comprehensive Scheme



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1 BEAM Plus for Existing Buildings

1.1 Introduction Building Environmental Assessment Method (BEAM) Plus is a comprehensive environmental assessment scheme for 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, operated, etc. Recognised as one of the world's leading green building assessment systems, it provides a comprehensive set of performance standards that can be pursued by developers and owners.

Owned and operated by the BEAM Society Limited (BSL), BEAM Plus for Existing Buildings is one of a series of rating systems that covers the management, operation and maintenance of a building and may be initiated at any time.

It aims to reduce the environmental impacts of existing buildings whilst improving quality and user satisfaction by the adoption of the best techniques available with reasonable cost.

1.1.1 BEAM Plus Existing Buildings Version 2.0 Hong Kong has over 42,000 existing buildings stocks. Majority of them are over thirty years old. Encouraging building owners of these buildings, especially in private sector, to adopt green building management and upgrading the building services systems can play a significant role in the world of sustainability. Improving their energy efficiency is also an essential step towards the achievement of Energy Saving Plan target by 2025.

BEAM Plus Existing Buildings Version 2.0 contains a number of major amendments to the guideline. The new version aims to embrace more participation in "Green" Existing Building, encourage more energy saving towards Energy Saving Plan Target, and educate and induce behavioural change.

The BEAM Plus Existing Buildings Version 2.0 is unique in the way with the following features:

- i. Copes with the local climatic, physical, constraints and ease of long-term facility management;
- ii. Is unique in new features which may set precedent to promote sustainability in Hong Kong with high living density;
- iii. Incorporates new initiatives to improve the energy efficiency and environmental performance;
- iv. Echoes with Government's latest target under the Energy Saving Plan;
- v. Moulds inhabitant's behaviour lifestyle through demand-side management;
- vi. Encourages enhancement to aged buildings;
- vii. Embraces existing buildings of all ages;
- viii. Contains various levels of practical requirements; and
- ix. Provides flexible implementation options to encourage participation.

There are 2 major schemes under BEAM Plus Existing Buildings Version 2.0, i.e. Comprehensive Scheme and Selective Scheme. Comprehensive Scheme adopts the 'Plan-Do-Check-Act' approach for the continual improvement of the buildings while Selective Scheme embraces the 'Better than yesterday' principal to recognise the efforts made by the building management of the aged existing buildings to achieve better building performance.

1.1.2 BEAM Society Limited (BSL)

BSL is committed to promoting and developing the BEAM assessment tools, assessing green buildings and training professionals.

BSL owns and operates BEAM Plus and undertakes assessments, training and examinations as a basis for certification and accreditation by the Hong Kong Green Building Council Limited (HKGBC). Oversight of BEAM Plus for Existing Buildings, including assessment monitoring and deliberation of Credit Interpretation Request (CIR), is performed by the BSL Technical Review Committee (TRC).

BSL Board of Directors (2014 – 2016/17):

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1st Vice Chairperson – Mr K M SO

2nd Vice Chairperson – Ms Ivy LEE

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Honorary Treasurer – Mr Frankie SO

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Nominated Directors (By Designated Institute) – Ir Dr Ka Lung CHAN, Mr Robert CHAN Hong Ki, Mr Joel CHAN, Mr Kim CHAN, Sr Sam CHENG, Ir Victor CHEUNG, Mr Alexander DUGGIE, Sr Nelson HO, Sr Dick KWOK, Sr Eddie LAM Kin Wing, Ir Julian LEE, Ir Chi Fung LEUNG, Mr Man Kit LEUNG (Ended on 31 December 2015), Ir Dr Chun Sing WONG.

1.1.3 Hong Kong Green Building Council Limited (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).

**1.1.4 Development of
BEAM Plus EB
Version 2.0**

The development of BEAM Plus EB Version 2.0 was led by a BSL Steering Committee comprising industry practitioners and experts. Industry stakeholders have been consulted via engagement workshops for feedback and opinion on areas including but not limited to the overall framework, performance categories and their relative emphasis, assessment criteria, submission requirement and grading methodology. The Steering Committee comprises:

Convenor – Mr K M SO

Members – Mr Benny AU, Ir Cary CHAN, Ir Prof Daniel W T CHAN, Ir Dr Ka Lung CHAN, Mr W M CHAN, Mr Arthur CHEUNG, Dr Tin Tai CHOW, Ir Colin CHUNG, Ms Yvonne IEONG, Ir Timmy KWAN, Dr Joseph LAI, Ms Susan LEUNG, Ms Meiling NG, Mr Clarence TSZ, Mr Martin WAN, Ir Dr Sammy WAN, Sr Bay WONG, Mr Romulus WONG, Ir Dr Raymond YAU.

Advisors – Mr Stephen CATLIN, Mr Oliver CHAN, Ir Thomas CHAN, Ms Ellen CHENG, Ms Karen CHEUNG, Mr Michael CHEUNG, Ir Patrick CHEUNG, Mr Rico CHEUNG, Mr Joe FONG, Dr Shermann FONG, Ir S K HO, Mr William HO, Mr John LAM, Mr Horace LEE, Ms Wendy LEUNG, Ir K C MAK, Mr W K WONG, Ms Veronica YING.

1.1.5 Disclaimer

BEAM Plus has been prepared with the assistance and participation of many individuals and representatives from various organisations. The final outcome represents a general consensus, but unanimous support from each and every organisation and individual consulted is not implied. The BEAM Plus documentation shall be revised on a regular basis and revised 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 on the BSL's website. An appropriate transitional period shall be allowed for projects undergoing assessment process.

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

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

1.1.6 Limitations

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

HKGBC offers a formal certification process of grading, this service provides for 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 Existing Buildings without formal certification does not entitle the user or any other party to promote any grading awarded.

1.2 Application and Eligibility

BEAM Plus Existing Buildings Version 2.0 attempts to cover the management, operation and maintenance of all types and ages of existing buildings, from small single building to large buildings, including but not limited to commercial, educational, government, industrial, office and residential buildings, hotels and shopping centres etc.

Buildings with BEAM 4/04 or BEAM Plus certificate are encouraged to renew their certificates by participating in this Scheme.

Newly completed buildings that have not been certified by BEAM Plus are also encouraged to participate in this Scheme. However, it is essential for the building management to have at least one year operational data of the building before registration.

Building with building services upgrades or minor renovations without changing the use of the building can be assessed under this Scheme.

Buildings undergone major renovation with structural alternations (such as the revitalisation of the entire industrial buildings or change of building use) cannot be assessed by this Scheme.

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

1.2.1 Assessment Boundaries

BEAM Plus concerns about the interactions between the assessed building, neighbouring properties, and the neighbourhood in general. The assessment seeks to reduce negative impacts on neighbours and rewards efforts to improve the quality of the immediate surroundings to the benefit of the neighbourhood: the concept of 'good neighbour' buildings.

Under normal circumstances, BEAM Plus Existing Buildings Version 2.0 only assesses those areas which are under the control of the Applicant. It is understood that the involvement of tenants also plays an important role in improving the building's environmental performance. Therefore, additional or bonus credits could be awarded when the Applicant can demonstrate that their tenants are also getting involved in the assessment. Details shall be referred to the assessment criteria of individual credit.

1.2.2 Area weighting

The credits under BEAM Plus Existing Buildings 2.0 are carefully designed under the 'Plan-do-check-act' and 'Better than yesterday' approach. It is not necessary for the Applicant to apply area weighting for the credits in EU and IEQ under this Scheme.

1.3 Certification Framework

BEAM Plus Existing Buildings Version 2.0 provides Applicants with more flexibility to participate in this green assessment to suit their program, budget and technical capability. A new assessment framework with 2 Schemes are designed and presented in Figure 1.1, including:

i. Comprehensive Scheme A (One-step approach)

All aspects under this Manual are assessed in one-go and one full certificate is offered if the requirements are fulfilled.

Comprehensive Scheme A is designed for BEAM Plus New Buildings certified buildings. Those buildings shall have the basic hardwares to fulfil certain assessment criteria in different aspects so that they can be certified by BEAM Plus Existing Buildings as a whole.

ii. Comprehensive Scheme B (Step-wise approach)

Free combination of aspects assessment is allowed. Intermediate result(s) for the assessed aspect(s) will be issued. The Applicant is required to update the necessary information of the assessed aspect(s) and submit the remaining aspect(s) within 3 years of the issuance of first intermediate result. Those documentation required to be updated are marked with [#] in the Manual.

An example of submission timeline is illustrated in Figure 1.2.

Comprehensive Scheme B is designed for buildings that need to be upgraded in order to achieve BEAM Plus certification. Building management may not have the full budget and sufficient time to upgrade all the systems in a single financial year. The intermediate certificate can recognise their effort in improving their building performance in certain area before the final full certification. Buildings will be assessed and graded with the same standard under Comprehensive Scheme A.

iii. Selective Scheme

It is an individual aspect assessment approach, and certificate will be issued for each individual assessed aspect. Should the same project completed the assessment of all 6 aspects, "Record of Achievement" may be issued upon request by Applicant to document the result of each aspect assessed.

Building Owners/ Building Management Companies may choose to apply BEAM Plus certification via Selective Scheme if they do not intend to achieve the performance requirements for all aspects via Comprehensive Scheme. Certification under Selective Scheme has a lower threshold than Comprehensive Scheme, with aspect by aspect assessment.

This Manual focuses on the criteria of Comprehensive Schemes A and B only.

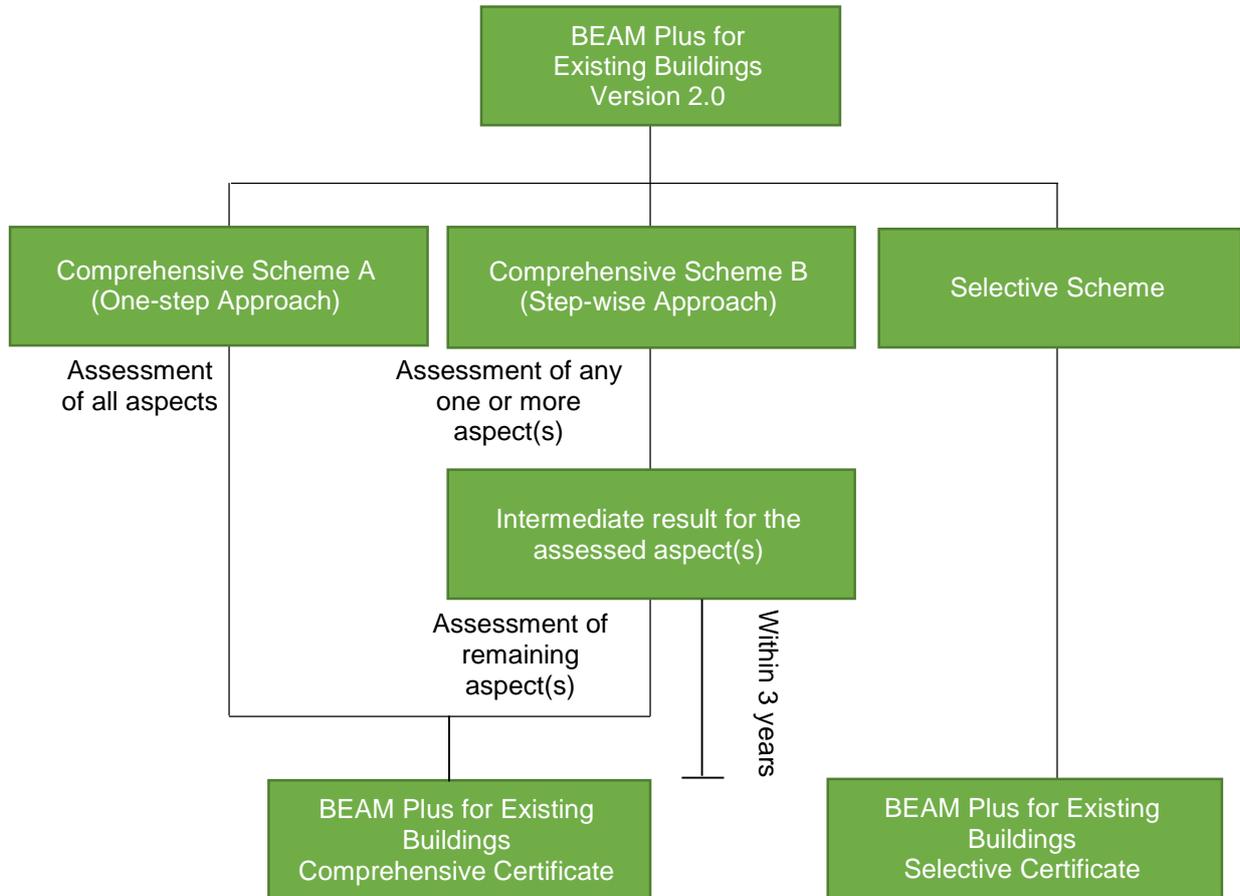


Figure 1.1 Assessment Flowchart of BEAM Plus Existing Buildings Version 2.0.

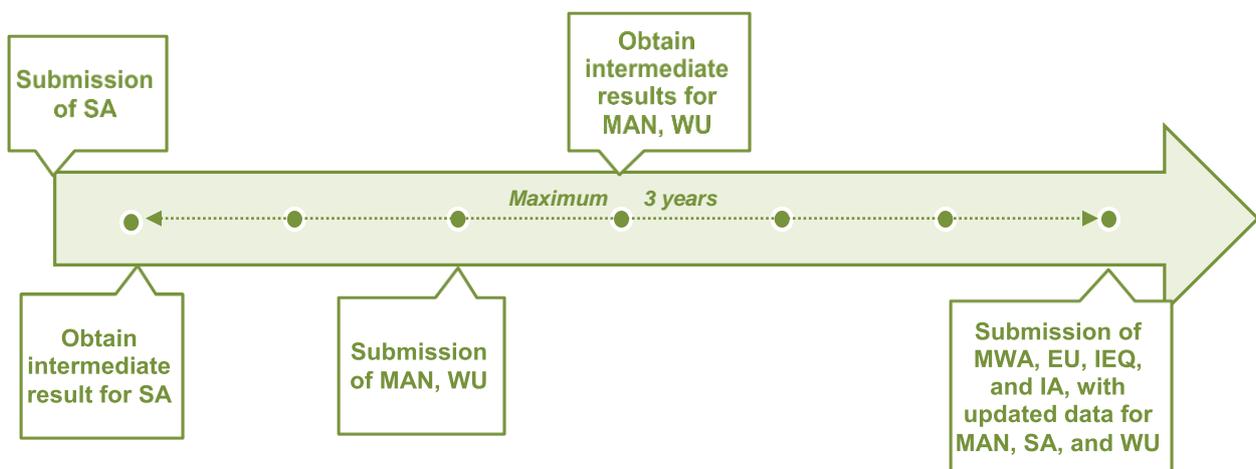


Figure 1.2 Example of submission timeline for Comprehensive Scheme B

1.3.1 Certification Process Guidance materials of certification under BEAM Plus Existing Buildings Version 2.0 Comprehensive Scheme are available on the HKGBC and BSL website [1].

1.3.2 Provisional Assessment Provisional assessment (PA) is only applicable for Comprehensive Scheme A. PA is not allowed under Comprehensive Scheme B.

1.3.3 Certificate Validity For Comprehensive Scheme A:

- i. Valid for 5 years from the date of their issuance;

For Comprehensive Scheme B:

- i. Valid for 3 years for the first intermediate certificate; and
- ii. Upon the completion of the assessment for all aspects, the validity of the final certificate is 5 years.

Certified projects are listed in a website database to indicate their address, location, type, developer/ owner, BEAM Pro, tool and rating.

Upon the expiry date, the BEAM Plus certificate and grading are no longer effective or recognised by the BSL. Applicants are encouraged to commission and submit separate certification assessments to renew their certificate.

1.3.4 Certification Fees Certification fees for BEAM Plus Existing Buildings Version 2.0 Comprehensive Scheme depend on the size and complexity of the project as determined by the HKGBC and BSL. Submission of credit interpretation request (CIR) and Appeals are subject to separate published charges. More details of fee structure can be found in HKGBC and BSL website.

1 BEAM Society Limited. Retrieved 1 March 2016, from http://www.beamsociety.org.hk/en_index.php

1.3.5 Credit Interpretation Request (CIR)

CIR process is a means whereby Applicants can seek technical and administrative guidance from the BSL TRC on the application of BEAM Plus credits to their projects. Examples may include:

- i. alternative compliance approaches to fulfilling the objectives of a particular credit;
- ii. clarifications of credit options and special circumstances; and
- iii. petitioning for higher credit allocation (performance enhancements).

CIR submissions should comprise a method statement identifying the objective of BEAM Plus Existing Buildings Version 2.0 Comprehensive Scheme for which credit is being sought, a description of the approach being adopted and, where appropriate, the proposed alternative and method for assessment. More details of CIR can be found in HKGBC and BSL website.

1.3.6 Appeals

The Applicants may submit an appeal on individual credit should they disagree to and not accept the decision made by the BSL. More details can be found in HKGBC and BSL website.

- 1.4 Credit Performance Categories** Different assessment methods assign their aspects under different categories according to the preferences of the tool developer. In BEAM Plus Existing Buildings Version 2.0 Comprehensive Scheme, aspects are grouped into the following categories:
- i. Management (MAN);
 - ii. Site Aspects (SA);
 - iii. Materials and Waste Aspects (MWA);
 - iv. Energy Use (EU);
 - v. Water Use (WU);
 - vi. Indoor Environmental Quality (IEQ); and
 - vii. Innovations and Additions (IA).
- Whilst BEAM Plus Existing Buildings Version 2.0 Comprehensive Scheme adopts similar categories as other versions of BEAM Plus (for new buildings and interiors), the number and nature of credits within each category is specific to the context of operation, maintenance and management of existing buildings.
- 1.4.1 Management (MAN)** MAN assesses the policies, procedures and strategies implemented to ensure buildings are operated in a sustainable manner:
- i. Green procurement;
 - ii. Environmental, Health and Safety (EHS), and energy management;
 - iii. Environmental, social and governance (ESG) disclosure;
 - iv. Staff training;
 - v. Operation and maintenance;
 - vi. IAQ management for renovation;
 - vii. Cleaning and pest control; and
 - viii. Building users involvement.
- 1.4.2 Site Aspects (SA)** In general, the location of the building determines the extent of its environmental aspects. SA include:
- i. Site location;
 - ii. Emissions from the site;
 - iii. Greenery; and
 - iv. Site amenities.
- 1.4.3 Materials and Waste Aspects (MWA)** MWA focuses on materials in (green purchasing) and out (waste disposal) of the building. MWA include:
- i. Selection of materials; and
 - ii. Waste management and reduction.

1.4.4 Energy Use (EU) Assessments of EU in a building contain variety of uses, energy sources and building services systems or equipment, which are complex processes given the number of influencing variables. By comparing with the benchmarks derived from audits of similar type of buildings, and/or a computational approach, the energy uses, in addition to features known to have impact on overall performance will be determined. EU includes:

- i. Energy performance;
- ii. Energy management and analysis;
- iii. Commissioning;
- iv. Energy efficient improvement; and
- v. Enhancement.

1.4.5 Water Use (WU) Assessments under WU include quality and features that improve the utilisation and reduce effluent. WU includes:

- i. Water conservation;
- ii. Water management; and
- iii. Effluent.

1.4.6 Indoor Environmental Quality (IEQ) Indoor environmental issues include those aspects of building performance that impact on the health, comfort, or well-being of the occupants, as well as aspects of performance that improve quality and functionality. IEQ includes:

- i. Occupants satisfaction;
- ii. Ventilation ;
- iii. Thermal comfort;
- iv. Hygiene;
- v. Indoor air quality;
- vi. Lighting quality; and
- vii. Acoustics and noise.

1.4.7 Innovations and Additions (IA) In this section, Applicants are encouraged to submit proposals for BSL consideration where the project:

- i. introduces innovative designs, construction or operational provisions that enhance performance and are not hitherto found in Hong Kong; or
- ii. achieves performance enhancements that greatly exceed the prevailing requirements in BEAM Plus for Existing Buildings.

In such cases Applicants can submit proposals that:

- i. detail the proposed technology/ practice;
- ii. demonstrate how the technology/ practice is implemented; and
- iii. quantify the environmental benefits.

**1.4.8 Alternative
Assessment
Methods**

BEAM Plus does not seek to be overly prescriptive in setting the criteria and compliance methods. As such it is possible that some projects may not be fully embraced by the current criteria due to their unusual nature, system designs, etc. In such cases Applicants can consider alternative approaches that also meet the same objectives, and submit a CIR that details:

- i. BEAM Plus for Existing Buildings objective (clause number) for which credit(s) is being sought;
- ii. proposed alternative criteria; and
- iii. proposed method for assessment.

Proposals should be made at the earliest opportunity during the assessment, via submission of a CIR.

It is the sole responsibility of the Applicant to provide a comprehensive submission in the first instance. Inadequate submissions increase administration and will delay the assessment process.

1.5 Grading Methodology

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

1.5.2 Category Weighting Having reviewed local and international assessment schemes and other relevant information, a weighting for each environmental performance category has been assigned to reflect its importance and the global trends as stated as follow:

Category	Weighting (%)
Management ("MAN")	24
Site Aspects ("SA")	10
Materials and Waste Aspects ("MWA")	14
Energy Use ("EU")	24
Water Use ("WU")	14
Indoor Environmental Quality ("IEQ")	14
	100

1.5.3 Exclusions Exclusions are allowed where an issue or part of an assessment is not applicable to particular circumstances or building type.

1.5.4 Pre-requisites The Applicant must demonstrate that all the pre-requisites are achieved. Otherwise, the formal assessment cannot be commenced and thus no grading would be awarded.

1.5.5 Assessment The assessment shall be undertaken by independent BAS on behalf of BSL. The Applicant shall provide documentation and photographic evidence.

1.5.6 Bonus Credits These credits would not be counted towards the total number of credits available, but would be counted under the corresponding categories. In addition, the credits achieved under the IA section shall also be considered as bonus credits.

1.5.7 Determination of Overall Grade The final certificate grading for projects certified under BEAM Plus Existing Buildings Version 2.0 Comprehensive Schemes A and B is subject to the following conditions:

- i. satisfying all pre-requisites;
- ii. achieving overall score required; and
- iii. obtaining minimum percentage (%) for each category listed below.

Grade	Overall Score	MAN	SA	MWA	EU	WU	IEQ
Platinum	75	70%	50%	50%	70%	50%	50%
Gold	65	60%	40%	40%	60%	40%	40%
Silver	55	50%	30%	30%	50%	30%	30%
Bronze	40	40%	20%	20%	40%	20%	20%

The intermediate results for projects certified under BEAM Plus Existing Buildings Version 2.0 Comprehensive Scheme B is subject to the following conditions:

- i. satisfying all pre-requisites of assessed category(ies); and
- ii. obtaining minimum percentage (%) for assessed category(ies) listed above.

If a project can comply 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 to any one of the applicable pre-requisites, it will be graded as “Pre-requisite(s) Not Achieved”.

Calculation Examples

Sample calculations to determine the overall grade are illustrated below. In the first example, the overall score 81.5, which is over 75. In addition, the percentages achieved for all individual categories are over 70%. Therefore, Platinum rating is awarded.

In the second example, although the overall score is above 75 and the sub-category grade in MAN, SA, MWA, EU and IEQ is Platinum, the sub-category rating in WU is only Silver. Therefore, the overall rating is only Silver.

Example 1

Category	Applicable Credits (A)	Achieved Credits (B)	% Achieved credit (C)	Category Weighting (D)	Weighted Achieved Score (E)	Category Grade
MAN	23	18	78.3%	24%	18.8	Platinum
SA	22	17	77.3%	10%	7.7	Platinum
MWA	17	13	76.5%	14%	10.7	Platinum
EU	39	30	76.9%	24%	18.5	Platinum
WU	23	18	78.3%	14%	11.0	Platinum
IEQ	26	20	76.9%	14%	10.8	Platinum
IA		4			4	
Overall rating					81.5	Platinum

Example 2

Category	Applicable Credits (A)	Achieved Credits (B)	% Achieved credit (C)	Category Weighting (D)	Weighted Achieved Score (E)	Category Grade
MAN	23	21	91.3%	24%	21.9	Platinum
SA	22	17	77.3%	10%	7.7	Platinum
MWA	17	13	76.5%	14%	10.7	Platinum
EU	39	30	76.9%	24%	18.5	Platinum
WU	23	8	34.8%	14%	4.9	Silver
IEQ	26	20	76.9%	14%	10.8	Platinum
IA		4			4	
Overall rating					78.5	Silver

Remarks:

$$C = B / A$$

$$E = C \times D \times 100$$

1.6 Abbreviation

ACRQWS	Advisory Committee on Water Resources and Quality of Water Supplies
AFCD	Agriculture, Fisheries and Conservation Department
ANL	Acceptable Noise Level
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
BAS	BEAM Assessor
BD	Buildings Department
BEAM Pro	BEAM Professionals
BEC	Building Energy Code
BEEO	Buildings Energy Efficiency Ordinance
BMS	Building Management System
BS EN	British Standard
BSL	BEAM Society Limited
BSRIA	Building Services Research and Information Association
CFC	Chlorofluorocarbons
CFL	Compact Fluorescent Lamp
CIC	Construction Industry Council
CIB	Certificate Issuing Body
CIBSE	The Chartered Institution of Building Services Engineers (UK)
CIE	Commission Internationale de l'Eclairage
CIR	Credit Interpretation Request
CO	Carbon Monoxide
CSR	Corporate Social Responsibility
Cx	Commissioning
DSM	Demand Side Management
EHS	Environmental, Health and Safety
EMS	Environmental Management System
EMSD	Electrical and Mechanical Services Department
EnMS	Energy Management System
EPD	Environmental Protection Department
ESG	Environmental, Social and Governance
EU	Energy Use
EUI	Energy Use Intensity

FOC	Form of Compliance
FSC	Forest Stewardship Council
GHG	Greenhouse Gas
GLTMS	Greening, Landscape and Tree Management Section of Development Bureau
GRI	Global Reporting Initiative
GWP	Global Warming Potential
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HKAEE	Hong Kong Awards for Environmental Excellence
HKAS	Hong Kong Accreditation Service
HKGBC	Hong Kong Green Building Council Limited
HK BESTOF	HKGBC Benchmarking & Energy Saving Tool – Office Buildings
HK G-PASS	HKGBC Green Product Accreditation and Standards
HKGOC	Hong Kong Green Organisation Certification
HKIE	Hong Kong Institution of Engineers
HKPSG	Hong Kong Planning Standards and Guidelines
HKSAR	Hong Kong Special Administrative Region
HOKLAS	Hong Kong Laboratory Accreditation Scheme
HVAC&R	Heating, Ventilating, Air-Conditioning and Refrigeration
IAQ	Indoor Air Quality
IEC	International Electrotechnical Commission
IEQ	Indoor Environmental Quality
IPM	Integrated Pest Management
LD	Legionnaires Disease
LPD	Lighting Power Density
MAN	Management Aspects
MRC	Material Recovery Chambers
MWA	Materials and Waste Aspects
NO₂	Nitrogen Dioxide
NSR	Noise Sensitive Receiver
O₃	Ozone
O&M	Operation and Maintenance
ODP	Ozone Depleting Potential
ODS	Ozone Depleting Substances
OHSAS	Occupational Health & Safety System

REA	Registered Energy Assessor
R.P.E.	Registered Professional Engineer
RS&MRC	Refuse Storage and Material Recovery Chambers
RS&MRR	Refuse Storage and Material Recovery Rooms
RSP	Respirable Suspended Particulates
QSP	Qualified Service Provider
SA	Site Aspects
SR	Solar Reflectance
SRI	Sound Reduction Index
SWL	Sound Power Level
THD	Total Harmonic Distortion
TRC	Technical Review Committee of BEAM Society Limited
TVOC	Total Volatile Organic Compound
UGR	Unified Glare Rating
US EPA	The United States Environmental Protection Agency
VBAS	Voluntary Building Assessment Scheme
VRF	Variable Refrigerant Flow
VSD	Variable Speed Drive
WACS	Water-cooled Air-Conditioning Systems
WEEE	Waste Electrical and Electronic Equipment
WELS	Water Efficiency Labelling Scheme by Water Supplies Department
WHO	World Health Organization
WSD	Water Supplies Department
WU	Water Use
WWF	World Wildlife Fund

1.7 Summary of Credits

	Section	Credit Requirement	Exclusions	Credit
2	Management (MAN)			23 + 6B
<u>MAN P1</u>	Green Purchasing Plan	Demonstrate that green purchasing plan and procedures (including both materials and services) either follow their internal company guideline or other international standards, shall be in place.	None.	Required
<u>MAN 1</u>	EHS and Energy Management System	1 credit where the building management operates an Environmental Management System (EMS) certified to ISO 14001.	None.	1
		1 credit where the building management operates an Occupational Health and Safety System (OHSAS).		1
		1 credit where the building management operates an Energy Management System (EnMS).		1
		1 Bonus credit where building management operates an OHSAS certified to BS OHSAS 18001.		1B
		1 Bonus credit where the building management operates an EnMS certified to ISO 50001.		1B
<u>MAN 2</u>	Environmental, Social and Governance (ESG) Disclosure	1 credit where the Building Owner/ Building Management Company discloses sustainability policy and targets to the public.	None.	1
		1 Bonus credit where the Building Owner/ Building Management Company follows Global Reporting Initiative™ (GRI) Sustainability Reporting Guidelines and discloses the G4 sustainability report to the public.		1B
<u>MAN 3</u>	BEAM Professional	1 credit for at least 2 members from the Building Management Company are certified BEAM Professional with EB credential.	None.	1
		Alternatively 1 credit for at least 1 key member from the Building Management Company is a certified BEAM Professional with EB credential and at least 1 member is a certified BEAM Affiliate.		
		1 additional credit for the building-in-charge being a certified BEAM Professional with EB credential and with at least 1 professional corporate membership qualification (e.g. HKIH, HKIA, HKIE, HKIS (BS/PFM), RICS (BS/FM), IFMA, HKIFM, BSOMES, or equivalent).		1

	Section	Credit Requirement	Exclusions	Credit
2	Management (MAN)			23 + 6B
MAN 4	Staff Training and Resources	a) Staff and Technical Resources 1 credit for having adequate staff and technical resources to meet the O&M requirements of the building.	None.	1
		b) Staff Training 1 credit for providing adequate and periodic training for the staff responsible for the O&M of the building.		1
MAN 5	Building and Site Operation and Maintenance	a) Building Maintenance 1 credit for demonstrating the operation of a planned programme of regular inspection, cleaning and maintenance of the building's fabric and structure under the control of the Applicant.	Refer to assessment criteria.	1
		b) External Areas and Facilities 1 credit for demonstrating the operation of a planned programme of regular inspection, cleaning and maintenance of external areas and facilities.		1
MAN 6	Building Services Operation and Maintenance	a) Central Heating Ventilation and Air-Conditioning (HVAC) Plant 2 credits for demonstrating the operation of a planned programme of regular inspection and maintenance of the central HVAC plant.	Building does not have a central HVAC plant	2
		b) Other Engineering Systems Maximum 4 credits for demonstrating the operation of a planned programme of regular inspection and maintenance of the following listed systems. i. Air-conditioning system except central HVAC plant; ii. Electrical system; iii. Lighting system; and iv. Plumbing and Drainage system.	None.	4
		c) Assessment of Operation & Maintenance Practice 1 credit for having undertaken an audit of the effectiveness of the O&M practices for all building services engineering systems.	None.	1
MAN 7	Electronic Operation and Maintenance Platform	1 Bonus credit for operating an electronic O&M platform by the Building Owner/ Building Management Company.	None.	1B
MAN 8	IAQ Management for Renovation	1 credit for providing a Construction Indoor Air Quality (IAQ) Management Plan.	None.	1
		1 credit for providing records that the Construction IAQ Management Plan has been implemented by the Building Owner/ Building Management Company/ tenants during renovation.		1

	Section	Credit Requirement	Exclusions	Credit
2	Management (MAN)			23 + 6B
MAN 9	Green Cleaning	a) Implementation of Green Cleaning 1 credit for demonstrating the appropriate green cleaning procedures/ practices for the project.	None.	1
		b) Use of Green Cleaning Detergent 1 credit for demonstrating the use of at least 10% of green cleaning detergents.		1
		1 Bonus credit for demonstrating the use of at least 20% of green cleaning detergents.		1B
MAN 10	Integrated Pest Management	1 credit for implementing an integrated programme for pest management.	None.	1
MAN 11	User Guidance	1 credit for providing user guide to encourage and promote environmentally friendly activities.	None.	1
MAN 12	Green Lease	1 Bonus credit for implementing green lease to the tenants of the buildings.	Buildings without any tenants.	1B

	Section	Credit Requirement	Exclusions	Credit
3	Site Aspects (SA)			22 + 3B
SA 1	Green Building Attributes	Maximum 7 credits for the building that has been certified under BEAM Plus New Buildings (Version 1.1 or 1.2)/ BEAM 4/04 or 5/04: i. 7 credits for Platinum grade; ii. 6 credits for Gold grade; and iii. 5 credits for any other grade. Alternatively Maximum 5 credits for an uncertified building that meets the listed performance characteristics.	None.	7
SA 2	Noise Pollution	a) Provision of Acoustic Treatment 1 credit for providing adequate acoustic treatment to the following building services equipment: chillers, cooling towers, ventilation fans with Sound Power Level (SWL) higher than 80 dB(A). b) Demonstration of Compliance with HKPSG Criteria 1 credit for demonstrating that the level of the intruding noise at the façade of the potential Noise Sensitive Receivers (NSRs) is in compliance with the criteria recommended in the Hong Kong Planning Standards and Guidelines (HKPSG).	None.	2

	Section	Credit Requirement	Exclusions	Credit
3	Site Aspects (SA)			22 + 3B
<u>SA 3</u>	Light Pollution	2 credits if there are no external lightings installed for the building. Alternatively 1 credit for switching off the Building Owner/ Building Management Company's external lightings from 23:00 to 07:00. 1 additional credit for liaising with tenants and requiring them to switch off the external lightings from 23:00 to 07:00.	None.	2
<u>SA 4</u>	Heat Island Reduction	1 credit for demonstrating the implementation of any combination of the following strategies for a minimum of 10% of the external non-roof area (i.e. ground floor and podium with less than 15m in height): i. Greenery; ii. Water feature; iii. Green wall or vertical greening; iv. Shading device; and/or v. Paving materials with solar reflectance (SR) of 0.33. 1 to 2 Bonus credit(s) for more than 20% or 30% of the external non-roof area covered with the aforesaid features.	None.	1 + 2B
<u>SA 5</u>	Green Roof	1 Bonus credit for providing green roof and/or organic farm for at least 20% of the available main roof area.	None.	1B
<u>SA 6</u>	Corporate Social Responsibility Facilities/ Services	Maximum 4 credits for providing the following listed CSR facilities/ services: i. Allowing person with visual impairment to bring along with their guide dogs; ii. Automated External Defibrillator. iii. Baby-care room; iv. Bicycle parking; v. Breast feeding room; vi. Free baby stroller lending service; vii. Free drinking fountain; viii. Free wheelchair lending service; ix. Free Wi-Fi in common area; x. Organic farm; xi. Permanent art work; xii. Permanent green building education show board; and xiii. Others to be proposed by the Applicant.	None.	4

	Section	Credit Requirement	Exclusions	Credit
3	Site Aspects (SA)			22 + 3B
SA 7	Amenities for Operation and Maintenance	Maximum 3 credits for providing the following listed amenities that improve the operation and maintenance of the building and its engineering services: <ul style="list-style-type: none"> i. Aerial working platform; ii. Building Management System (BMS); iii. Cat ladder; iv. Davit arm system; v. External pipe duct; vi. Fall arrest system; vii. Gondola system; viii. Guard room; ix. Maintenance platform; x. Maintenance workshop; xi. Movable platform, and xii. Others to be proposed by the Applicant. 	None.	3
SA 8	Barrier Free Access	Maximum 3 credits for providing enhanced barrier free access provisions as per the latest version of the Design Manual of Barrier Free Access.	None.	3

	Section	Credit Requirement	Exclusions	Credit
4	Materials and Waste Aspects (MWA)			17 + 7B
MWA P1	Waste Recycling Facilities	Providing spaces for collection, sorting, storage and disposal of waste and recovered materials.	None.	Required
MWA P2	Materials Purchasing Plan	Demonstrating that the plan of material procurement (sub-section under MAN P1 Green Purchasing Plan) and its procedures for both on-going consumables and durable goods either following the internal company guideline or other international standards are in place.	None.	Required
MWA 1	Materials Purchasing Practices	1 to 2 credit(s) for demonstrating at least 50% or 70% of purchased on-going consumables are environmentally friendly products for the past 12 months as minimum.	None.	2
		1 to 2 credit(s) for demonstrating at least 50% or 70% of purchased durable goods are environmentally friendly products for the past 12 months as minimum.		2
		1 credit for demonstrating at least 70% of purchased both on-going consumables and durable goods are environmentally friendly products for the past 24 months.		1
		1 Bonus credit for demonstrating at least 70% of purchased both on-going consumables and durable goods are environmentally friendly products for the past 36 months.		1B
MWA 2	Use of Certified Green Products	Maximum 2 Bonus credits for purchasing green products certified by Construction Industry Council (CIC) Carbon Labelling Scheme/ HKGBC Green Product Accreditation and Standards (HK G-PASS) or other internationally recognised schemes.	None.	2B

	Section	Credit Requirement	Exclusions	Credit
4	Materials and Waste Aspects (MWA)			17 + 7B
<u>MWA 3</u>	Ozone Depleting Substances	<p>a) Newly and Existing Installed Equipment using Refrigerants</p> <p>1 credit for all the equipment (both newly purchased and existing) using the refrigerants with Global Warming Potential (GWP) less than 1,900.</p> <p>Alternatively, for equipment with refrigerant GWP value > 1,900, credit can be achieved when the Applicant can demonstrate a phased programme of refrigerant replacement.</p> <p>1 credit for using refrigerants with a combined value less than or equal to the threshold for the combined contributions to ozone depletion and global warming potentials for all new and existing HVAC&R equipment that under the control of Applicant.</p> <p>b) Fire Suppression and Other Materials</p> <p>1 credit for using the fire suppression and other materials that avoids the use of ozone depleting substances in their manufacture, composition or use.</p>	None.	1
<u>MWA 4</u>	Waste Management Plan	1 credit for developing a waste management plan.	None.	1
<u>MWA 5</u>	Recycling Facilities for Different Waste Streams	<p>Maximum 4 credits for providing the following listed on-site recycling facilities and implementing the materials collection arrangement:</p> <p>i. Fluorescent lamp (CFLs and fluorescent tubes);</p> <p>ii. Glass bottle;</p> <p>iii. Rechargeable battery; and</p> <p>iv. Waste Electrical and Electronic Equipment (WEEE).</p>	None.	4
<u>MWA 6</u>	Food Waste Management	<p>1 credit for signing the Food Wise Charter and demonstrating the implementation of food waste reduction good practice guide as per Hong Kong Food Wise Campaign.</p> <p>1 Bonus credit for providing on-site used cooking oil collection facility and implementing the collection arrangement.</p>	None.	1 1B
<u>MWA 7</u>	Waste Treatment Equipment	1 Bonus credit for providing at least one set of waste treatment equipment.	None.	1B
<u>MWA 8</u>	Action to Waste Reduction	<p>a) Implementation of the Waste Management Plan</p> <p>1 credit for demonstrating the implementation of the waste management plan.</p> <p>b) Waste Stream Audit</p> <p>1 Bonus credit for undertaking a waste stream audit.</p> <p>c) Waste and Recycling Records</p> <p>1 credit for the collection of the waste and recycling records for past 12 months.</p>	None.	1 1B 1

Section	Credit Requirement	Exclusions	Credit
4	Materials and Waste Aspects (MWA)		17 + 7B
	1 Bonus credit for the collection of the waste and recycling records for the past 24 months.		1B
	d) New Targets on Waste Recycle/ Reduction 1 credit for providing new targets on the waste recycle items, recycle rate and reduction rate based on the performance of the past 12 months.		1

Section	Credit Requirement	Exclusions	Credit
5	Energy Use (EU)		39 + 9B
EU P1	Minimum Energy Performance	Conducting energy audit in accordance with the Buildings Energy Efficiency Ordinance (Cap 610) requirements for existing buildings.	Buildings not covered by BEEO. Required
EU 1	Energy Management	a) Energy Management Policy 1 credit for an energy management policy endorsed by top management.	None. 1
		b) Energy Management Plan 1 credit for energy management plan covering less than 3 years. 2 credits for energy management plan covering 3 years or more.	None. 2
		c) Appointment of Energy Warden 1 credit for appointing an Energy Warden in the Building Management Company.	None. 1
EU 2	Energy Analysis	a) Data Collection Facilities 1 credit for sub-metering systems for any 3 of the following electrical loads where applicable: i. Chiller plant; ii. Cooling tower plant; iii. Lift; iv. Escalator; v. Lighting; and vi. Plumbing & drainage. 1 credit for having Building Management System (BMS) to log operation data (e.g. pressure, temperature, flow rate, on/off status) for monitoring operation and function of the system including the following as a minimum: i. Air side; ii. Water side; iii. Cooling load; and iv. Lighting control.	Building to compulsorily comply with BEC 2012 or later version Residential buildings.

Section	Credit Requirement	Exclusions	Credit
5	Energy Use (EU)		39 + 9B
	<p>b) Data Collection Record 1 credit for providing energy consumption data record of at least 1 year for major electrical loads.</p> <p>2 credits for providing energy consumption data record of more than 3 years for major electrical loads.</p>	None.	2
	<p>c) Data Analysis 1 credit for calculating the EUI of the following services in data analysis:</p> <ul style="list-style-type: none"> i. Air-conditioning system; ii. Lift & escalator (if any); iii. Lighting; and iv. Others. 	None.	1
	<p>d) Energy Audit Report 3 credits for filling up Table (II) to Table (VIII) under the Template 1 on Additional Information to Executive Summary of Energy Audit Report.</p> <p>2 credits for filling up the entire Template 1 on Additional Information to Executive Summary of Energy Audit Report to EMSD.</p>	None.	5
	<p>e) Carbon Audit Report 1 credit for conducting carbon audit in accordance with the requirements as stipulated in the guideline issued by the Authority.</p>	None.	1
EU 3	Commissioning		
	<p>a) Action Plan 1 credit for action plan covering less than 3 years. 2 credits for action plan covering 3 years or more.</p>	None.	2
	<p>b) Commissioning 1 credit for providing original/ retro-commissioning (RetroCx) for electrical services systems.</p> <p>1 credit for providing original/ retro-commissioning (RetroCx) for plumbing and drainage system.</p> <p>1 credit for providing original/ retro-commissioning (RetroCx) for lift and escalator system (if any).</p> <p>For buildings with chiller system: 1 credit for providing original/ retro-commissioning (RetroCx) for water side equipment of central air-conditioning system.</p> <p>1 credit for providing original/ retro-commissioning (RetroCx) for air side equipment of central air-conditioning system.</p>	None.	Max. 5

Section	Credit Requirement	Exclusions	Credit																								
5	Energy Use (EU)		39 + 9B																								
	<p>For buildings without chiller system: 1 credit for providing original/ retro-commissioning (RetroCx) for air-conditioning system.</p> <p>c) On-going Commissioning 1 credit for providing an ongoing commissioning plan detailing the works and person-in-charge for electrical services if on-going commissioning have been conducted for electrical system and/or for Heating, Ventilating, and Air-Conditioning (HVAC) system if on-going commissioning have been conducted for HVAC system.</p> <p>1 credit for the execution of any 2 of the following measures for power quality management regularly. 2 credits for the execution of any 4 of the following measures for power quality management regularly.</p> <ul style="list-style-type: none"> i. Power factor monitoring & correction; ii. 3-phase Load Balancing; iii. Maximum demand monitoring; iv. Demand Side Management (DSM); v. Total Harmonic Distortion (THD); and vi. Thermal Scan on electrical distribution system. <p>For buildings with chiller system: 1 credit for ongoing commissioning for water side equipment of central air-conditioning system.</p> <p>1 credit for ongoing commissioning for air side equipment of central air-conditioning system.</p> <p>For buildings without chiller system: 1 credit for ongoing commissioning for all HVAC equipment.</p>	None.	Max. 5																								
EU 4	<p>Energy Benchmarking and Improvement</p> <p>a) Benchmarking</p> <p>For applicable types of Buildings: Credit(s) can be achieved based on the benchmarking results obtained from EMSD Benchmarking Tool.</p> <table border="1"> <thead> <tr> <th>No. of Credit(s)</th> <th>1</th> <th>3</th> <th>5</th> <th>1 Bonus</th> <th>2 Bonus</th> </tr> </thead> <tbody> <tr> <td>Percentile</td> <td>50th</td> <td>40th</td> <td>30th</td> <td>20th</td> <td>10th</td> </tr> </tbody> </table> <p>Alternative for Commercial Buildings:</p> <p>Credit(s) can be achieved based on the label obtained from HKGBC Benchmarking & Energy Saving Tool – Office Buildings (HK BESTOF).</p> <table border="1"> <thead> <tr> <th>No. of Credit(s)</th> <th>1</th> <th>3</th> <th>5</th> <th>1 Bonus</th> <th>2 Bonus</th> </tr> </thead> <tbody> <tr> <td>HK BESTOF</td> <td>Green</td> <td>Bronze</td> <td>Silver</td> <td>Gold</td> <td>Platinum</td> </tr> </tbody> </table>	No. of Credit(s)	1	3	5	1 Bonus	2 Bonus	Percentile	50 th	40 th	30 th	20 th	10 th	No. of Credit(s)	1	3	5	1 Bonus	2 Bonus	HK BESTOF	Green	Bronze	Silver	Gold	Platinum	Building types not covered by EMSD Benchmarking Tool.	Max. 12 + 2B
No. of Credit(s)	1	3	5	1 Bonus	2 Bonus																						
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HK BESTOF	Green	Bronze	Silver	Gold	Platinum																						

Section	Credit Requirement	Exclusions	Credit
5	Energy Use (EU)		39 + 9B

b) Self-Improvement
Credit(s) can be achieved based on the reduction percentage by comparing electricity bill, Towngas bill or metering data. (Baseline year can be any year in the past 5 years).

None.

i. For buildings ranked at the 40th percentile or below under EMSD Benchmarking Tool/ "Bronze" or below label obtained from HK BESTOF:

No. of Credit(s)	1	2	3	4
Annual energy use reduction	2%	4%	6%	8%

ii. For buildings ranked at the 20th or 30th percentile under EMSD Benchmarking Tool/ "Gold" or "Silver" label obtained from HK BESTOF:

No. of Credit(s)	1	2	3	4
Annual energy use reduction	1%	2%	3%	4%

iii. For buildings ranked at the 10th percentile under EMSD Benchmarking Tool or "Platinum" label obtained from HK BESTOF:

No. of Credit(s)	1	2	3	4
Annual energy use reduction	0.5%	1%	1.5%	2%

iv. For buildings which are excluded in part (a) Benchmarking:

No. of Credit(s)	1	2	3	4	1 Bonus	2 Bonus
Annual energy use reduction	1%	2%	3%	4%	6%	8%

c) Peak Electricity Demand Reduction
Credit(s) can be achieved based on the reduction percentage in the peak electricity demand.

Residential Buildings or Buildings not charged by either Bulk Tariff, Large Power Tariff or Maximum Demand Tariff.

No. of Credit(s)	1	2	3
Commercial and Hotel Buildings	10%	15%	20%
Educational Buildings (Centralised Air-Conditioning System)	10%	15%	20%
Educational Buildings (Unitary Air-conditioner)	5%	10%	15%
Other Building Types	5%	10%	15%

EU 5	Enhancement	Maximum of 1 Bonus credit for each energy conservation approach is allowed but the award of credit is subject to the final approval of BEAM Society Limited (BSL)'s Technical Review Committee (TRC) based on the estimated energy	None.	7B
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Section	Credit Requirement	Exclusions	Credit
5	Energy Use (EU)		39 + 9B
	reduction, justification and/or the innovation of the proposed approaches. Note: Energy saving measures that rely on building user's behaviour or manual control (such as, turning up the set temperature manually for air-conditioning; turning off lighting by hand in accordance to staff energy management manual) will not be considered energy saving features in this section. Some of the prescriptive approaches include: a) Research and Development in Energy 1 Bonus credit for conducting research and development or participating in competition with published paper related to energy aspects. b) Compliance with the BEC Maximum 4 Bonus credits for compliance with the latest version of the following listed BEC (This bonus credit does not apply to those buildings that are required to comply with the latest version of the BEC): Energy Efficiency Requirements for Air-Conditioning Installations; Energy Efficiency Requirements for Electrical Installations; Energy Efficiency Requirements for Lighting Installations; and/or Energy Efficiency Requirements for Lift and Escalator Installations. c) Renewable Energy System 1 Bonus credit where at least 0.2% of building energy consumption in communal area is obtained from renewable energy sources. d) Separate Energy Charges 1 Bonus credit where separate charges are made for energy use. e) Other Approaches Maximum 7 Bonus credits for adopting other energy conservation approach not prescribed above.		

Section	Credit Requirement	Exclusions	Credit
6	Water Use (WU)		23 + 8B
WU P1	Water Conservation Plan Developing a water conservation plan endorsed by top management.	None.	Required
WU P2	Water Efficient Devices At least 80% of all water taps and shower heads for bathing (if any) installed are with Water Efficiency Labelling Scheme (WELS) Grade 2 or above. Alternatively	Water devices installed at tenants' areas can be excluded	Required

Section	Credit Requirement	Exclusions	Credit
7	Indoor Environmental Quality (IEQ)		26 + 5B
	<i>Alternatively</i>		
	In case of the minimum ventilation rate of ANSI/ASHRAE 62.1-2013 is not complied due to the physical constraints of the existing ventilation system, demonstrate that the system is operated at maximum outdoor air delivery rate and provide not less than 5 l/s per person of combined outdoor air rate.		
IEQ 1	Building User Satisfaction Survey on Indoor Comfort	1 credit for conducting regular building user satisfaction surveys to collect anonymous responses regarding the indoor environmental quality (e.g. hygiene, IAQ, ventilation, thermal comfort, lighting quality, aural environment etc.).	None. 1
		1 credit for implementing the recommendations for improvement of IEQ as stipulated in the survey report.	1
IEQ 2	Ventilation in Common Areas	1 credit for providing adequate ventilation for 90% of mechanically ventilated common areas in a building.	None. 1
	<i>Alternatively</i>		
	For naturally ventilated premises, 1 credit for demonstrating 80% of the common areas in a building are provided by natural ventilation.		
IEQ 3	Localised Ventilation	1 credit for providing adequate ventilation for rooms/ areas with significant indoor pollution sources.	None. 1
IEQ 4	Thermal Comfort in Air-Conditioned Premises	1 credit for sustaining the air temperature at the design value within $\pm 1.5^{\circ}\text{C}$ when the air side system is operating at steady state under normally occupied periods.	Premises without any A/C provisions. 1
		1 credit for demonstrating an appropriate temperature (i.e. $< 25.5^{\circ}\text{C}$), relative humidity (i.e. $< 70\%$) and air velocity (< 0.3 m/s) in the building.	1
IEQ 5	Biological Contamination	1 credit for complying with the recommendations given in the Code of Practice - Prevention of Legionnaires Disease, in respect of air-conditioning and ventilation systems, and water systems.	None. 1
IEQ 6	Waste Disposal Facilities	1 credit for providing de-odourising system in all rooms designated for refuse storage or materials recovery.	None. 1
IEQ 7	Control of Environmental Tobacco Smoke	1 credit for implementing no smoking policy outside the building except in designated smoking areas.	None. 1
IEQ 8	IAQ Monitoring	Maximum 7 credits for demonstrating compliance with appropriate criteria for indoor pollutant levels, for following parameters: i. Carbon Dioxide; ii. Carbon Monoxide, Nitrogen Dioxide and Ozone; iii. Respirable Suspended Particulate;	None. 7

Section	Credit Requirement	Exclusions	Credit	
7	Indoor Environmental Quality (IEQ)		26 + 5B	
	<ul style="list-style-type: none"> iv. Formaldehyde; v. Total Volatile Organic Compounds; vi. Radon; and vii. Bacteria. 			
	1 Bonus credit where the whole building (i.e. including the tenant areas) is certified by the Good Class of 'Indoor Air Quality Certification Scheme for Office and Public Place'.		1B	
	1 Bonus credit for demonstrating the continuous participation in the 'Indoor Air Quality Certification Scheme for Office and Public Place' for past 3 consecutive years.		1B	
IEQ 9	IAQ in Car Parks	1 credit for complying with the recommended CO and NO ₂ level as stipulated in ProPECC PN 2/96.	Buildings without car park or with carpark area less than 10% of construction floor area.	1
IEQ 10	Interior Lighting in Normally Occupied Areas	<p>Maximum 3 credits for achieving the prescribed lighting performance in each type of premises, regarding the illuminance and lighting quality as listed below:</p> <ul style="list-style-type: none"> i. Maintained illuminance and illuminance uniformity; ii. Achieving the limiting unified glare rating; and iii. Light sources with an appropriate colour rendering index. 	Residential units, hotels and apartment buildings.	3
		1 Bonus credit for fulfilling the above requirement in tenant's areas with at least 50% coverage.	None.	1B
IEQ 11	Interior Lighting in Areas Not Normally Occupied	<p>Maximum 3 credits for achieving the prescribed lighting performance in each type of not normally occupied areas, regarding the illuminance and lighting quality as listed below:</p> <ul style="list-style-type: none"> i. Maintained illuminance and illuminance uniformity; ii. Achieving the limiting unified glare rating; and iii. Light sources with an appropriate colour rendering index. 	None.	3
IEQ 12	Background Noise	<p>1 credit for demonstrating background noise levels from both external sources and building services equipment are within the prescribed criteria.</p> <p>Based on the nature of the building, relaxation shall be allowed in considering the acceptance of this credit. The Applicant shall submit both the design and calculation to justify such relaxation.</p>	Buildings/ premises in which speech intelligibility is not important.	1
IEQ 13	Room Acoustics	1 credit for demonstrating that the mid-frequency reverberation time in applicable rooms meets the prescribed criteria of different types of premises.	Buildings/ premises in which speech	1

Section	Credit Requirement	Exclusions	Credit
7	Indoor Environmental Quality (IEQ)		26 + 5B
		intelligibility is not important, and rooms of special acoustical nature.	
IEQ 14	Noise Isolation	1 credit for demonstrating airborne noise isolation between rooms, spaces and premises fulfils the prescribed criteria.	1
		For residential developments only, 1 Bonus credit for demonstrating impact noise isolation between floors fulfils the prescribed criteria.	1B
		Based on the nature of the building, relaxation shall be allowed in considering the acceptance of this credit. The Applicant shall submit both the design and calculation to justify such relaxation.	
IEQ 15	Vibration	1 Bonus credit for vibration levels not exceeding the prescribed criteria.	1B
Section	Credit Requirement	Exclusions	Credit
8	Innovations and Additions (IA)		12B
IA 1	Innovative Techniques	Maximum 5 Bonus credits for implementation of each innovative technique which provides environmental benefits in addition to those already covered in this Manual.	5B
IA 2	Performance Enhancements	Maximum 5 Bonus credits for having exemplary performance of the requirement stipulated in this Manual.	None.
IA 3	Provision of Venues or Public Spaces for Environmental Programme	1 Bonus credit for providing venue or public spaces for environmental programmes or events.	1B
IA 4	Engagement with Neighbourhoods	1 Bonus credit for planning, managing and conducting a significant and wide ranging social engagement, engaging the impacted and relevant constituents in the community.	1B
IA 5	Provision of Electrical Vehicle Charging Stations	1 Bonus credit for providing quick charger(s) for Electric Vehicles for 50% of the total parking capacity of the site.	1B

	Section	Credit Requirement	Exclusions	Credit
8	Innovations and Additions (IA)			12B
<u>IA 6</u>	Recognition and Appreciation Awarded from Other Organisations	<p>Maximum 2 Bonus credits for obtaining/ achieving the following listed environmental award/ certification scheme/ campaign.</p> <p>Environmental award/ certification scheme/campaign:</p> <ol style="list-style-type: none"> i. EarthCheck Certification; ii. Green Building Award; iii. Green Globe Certification; iv. CLP Green^{PLUS} Award; v. Hong Kong Awards for Environmental Excellence (HKAEE) “Sectoral Awards”; vi. Hong Kong Green Mark Certification Scheme; vii. Sustainable Building Index; viii. Voluntary Building Assessment Scheme (VBAS) – Environmental Awareness Quality Label; and ix. Other green building related award/ certification scheme/campaign which is not listed above. 	None.	2B
<u>IA 7</u>	Achievement of Hong Kong Green Organisation Certification	<p>Maximum 2 Bonus credits for obtaining the following certificate(s) of Hong Kong Green Organisation Certification (HKGOC).</p> <ol style="list-style-type: none"> i. Wastewi\$e Certificate; ii. Energywi\$e Certificate; iii. IAQwi\$e Certificate; and iv. Carbon Reduction Certificate. 	None.	2B

2	Management	2.P Prerequisite
		2.1 Environmental, Health and Safety (EHS), and energy management
		2.2 Environmental, Social and Governance (ESG) disclosure
		2.3 Staff training
		2.4 Operation and maintenance
		2.5 IAQ management for renovation
		2.6 Cleaning and pest control
		2.7 Building users involvement
	Background	An effective management of building operations and maintenance is the key factor for better environmental performance of the building, especially for existing buildings. The 'Management' category assesses the overarching management system, policies and procedures put in place, staffing and resources, and the involvement of building users to ensure buildings are operating in their maximum sustainable potential.
2.P	Prerequisite	MAN P1 Green Purchasing Plan
	Background	It is encouraged to investigate the products that are purchased for the building and to replace them with environmentally friendly alternatives. A purchasing plan or practice shall be formulated to use green products whenever possible.
2.1	EHS and Energy Management	MAN 1 EHS and Energy Management System
	Background	Regardless the age and condition of a building, there are initiatives that the management can undertake to improve the quality and performance of a building. The Applicant is expected to carry out programmes to enhance health and safety, and reduce environmental impacts in the building operation.
2.2	ESG disclosure	MAN 2 Environmental, Social and Governance (ESG) Disclosure
	Background	ESG reporting helps a company to better understand the impacts of their activities, set goals, measure performance and mitigate risks and identify opportunities of certain environmental and social issues.
2.3	Staff training	MAN 3 BEAM Professional MAN 4 Staff Training and Resources
	Background	Staff skills and experience are important factors in improving building performance. The qualifications and experience of the management, operation and maintenance staff should be commensurate with the engineering systems, size and complexity of the buildings.
2.4	Operation and maintenance	MAN 5 Building and Site Operation and Maintenance MAN 6 Building Services Operation and Maintenance MAN 7 Electronic Operation and Maintenance Platform

	Background	Effective operation and maintenance of the building, systems and equipment significantly impact on the building performance. Proper O&M can also extend the life of building structure and equipment, avoid wastage of resources for premature refurbishment or replacements.
2.5	IAQ management for renovation	MAN 8 IAQ Management for Renovation
	Background	Dust and odours generated by various renovation, fit-out and decoration activities can cause air pollution. Good management practices reduce the impacts of air pollution on the workers and adjacent neighbours, and protect the HVAC&R systems in the building.
2.6	Cleaning and pest control	MAN 9 Green Cleaning MAN 10 Integrated Pest Management
	Background	Green housekeeping ensures the products and procedures for cleaning and pest control are safe, hygienic and with limited environmental impacts.
2.7	Building users involvement	MAN 11 User Guidance MAN 12 Green Lease
	Background	Sustainable operation of a building can be achieved if the tenants or building users are willing to work with the Building Owner/ Building Management Company. Building environmental performance can then be improved with such collaborative efforts.

	MAN P1 Green Purchasing Plan
Exclusion	None.
Objective	To encourage the purchase of products used in the Operation and Maintenance (O&M) of buildings with reducing environmental impacts through the formulation of procedures or plans.
Requirement	Demonstrate that green purchasing plan and procedures (including both materials and services) either follow their internal company guideline or other international standards, shall be in place.
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall provide documentary evidence that purchasing plans and procedures endorsed by top management are in place for governing the procurement of materials, products and equipment, which shall have no significant negative impacts on the environment and the safety and health of employees and building users.</p> <p>The green purchasing plan may include the procurement of:</p> <ol style="list-style-type: none">i. Durable goods, products and equipment; materials with low embodied energy;ii. Locally produced materials where available;iii. Wood products from well-managed sources;iv. Products which do not use CFCs, HCFCs, halons;v. Salvaged materials and components;vi. Rapidly renewable materials;vii. Durable materials;viii. Finishes; paints, adhesives, etc., with low levels of emissions;ix. Minimal packaging and/or recyclable packaging;x. Products having high recyclable content;xi. Products that are recyclable;xii. Energy efficient appliances and equipment; andxiii. Water efficient appliances, etc. <p>The above list is not exhaustive and it is not necessary to include all abovementioned items in their own green purchasing plan. The Applicant shall compose their green purchasing plan which adequately covers the materials with respect to their own operational needs.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following document:</p> <ol style="list-style-type: none">i. Green purchasing plan endorsed by top management.

Background

Purchasing practices should form part of environmental management system of an organisation. Where major consumers include safety, health and environmental considerations in purchasing decisions, the market place does respond. BEAM Plus encourages purchasing practices that promote the supply and use of environmentally friendly products, materials and equipment in building operations and maintenance, redecoration, fit-out, etc.

Although life-cycle analysis can be used to assess materials and products, there are no well-defined criteria for categorizing materials as green or environmentally friendly. This involves the identification and quantification of all of the raw materials and energy consumed in the production, use, and disposal of the product, as well as the pollutants and by-products generated. Two of the most significant environmental impact caused by materials used in buildings are effects generated from waste streams and the possible impacts on the health and comfort of occupants. There are many environmentally friendly alternatives that are available in market to substitute the products currently used in buildings.

As early as year 2000, the Government amended its procurement regulations to require bureaux and departments to take environmental considerations into account when procuring goods and services [1]. Specifically, bureaux and departments are encouraged to avoid using single-use disposable items and purchase products with the following features:

- i. Improved recyclability, high recycled content, reduced packing and greater durability;
- ii. Higher energy efficiency;
- iii. Utilising clean technology and/or clean fuels;
- iv. Resulting in reduced water consumption;
- v. Emitting fewer irritating or toxic substances during installation or use; and/or
- vi. Resulting in decrease in production of toxic substances, or of substance with lower toxicity, upon disposal.

1 Environmental Protection Department. Green Procurement. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/english/how_help/green_procure/green_procure.html

	MAN 1 EHS and Energy Management System
Exclusion	None.
Objective	To encourage the building management to implement systematic management systems that embrace quality, environmental, health, safety, and energy.
Credit Attainable	3 + 2 Bonus
Credit Requirement	<p>1 credit where the building management operates an Environmental Management System (EMS) certified to ISO 14001.</p> <p>1 credit where the building management operates an Occupational Health and Safety System (OHSAS).</p> <p>1 credit where the building management operates an Energy Management System (EnMS).</p> <p>1 Bonus credit where building management operates an OHSAS certified to BS OHSAS 18001.</p> <p>1 Bonus credit where the building management operates an EnMS certified to ISO 50001.</p>
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall provide the documentation such as the manuals, operation procedures, policies and audit records to demonstrate that the Building Management Company is operating the EMS, OHSAS and EnMS.</p> <p>Note: Only internal audit records for the OHSAS and EnMS are required when the Applicant does not intend to attempt the Bonus credits.</p> <p>Bonus credit(s) can be achieved when the Applicant can provide the BS OHSAS 18001 and ISO 50001 certificates. The name of the building should be stated in the certificates. Credits will not be granted if only the head office operation of the Building Management Company is awarded with the certificates.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">A valid ISO 14001 certificate of the building [#];Internal audit records of the OHSAS and EnMS system of the building (for the Applicant who cannot present the BS OHSAS 18001 and ISO 50001 certificate) [#];A valid BS OHSAS 18001 certificate of the building [#]; andA valid ISO 50001 certificate of the building [#].

Note: If the Applicant has provided the BS OHSAS 18001 and ISO 50001 certificate, it is not necessary for the Applicant to provide the documentations as stated in item (ii) above.

Background

ISO 14001 [1] is an internationally recognised standard that specifies requirements for an environmental management system to enable organisations to develop and implement policies and objectives which take into account the legal and other requirements to which the organisation subscribes, and information about significant environmental aspects. It applies to those environmental aspects that the organisation identifies as those which it can control and those which it can influence. It does not itself state specific environmental performance criteria.

BS OHSAS 18001 [2] is an international standard which sets out the requirements for occupational health and safety management good practice for organisation with any scale. It provides guidance to help organisation design its own health and safety framework. BS OHSAS 18001 can also be adapted to all types of organisations to help eliminate or minimise operational risks and hazards. The standard is designed to help organisation create the best possible working conditions and meet legal, industry and customer requirements.

ISO 50001 [3] specifies requirements for establishing, implementing, maintaining and improving an energy management system. Its purpose is to enable an organisation to follow a systematic approach in achieving continual improvement of energy performance including energy efficiency, energy use and consumption. It specifies the requirements applicable to energy use and consumption including measurement, documentation and reporting, design and procurement practices for equipment, systems, processes and personnel that contribute to energy performance. It does not prescribe specific performance criteria with respect to energy.

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- 1 International Organization for Standardization. ISO 14000 Environmental Management. Retrieved 1 March 2016, from <http://www.iso.org/iso/home/standards/management-standards/iso14000.htm>
 - 2 BSI Group. Getting Started with BS OHSAS 18001 Occupational Health and Safety Management. Retrieved 1 March 2016, from <http://www.bsigroup.com/en-GB/ohsas-18001-occupational-health-and-safety/Introduction-to-BS-OHSAS-18001>
 - 3 International Organization for Standardization. ISO 50001 - Energy management. Retrieved 1 March 2016, from <http://www.iso.org/iso/home/standards/management-standards/iso50001.htm>

	MAN 2 Environmental, Social and Governance (ESG) Disclosure
Exclusion	None.
Objective	To encourage Building Owner/ Building Management Company to have ESG reporting and disclose its operational performance to the public.
Credit Attainable	1 + 1 Bonus
Credit Requirement	<p>1 credit where the Building Owner/ Building Management Company discloses sustainability policy and targets to the public.</p> <p>1 Bonus credit where the Building Owner/ Building Management Company follows Global Reporting Initiative™ (GRI) Sustainability Reporting Guidelines and discloses the G4 sustainability report to the public.</p>
Assessment	<p><u>Criteria</u></p> <p>a) Disclosure of Sustainability Policy and Targets</p> <p>The Applicant shall provide the sustainability policy and targets of the Building Owner/ Building Management Company. The scope of the sustainability policy is not regulated but it should cover at least the environmental issues.</p> <p>b) ESG Reporting</p> <p>The ESG report shall be composed under the Reporting Principles and either “Core” or “Comprehensive” in accordance options of the GRI G4 guidelines.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <p>a) Disclosure of Sustainability Policy and Targets</p> <p>i. Sustainability policy and targets and evidence showing such information is disclosed to public.</p> <p>b) ESG Reporting</p> <p>i. The ESG report of the Building Owner/ Building Management Company that follows the GRI G4 requirements [#]; and</p> <p>ii. Evidence showing the ESG report is publicly available.</p>
Background	Corporate sustainability reporting, also known as ESG Reporting, plays an important role in business sustainability and is rapidly becoming an essential business management tool. Its importance is recognised by companies, investors and regulators alike. It is a means

by which businesses can better understand the impacts of their activities, set goals, measure performance and mitigate risks and identify opportunities [1].

The GRI Sustainability Reporting Guidelines are the most widely used sustainability reporting framework in the world. They offer Reporting Principles, Standard Disclosures and an Implementation Manual for the preparation of sustainability reports by organisations, regardless of their size, sector or location. Such information is available at GRI website [2].

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- 1 Business Environment Council Handbook: Understanding Materiality for Environmental, Social and Governance Reporting. Retrieved 1 March 2016, from http://bec.org.hk/files/images/BEC_advisorygroups/BEC_ESG_Handbook_web.pdf
 - 2 Global Reporting Initiative. G4 Sustainability Reporting Guidelines. Retrieved 1 March 2016, from <https://www.globalreporting.org/STANDARDS/G4/Pages/default.aspx>

	MAN 3	BEAM Professional
Exclusion	None.	
Objective	To facilitate the application for the BEAM Plus certification process and ensure the operation of the building complies with the BEAM Plus requirements.	
Credit Attainable	2	
Credit Requirement	1 credit for at least 2 members from the Building Management Company are certified BEAM Professional with EB credential.	

Alternatively

1 credit for at least 1 key member from the Building Management Company is a certified BEAM Professional with EB credential and at least 1 member is a certified BEAM Affiliate.

1 additional credit for the building-in-charge being a certified BEAM Professional with EB credential and with at least 1 professional corporate membership qualification (e.g. HKIH, HKIA, HKIE, HKIS (BS/PFM), RICS (BS/FM), IFMA, HKIFM, BSOMES, or equivalent).

Assessment

Criteria

The Applicant shall provide evidence that at least 2 members from the Building Management Company are BEAM Professionals with EB credential. Alternatively, at least 1 key member from the Building Management Company is a certified BEAM Professional with EB credential and at least 1 member is a certified BEAM Affiliate.

The involved personal shall meet the following requirements:

- i. He/ she has been working at that Building Management Company for at least 6 months at the time of submission;
- ii. He/ she is accredited as BEAM Professional with EB credential/ BEAM Affiliate at the time of submission;
- iii. He/ she shall not be in the BEAM Professional/ BEAM Affiliate suspension list throughout the entire BEAM Plus certification period; and
- iv. For the 'building-in-charge', he/ she shall have obtained the BEAM Professional accreditation and professional corporate membership qualification at least 12 months at the time of submission.

Documentation

The Applicant shall provide the following documents:

- i. The organisation chart of the Building Management Company;

- ii. Documents such as meeting minutes, memo, internal emails etc. showing the involved personal has been working in the Building Management Company for at least 6 months;
- iii. The BEAM Professional/ BEAM Affiliate certificate; and.
- iv. The CV and professional certificate of the “building-in-charge”.

Background

BEAM Professionals [1] are green building professionals accredited by the HKGBC in various aspects of the entire green building life cycle. A key role of BEAM Professional is to integrate the latest green building standards and practices into building planning, design, construction and operation.

A BEAM Affiliate [2] is a person accredited by HKGBC as being competent to support green building design, construction and operation. This qualification welcomes members of sub-professional or technical staff working in the construction/ real estate industry, interior design practitioners and recent degree graduates who are in the process of working towards a professional qualification. The credential also serves as an alternative route to become a BEAM Professional if one have not yet meet with the BEAM Professional requirement.

1 Hong Kong Green Building Council Limited. BEAM Professionals. Retrieved 1 March 2016, from <https://www.hkgbc.org.hk/eng/beam-Professional.aspx>

2 Hong Kong Green Building Council Limited. BEAM Affiliate. Retrieved 1 March 2016, from <https://www.hkgbc.org.hk/eng/beam-affiliate.aspx>

	MAN 4	Staff Training and Resources
Exclusion		None.
Objective		To ensure the staff training and technical resources are adequate for the Operation and Maintenance (O&M) of the building.
Credit Attainable		2
Credit Requirement		a) Staff and Technical Resources 1 credit for having adequate staff and technical resources to meet the O&M requirements of the building. b) Staff Training 1 credit for providing adequate and periodic training for the staff responsible for the O&M of the building.
Assessment		<u>Criteria</u> a) Staff and Technical Resources The Applicant shall provide the organisation chart (O-chart) clearly indicating the responsibility and job duties of each building management staff for the O&M of the building. If the O&M of a certain system is outsourced, the Applicant shall provide the tender/ contract documents requiring the sub-contractor to have sufficient resources for the works. The building-in-charge shall also provide a statement stating the staffing and resources are adequate for the O&M of the building. b) Staff Training The Applicant shall provide the training records for the staff members responsible for O&M for the past 12 months. The topics of the training are not regulated but the training shall be related to the operation of the building. The minimum training requirements are 15 hours and 6 hours per year for the building-in-charge and other staff respectively. Only staff members of the Building Management Company are included in the assessment. Staff members of sub-contractors are excluded from the assessment. <u>Documentation</u> The Applicant shall provide the following documents: a) Staff and Technical Resources i. The O-chart of the building;

- ii. Tender/ contract documents requiring the sub-contractor to have sufficient resources for the O&M works (if any);
- iii. Statement stating the staffing and resources are adequate for the O&M of the building; and
- iv. Job duties and responsibilities of the staff responsible for O&M.

b) Staff Training

- i. Staff training records for the past 12 months [#].

Background

Staff skills and experience are important factors in improving building performance. The qualifications and experience of the management, O&M staff should be commensurate with the engineering systems, size and complexity of the buildings.

With different initiatives and requirements such as the implementation of Buildings Energy Efficiency Ordinance (Cap 610) and Lifts and Escalators Ordinance (Cap 618), the O&M staff needs to maintain their knowledge and skills to satisfy new demands from a building and its users. Therefore, the O&M staff is encouraged to have sufficient training sessions to acquire updated knowledge and uphold the latest requirements.

MAN 5 Building and Site Operation and Maintenance

Exclusion	For part b) only, Building footprint exceeds 80% of the site area.
Objective	To encourage planned inspection, maintenance and repairing of the building fabric, structure, and external areas in order to enhance safety and reduce environmental impacts.
Credit Attainable	2
Credit Requirement	<p>a) Building Maintenance</p> <p>1 credit for demonstrating the operation of a planned programme of regular inspection, cleaning and maintenance of the building's fabric and structure under the control of the Applicant.</p> <p>b) External Areas and Facilities</p> <p>1 credit for demonstrating the operation of a planned programme of regular inspection, cleaning and maintenance of external areas and facilities.</p>
Assessment	<p><u>Criteria</u></p> <p>a) Building Maintenance</p> <p>The Applicant shall provide documentation to demonstrate that the system of inspections, cleaning, maintenance and general repairs to the building fabric and structural elements are effective in maintaining reliability and prolonging service life of the building. Building fabric and structure shall include:</p> <ul style="list-style-type: none">i. Building façade;ii. Curtain wall; andiii. External cladding. <p>b) External Areas and Facilities</p> <p>The following external areas and facilities which are under the control of the Applicant shall be assessed:</p> <ul style="list-style-type: none">i. Roads and pavements;ii. Hard and soft landscape areas;iii. Stairs and ramps; andiv. Recreational facilities. <p>The Applicant shall provide the planned programme of regular inspection, cleaning and maintenance of the external areas and facilities. The frequency of these activities is not regulated and it is subject to the Applicant's operation requirement. The Applicant shall provide the undertaking letter signed by the building-in-charge stating</p>

that the frequency for inspection, cleaning and maintenance is sufficient.

This credit shall be excluded where the building footprint exceeds 80% of the site area.

Documentation

The Applicant shall provide the following documents:

- i. A list of all the elements of the building fabric and structure (for part a)/ external areas and facilities (for part b) subject to regular inspection, cleaning and maintenance;
- ii. Maintenance procedures of the elements as stated (i) above;
- iii. Personnel that are responsible for the inspection, cleaning and maintenance;
- iv. Records of inspection, maintenance and repairs for the past 12 months [#];
- v. The planned inspection, maintenance and repairs programme for the next 12 months; and
- vi. Undertaking letter signed by the building-in-charge.

Background

Where buildings are not properly maintained, they deteriorate more quickly, where in extreme cases major refurbishment or demolition may be required. In such cases, the process of refurbishment or reconstruction will consume significant amount of both energy and materials, unnecessarily increases the burden on natural resources. Appropriate planned inspection, cleaning and maintenance is essential to retain the value of a building as an asset, sustain utility, ensure compliance with legal requirements such as health and safety regulations, and to assist owners and occupants in managing the building in a more efficient and hence environmentally conscious manner. Regular inspections of the building fabric and structural elements should be carried out, with proper system to manage the long-term maintenance planning programme to ensure that all maintenance will be continued in order to retain asset value of the building and maintain the performance requirements.

MAN 6 Building Services Operation and Maintenance

Exclusion	For part a) only, building does not have a central HVAC plant.
Objective	To encourage proper and efficient operation of the engineering systems by operation and maintenance programme.
Credit Attainable	7
Credit Requirement	<p>a) Central Heating Ventilation and Air-Conditioning (HVAC) Plant</p> <p>2 credits for demonstrating the operation of a planned programme of regular inspection and maintenance of the central HVAC plant.</p> <p>b) Other Engineering Systems</p> <p>Maximum 4 credits for demonstrating the operation of a planned programme of regular inspection and maintenance of the following listed systems:</p> <ul style="list-style-type: none">i. Air-conditioning system except central HVAC plant;ii. Electrical system;iii. Lighting system; andiv. Plumbing and Drainage system. <p>c) Assessment of Operation & Maintenance Practice</p> <p>1 credit for having undertaken an audit of the effectiveness of the O&M practices for all building services engineering systems.</p>
Assessment	<p><u>Criteria</u></p> <p>a) Central HVAC Plant</p> <p>The Applicant shall provide the planned programme for regular inspection and maintenance of the central HVAC plant. The frequency of these activities is not regulated and subject to the Applicant's operation requirement. The Applicant shall provide the undertaking letter stating that the frequency for inspection and maintenance is sufficient</p> <p>b) Other Engineering Systems</p> <p>1 credit can be achieved for demonstrating the operation of a planned programme for each of the above listed items.</p> <p>The Applicant shall provide the planned programme of regular inspection and maintenance of the air-conditioning (except central HVAC plant), electrical, lighting and plumbing & drainage system. The frequency of these activities is not regulated and it is subject to the Applicant's operation requirement. The Applicant shall provide the</p>

undertaking letter stating that the frequency for inspection and maintenance is sufficient

c) Assessment of Operation & Maintenance Practice

The Applicant shall provide a report detailing the steps taken, outcomes and actions taken or planned (with appropriate budget information) for improvements in the building services operation and maintenance practices. The audit approach should follow the details in BSRIA's guide [1] or similar equivalent approaches. The effectiveness audit shall be conducted every 5 years.

Documentation

The Applicant shall provide the following documents:

- i. Frequencies of cleaning and inspection of the applicable HVAC and other engineering system(s);
- ii. Maintenance procedures of the system(s) as stated (i) above;
- iii. Personnel that are responsible for the inspection, cleaning and maintenance;
- iv. Records of inspection, maintenance and repairs for the past 12 months [#];
- v. The planned inspection, maintenance and repairs programme for the next 12 months; and
- vi. Audit report showing the effectiveness of the O&M practice.

Background

Building Owner/ Building Management Company conducting the O&M should adapt in size and complexity to ensure that operating performance is sustained. All O&M requires knowledgeable, skilled, and well trained management and technical staff and a well planned maintenance program.

Although it is a general practice for Building Owner/ Building Management Company to conduct routine inspections, maintenance works and fulfil statutory requirements for the building services systems, a well-planned operation and sufficient maintenance works would maintain higher operation efficiencies, reduce breakdown rate, prolong the operation life of the systems while the system can still meet with the comfort, health, and safety requirements of the building users.

1 Building Services Research and Information Association. BG 24/2012 Asset Management and Maintenance Audits. BSRIA 2012.

MAN 7 Electronic Operation and Maintenance Platform

Exclusion	None.
Objective	To improve the O&M efficiency of the building.
Credit Attainable	1 Bonus
Credit Requirement	1 Bonus credit for operating an electronic O&M platform by the Building Owner/ Building Management Company.

Assessment Criteria

The Applicant shall demonstrate an electronic O&M platform is adopted by the Building Management Company. Screenshots shall be provided to justify that the following documents are already uploaded to the platform:

- i. Building layout drawings;
- ii. Air-side and water-side schematic diagrams;
- iii. Equipment schedules of the MVAC, plumbing & drainage, electrical and lift & escalator systems (if any); and
- iv. O&M manuals of the aforesaid systems.

Documentation

The Applicant shall provide the following documents:

- i. Description of the electronic O&M platform; and
- ii. Screenshots showing the required documentations are uploaded to the O&M platform.

Background

Conventionally, the O&M manuals are large volumes of information covering installation, operation and maintenance details for the packaged equipment, systems and plant facilities. Feedbacks from the industry show that using these hard copy manuals in operations has caused problems for detailed component information from manufacturers. Significant time and effort have to be invested to clarify particular equipment details for maintenance, repair or even reordering. The hard copy formats of these manuals are also inconvenient to store, hard to maintain and soon become outdated when new equipment is installed.

The electronic O&M platform is a system that can store all the necessary contract documents, as-built drawings, equipment O&M manuals, etc. It ensures the building operators can retrieve the documents easily and allows effective communication among the management staff and the working team.

	MAN 8	IAQ Management for Renovation
Exclusion		None.
Objective		To reduce the potential for having indoor air quality problems caused by renovation, fit-out and decoration and where applicable demolition, with the consideration of the benefit of workers and adjacent neighbours.
Credit Attainable		2
Credit Requirement		1 credit for providing a Construction Indoor Air Quality (IAQ) Management Plan. 1 credit for providing records that the Construction IAQ Management Plan has been implemented by the Building Owner/ Building Management Company/ tenants during renovation.
Assessment		<u>Criteria</u> The Applicant shall provide a Construction IAQ Management Plan including but not limited to the following items: <ol style="list-style-type: none">i. Procedures adopted in enhancing the IAQ during renovation, fit-out or decoration and occupancy stage;ii. Measures to avoid contamination of adjacent normally occupied areas and common areas;iii. Contaminant source controls;iv. Provision of adequate outside air during installation of materials and finishes;v. Measures to protect the air ducts, on-site storage or protection of installed absorptive materials;vi. Cleaning procedures to be employed;vii. Procedures for building flush-out; andviii. Replacement of filtration media used on permanent MVAC equipment at completion of work. The Applicant shall also provide site records to demonstrate the Construction IAQ Management Plan is properly implemented. <u>Documentation</u> The Applicant shall provide the following documents: <ol style="list-style-type: none">i. Construction IAQ Management Plan; andii. Records showing the Construction IAQ Management Plan is properly implemented during renovation, fit-out and decoration [#].
Background		Dust and odours generated from various construction activities result in serious air pollution. High levels of dust, combined with other pollutants, can cause respiratory illnesses, for example inhaled particles may aggravate asthma, bronchitis, and very small particles

may even cause lung cancer. Dust also reduces visibility, dirties clothing and buildings and speed up the corrosion.

Best practices can prevent air pollution resulting from renovation, fit-out and decoration activities. A construction IAQ Management Plan should be developed before the work begins with contractors and be a regular agenda item for progress meetings.

The sequence of which materials, fixtures and fittings are installed during each phase of construction is a crucial component of the management plan. For example, products that emit Volatile Organic Compounds (VOCs) over a relatively short timeframe should be installed prior to the installation of absorbent materials.

Practical guidance for the control of air pollution during construction is available from ASHRAE [1], the United States Environmental Protection Agency (USEPA) [2] and Hong Kong Environmental Protection Department (EPD) [3]. Though the guidance focuses on managing the activities in occupied buildings, measures are also applicable in managing construction activities in new buildings. The guide provides recommendation in scheduling activities, source control, pathway interruption, protecting installed HVAC&R systems and equipment, and good housekeeping.

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- 1 ASHRAE Indoor Air Quality Guide: Best Practices for Design, Construction and Commissioning. Retrieved 1 March 2016, from <https://www.ashrae.org/resources--publications/bookstore/indoor-air-quality-guide>
 - 2 United States Environmental Protection Agency. IAQ Design Tools for Schools. Retrieved 1 March 2016, from <http://www.epa.gov/iaq-schools/indoor-air-quality-design-tools-schools>
 - 3 Environmental Protection Department. Improve the Indoor Air Quality in Your Building. Retrieved 1 March 2016, from http://www.iaq.gov.hk/media/9099/booklet_building.pdf

	MAN 9	Green Cleaning
Exclusion		None.
Objective		To encourage environmentally friendly cleaning products and procedures to protect human health and environmental quality.
Credit Attainable		2 + 1 Bonus
Credit Requirement		a) Implementation of Green Cleaning 1 credit for demonstrating the appropriate green cleaning procedures/ practices for the project. b) Use of Green Cleaning Detergent 1 credit for demonstrating the use of at least 10% of green cleaning detergents. 1 Bonus credit for demonstrating the use of at least 20% of green cleaning detergents.
Assessment		<u>Criteria</u> a) Implementation of Green Cleaning The Applicant shall provide the green cleaning plan including but not limited to the following: i. Method statements for the routine cleaning procedures; ii. Purchase of green cleaning products whenever possible; iii. Staff and training requirements; and iv. Feedbacks from building users. b) Use of Green Cleaning Detergent The Applicant shall also demonstrate at least 10% (in terms of volume) of the cleaning detergents purchased in the past 12 months are certified green products. <u>Documentation</u> The Applicant shall provide the following documents: a) Implementation of Green Cleaning i. The green cleaning plan; ii. Catalogues and certificates of the green cleaning detergents [#]; iii. Purchase order or delivery notes of the green cleaning detergents [#]; and iv. Staff and training requirements.

b) Use of Green Cleaning Detergent

- i. Summary table showing at least 10%/ 20% of the total volume of cleaning detergents purchased in the past 12 months are green cleaning detergents [#].

Background

Using less hazardous cleaning products (e.g. biodegradable, low toxicity, lower VOC emission, reduced packaging, etc.) can minimise harmful effect on cleaning staff and occupants and help maintaining a good indoor air quality.

Furthermore, putting environmental consideration in the first priority when making choice in purchasing cleaning materials and products can reduce related water, waste, and ambient air pollution.

Green Seal [1] establishes requirements for cleaning service providers, including in-house and external cleaning services, to create a green cleaning system that protects human health and the environment.

Information on environmentally friendly cleaning products can be found in many organisation including: Green Seal, EPD [2] (publishes green specifications of cleansing products requirements), and USEPA [3], etc.

1 Green Seal. Retrieved 1 March 2016, from <http://www.greenseal.org/>

2 Environmental Protection Department. List of Products with Recommended Green Specifications. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/english/how_help/green_procure/files/Green_Specifications.pdf

3 United States Government Environmental Protection Agency. Environmentally Preferable Purchasing (EPP) Cleaning. Retrieved 1 March 2016, from <http://www.epa.gov/epp/pubs/products/cleaning.htm>

	MAN 10	Integrated Pest Management
Exclusion		None.
Objective		To ensure the management of pest is safe, hygienic and with limited environmental impacts.
Credit Attainable		1
Credit Requirement		1 credit for implementing an integrated programme for pest management.
Assessment		<p><u>Criteria</u></p> <p>The Applicant shall provide an integrated pest management plan which details the following:</p> <ol style="list-style-type: none">Roles and responsibilities of the pest control service provider;Methods used for pest control;Identification of root causes of pest problems;Pest-specific strategies;Use of pesticides;Record keeping; andTraining requirements. <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">The integrated pest management plan adopted by the service provider;Frequency of the pest control; andPest control records for the past 12 months [#].
Background		<p>Pesticides pose risks to human health and the environment when users' directions of the products are not followed. Irresponsible use of pesticides, for example unnecessary or excess usage, disposing pesticides in a bad manner, could contaminate the environment. Even alternative or organic pesticides can result in the above environmental issues if they are not used properly. Building management should adopt pest control in ways that offer a means to reduce the risk, and in some cases, the amount of pesticides needed.</p> <p>Integrated pest management (IPM) is an approach to pest control by utilising regular monitoring and record keeping to determine if and when treatments are needed. It employs a combination of strategies and tactics to keep pest numbers low enough to prevent unacceptable damages or annoyance. Biological, cultural, physical, mechanical, educational, and chemical methods are used in site-specific combinations to solve the pest problems. Chemical controls are used only if necessary, and in the least-toxic formulation that is effective against the pest. Educational strategies are used to enhance pest</p>

prevention and to build up support for the IPM program.

The USEPA promotes integrated pest management through documents such as for schools [1], because IPM represents a prudent approach to understanding and dealing with environmental concerns. Because IPM is a decision-making process instead of a rote method, an IPM program will always be able to take into account different kind of pest problems.

1 United States Environmental Protection Agency. Managing Pests in Schools. Retrieved 1 March 2016, from <http://www2.epa.gov/managing-pests-schools>

MAN 11 User Guidance

Exclusion	None.
Objective	To inform and educate the building users the environmental, comfort and health impacts of their activities and encourage them to change their behaviour in order to reduce the environmental impacts.
Credit Attainable	1
Credit Requirement	1 credit for providing user guide to encourage and promote environmentally friendly activities.
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall provide a user guide which encourages and promotes environmentally friendly building use and activities. The guide shall include, but not limited to, the following sections:</p> <ol style="list-style-type: none">i. Health and hygiene;ii. Energy use;iii. Water conservation;iv. Sustainable materials for fit-out and redecoration;v. Waste management; andvi. Indoor environmental quality. <p>Evidence shall also be provided to demonstrate the user guide has been distributed to the building users. Feedback channel shall also be established for continual improvement.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. The building user guide;ii. Records showing the building user guide is distributed to the building users; andiii. Evidence showing that the feedback channel(s) from the building users to the Building Owner/ Building Management Company is established.
Background	<p>The overall building performance can be improved and the environmental impacts during operation can be reduced with the co-operation of the tenants or sub-owners of premises. Very often users are not aware of hygiene, comfort and environmental issues. It is good practice to provide guidance on the design and use of premises as they largely affect the overall building performance. It should contain guidance and information of applicable regulations, recommendations or requirements regarding the internal decorations and fit-out works in occupied areas, etc.</p>

MAN 12 Green Lease

Exclusion	Buildings without any tenants.
Objective	To ensure the Building Owner/ Building Management Company and building users can work together to achieve sustainable operation of the building.
Credit Attainable	1 Bonus
Credit Requirement	1 Bonus credit for implementing green lease to the tenants of the buildings.
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall demonstrate a green lease, either adopting a 'Soft' or 'Hard' approach is implemented for the building. The contents of the green lease are not regulated and shall be subject to the operation of the Applicant. However, the Applicant shall provide documentation to demonstrate that the green lease has already been implemented in at least 10% of its tenants.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. The green lease between the Building Owner/ Building Management Company and the tenant; andii. Records showing that the green lease is being implemented in at least 10% of the tenants [#].
Background	<p>Green lease is an arrangement that offers substantial benefits, both quantitatively and qualitatively, to both Building Owner/ Building Management Company and the tenants by [1]:</p> <ol style="list-style-type: none">i. Improving environmental performance of the leased space by securing a few critical commitments from both landlord and tenants;ii. Aligning financial incentives so that both parties benefit from adopting green measures; andiii. Improving environmental data reporting transparency to enable landlord and tenants to measure success against agreed-upon goals. <p>HKGBC has issued the "Green Tenancy Driver for Office Buildings" [2] in 2014. The Guide introduces a 5-stage roadmap, including Green Awareness, Voluntary Pilot Run, Graduated Collaborative Approach,</p>

1 Jones Lang LaSalle. Perspectives on Sustainable Tenant Strategies. Retrieved 1 March 2016, from <http://www.joneslanglasalle.com/SiteCollectionDocuments/United%20States/JLL-Perspectives-on-sustainable-tenant-strategies.pdf>

2 Hong Kong Green Building Council Limited. Green Tenancy Driver for Office Buildings. Retrieved 1 March 2016, from <https://www.hkgbc.org.hk/eng/got.aspx>

Split Incentive Consent and Green Lease. It aims at encouraging landlord-tenant collaboration to create a sustainable working environment.

3 Site Aspects

3.1 Site location

3.2 Emissions from the site

3.3 Greenery

3.4 Site amenities

Background

The assessment criteria in this category focus on the location of the building, 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.

3.1 Site location

SA 1 Green Building Attributes

Background

Building location is important in respect of adequacy of local amenities and public transport provisions in order to reduce travel needs and reliance on private vehicles. It would be an advantage if an existing building certified under BEAM or BEAM Plus in the past.

3.2 Emissions from the site

SA 2 Noise Pollution

SA 3 Light Pollution

Background

Various emissions from the building can have a negative impact on neighbouring properties. Certain emissions are within control of the building management and efforts should be made to minimise any potential negative impacts on neighbours and anyone passing by the development.

Discharges and emissions from the site should be considered over a building's lifetime. Noise pollution and light pollution arising from the building engineering systems and equipment is of concern, all of these can be alleviated by good design and proper installation and maintenance.

3.3 Greenery

SA 4 Heat Island Reduction

SA 5 Green Roof

Background

It is important to adequately consider the microclimate in the surrounding during the construction and operation of the building. In cities with high building density like Hong Kong, green roof contribute to preserve and expand urban greenery at the same time enhance the quality of living environment. A building rooftop covered with greenery can also significantly reduce surface temperature in summer.

3.4 Site amenities

SA 6 Corporate Social Responsibility Facilities/ Services

SA 7 Amenities for Operation and Maintenance

SA 8 Barrier Free Access

Background

In recent years, the HKSAR Government has sought to encourage better building designs through various 'green and innovative' features that can enhance the quality of buildings, and has put in place a number of incentives to encourage the adoption of such features. Measures which aim at improving accessibility for users, creating more enjoyable living and working spaces and ensuring efficient services cater the needs of users, etc. are example that enhance the quality and efficiency of built environments and thereby ensure buildings are sustainable.

	SA 1	Green Building Attributes
Exclusion		None.
Objective		To encourage the buildings to employ best practices in design and/or construction in order to enhance green performance.
Credit Attainable		7
Credit Requirement		<p>Maximum 7 credits for the building that has been certified under BEAM Plus New Buildings (Version 1.1 or 1.2), BEAM Version 4/04 or 5/04.</p> <ul style="list-style-type: none">i. 7 credits for Platinum grade or equivalent;ii. 6 credits for Gold grade or equivalent; andiii. 5 credits for any other grade. <p><i>Alternatively</i></p> <p>Maximum 5 credits for an uncertified building that meets the listed performance characteristics.</p>
Assessment	<u>Criteria</u>	<p>Only buildings with a valid BEAM/ BEAM Plus or other internationally recognised standards certificate are eligible to achieve the credits via this path. For BEAM 4/04 and 5/04 certified buildings, the certificates shall only be considered as valid when the projects were awarded less than 5 years ago at the time of submission.</p> <p>For an uncertified building, 1 credit is achieved for each of the listed characteristics, up to a maximum of 5 credits:</p> <ul style="list-style-type: none">i. Parking capacity must not exceed the minimum requirement from Government;ii. Public transport shall be within 500m walking distance from building main entrance(s);iii. At least 10 different basic services shall be located within 500m walking distance from building main entrance(s) (The basic services are made reference from section SA 3a of BEAM Plus New Buildings Version 1.2);iv. At least 2 different recreational facilities shall be located within 500m walking distance from building main entrance(s) (The recreational facilities are made reference from section SA 3a of BEAM Plus New Buildings Version 1.2);v. Provision of sitting facilities which are open to public during building operation period;vi. Provision of public space for exhibition or organising events (Exhibitions/ events shall be held within the past 12 months);vii. Using pervious materials for a minimum of 50% of hard landscaped areas;viii. Enhancement of the biodiversity within the site boundary when compared with the time of building completion;

- ix. Ensuring the vertical daylight factor is above 12% for neighbouring sensitive buildings;
- x. Provision of adequate active and passive security measures to suit the operation need; and
- xi. Provision of standard charger(s) for electric vehicles in the car park for 50% of the total parking capacity of the site.

Documentation

The Applicant shall provide the following documents:

For Certified Buildings

- i. Valid Certificate.

For Uncertified Buildings

- i. Summary table showing the quantities and locations of the facilities/ services with description;
- ii. Calculation/ technical reports;
- iii. Equipment catalogues and technical sheets;
- iv. Layouts/ building services drawings to indicate the facilities/ installations; and
- v. Record photographs.

Background

BEAM Plus encourages the Applicant to select certified green buildings, be BEAM/ BEAM Plus certified or otherwise, or building whose land use and site design can be shown to include green features. The Building Owners/ Building Management Companies are responsible for sourcing and selecting premises and are provided with opportunity to demonstrate corporate commitment to sustainable development of Hong Kong by selecting a building that has been certified as 'green' or implementing the green features in respect of site aspects.

	SA 2	Noise Pollution
Exclusion		None.
Objective		To reduce the noise nuisance to neighbours caused by building services equipment.
Credit Attainable		2
Credit Requirement		<p>a) Provision of Acoustic Treatment</p> <p>1 credit for providing adequate acoustic treatment to the following building services equipment: chillers, cooling towers, ventilation fans with Sound Power Level (SWL) higher than 80 dB(A).</p> <p>b) Demonstration of Compliance with HKPSG Criteria</p> <p>1 credit for demonstrating that the level of the intruding noise at the façade of the potential Noise Sensitive Receivers (NSRs) is in compliance with the criteria recommended in the Hong Kong Planning Standards and Guidelines (HKPSG).</p>
Assessment		<p><u>Criteria</u></p> <p>a) Provision of Acoustic Treatment</p> <p>Credit can be achieved for the provision of adequate acoustic treatment to chillers, cooling towers, ventilation fans with SWL higher than 80 dB(A). For examples:</p> <ul style="list-style-type: none">i. Chillers are being enclosed in an acoustic enclosure or plantroom or are installed with discharge/ intake silencer;ii. Erection of a barrier or installation of silencer for cooling tower; andiii. Installation of silencer at major fan discharge outlets (for exhaust fans) or at air inlets (for intake fans). <p>Alternatively, in case of no acoustic treatment is required and the Applicant can demonstrate the Acceptable Noise Levels (ANLs) at the nearest NSRs can comply with the statutory requirements, this credit can be excluded. If the Applicant can demonstrate the ANLs are at least 1 dB(A) lower than the statutory requirements, the credit is also achieved.</p> <p>b) Demonstration of Compliance with HKPSG Criteria</p> <p>Credit can be achieved by demonstrating that the level of the intruding noise at the façade of the potential NSRs is in compliance with the criteria recommended in HKPSG.</p> <p>Assessment shall be made at the façade of the potential NSRs.</p>

When assessed in accordance with the Technical Memorandum, the level of the intruding noise at the façade of the NSR shall be at least 5 dB(A) below the appropriate ANL shown in Table 3 of the Technical Memorandum or, in the case of the background being 5 dB(A) lower than the ANL, shall not be higher than the background, in accordance with paragraph 4.2.13, Chapter 9 of the Hong Kong Planning and Standards Guidelines [1]. The Applicant shall provide evidence in form of detailed analysis, appropriate calculations and/or measurements supporting that the building complies with the assessment criteria. In cases where a Noise Abatement Notice has been served, evidence of full compliance with the required remedial action shall also be presented.

Documentation

The Applicant shall provide the following documents:

a) Provision of Acoustic Treatment

- i. Equipment catalogues (with SWLs), operation schedule, drawings showing the provision of acoustic treatment for chillers, cooling towers, ventilation fans with SWL larger than 80 dB(A); and
- ii. Record photographs of the acoustic treatment.

b) Demonstration of Compliance with HKPSG Criteria

- i. Summary table listing the nearest NSRs, building equipment sound level, quantities, ANL and noise level at the façade of the nearest NSRs;
- ii. Location plan to indicate the positions of the NSRs and building equipment;
- iii. Equipment catalogues; and
- iv. Calculation or measurement.

Background

Unwanted sound from equipment on and around buildings contributes to noise pollution with potential impacts on neighbouring properties. Under the Noise Control Ordinance noise emanating from certain types of premises is controlled by means of Noise Abatement Notices which may be served on owners or occupiers of offending premises if the noise emitted:

- i. Does not comply with the ANL as set out in a technical memorandum;
- ii. Is a source of annoyance to any person other than persons on the premises; and
- iii. Does not comply with any standard or limit contained in any current regulations.

1 Planning Department. Hong Kong Planning and Standards Guidelines, Chapter 9 Environment. Retrieved 1 March 2016, from http://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/ch9/ch9_text.htm

In practice the Authority will respond to complaints and compliance with the ANL will be required only after a Noise Abatement Notice has been served. Non-compliance with such a notice will be an offence. The Technical Memorandum contains the technical procedures that shall be adopted by the Authority when investigating a complaint regarding noise emanating from such premises to determine whether or not a noise abatement notice shall be issued. BS 4142 [2] suggests methods for noise prediction and a generalised description of prediction is given in ISO 9613-2 [3]. Good practices on building services system noise control is published by the Environmental Protection Department (EPD) [4] [5].

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- 2 British Standards Institution. Method for rating industrial noise affecting mixed residential and industrial areas. British Standard BS 4142:1997. London, BSI. 1997.
 - 3 International Standards Organisation. ISO 9613-2. Attenuation of Sound During Propagation Outdoors Part 2. General Method of Calculation 1st ed. 1996.
 - 4 Environmental Protection Department. Good practices on pumping system noise control. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/sites/default/files/epd/english/environmentinhk/noise/guide_ref/files/Pump_sys_E-06.pdf
 - 5 Environmental Protection Department. Good practices on ventilation system noise control. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/sites/default/files/epd/english/environmentinhk/noise/guide_ref/files/Vent_sys_E-06.pdf

	SA 3	Light Pollution
Exclusion		None.
Objective		To minimise light pollution caused by external lighting.
Credit Attainable		2
Credit Requirement		2 credits if there are no external lightings installed for the building. <i>Alternatively</i> 1 credit for switching off the Building Owner/ Building Management Company's external lightings from 23:00 to 07:00. 1 additional credit for liaising with tenants and requiring them to switch off the external lightings from 23:00 to 07:00.
Assessment		<u>Criteria</u> 2 credits can be achieved if there are no external lightings, including advertisement boards, façade lightings and video walls, installed on exterior of the building. <i>Alternatively</i> 1 credit can be achieved by switching off the Building Owner/ Building Management Company's external lightings from 23:00 to 07:00 hours. 1 additional credit can be achieved by liaising with tenants and requesting them to switch off the external lightings from 23:00 to 07:00 hours. External light management policy endorsed by top management is required. The scope and exemption is made reference to the Document for Engaging Stakeholders and the Public set up by the Task Force on External Lighting clauses 38 to 43 [1]. <u>Documentation</u> The Applicant shall provide the following documents: i. Record photographs of external area and exterior of the building; and ii. Layouts/ building services drawings demonstrating that there are no external lightings installed for the building.

1 Task Force on External Lighting. Document for Engaging Stakeholders and the Public. Retrieved 1 March 2016, from <http://www.enb.gov.hk/sites/default/files/pdf/ExternalLightingEng.pdf>

Alternatively

- i. Summary table listing the quantities and operation schedule of all external lightings;
- ii. Location plan to indicate the external lightings;
- iii. External light management policy endorsed by top management; and
- iv. Record photographs of Building Owner/ Building Management Company's external lighting in both switch-on and switch-off state).

For additional credit:

- v. Signed agreement between Building Owner/ Building Management Company and tenants for switching off the external light; and
- vi. Record photographs of tenants' external lighting in both switch-on and switch-off state.

Background

In view of growing public concerns on light nuisance and energy wastage caused by external lightings, the Government has taken a series of actions to identify the problems arising from external lightings and to come up with possible measures to mitigate the issues. The actions include the commissioning of a consultancy study on energy wastage and light nuisance of external lightings in 2009 (the Study) and the promulgation of the Guidelines on Industry Best Practices for External Lighting in January 2012 to encourage early action for minimising light nuisance and energy wastage. In addition, the Government set up the Task Force on External Lighting (the Task Force) in August 2011 to give advices on the appropriate strategy and measures for tackling nuisance and energy wastage problems caused by external lightings with regard to international experience and practices.

As per the Document for Engaging Stakeholders and the Public issued by the Task Force on External Lighting (set up by Environment Bureau), limiting the use of external lightings in a specified time period at night (suggested to be 23:00 to 07:00 hours) could reduce the effects of light pollution.

	SA 4	Heat Island Reduction
Exclusion		None.
Objective		To ensure the microclimate has been adequately considered, and where appropriate, suitable mitigation measures are provided.
Credit Attainable		1 + 2 Bonus
Credit Requirement		<p>1 credit for demonstrating the implementation of any combination of the following strategies for a minimum of 10% of the external non-roof area (i.e. ground floor and podium with less than 15m in height):</p> <ul style="list-style-type: none">i. Greenery;ii. Water feature;iii. Green wall or vertical greening;iv. Shading device; and/orv. Paving materials with solar reflectance (SR) of 0.33. <p>1 to 2 Bonus credit(s) for more than 20% or 30% of the external non-roof area covered with the aforesaid features.</p>
Assessment		<p><u>Criteria</u></p> <p>Use any combination of the listed strategies (in terms of area) for a minimum of 10% of the external non-roof area, including both ground floor and podium with less than 15m in height.</p> <p>All greenery areas shall be measured based on the soil areas as shown on the drawings. Greenery in movable pots shall not be accounted. Reduction factor is not necessary for water feature.</p> <p>Bonus credits can be achieved for having more than 20% (1 Bonus credit) or 30% (2 Bonus credits) of the total external non-roof area covered with the aforesaid features.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ul style="list-style-type: none">i. Narrative of the strategies and the combination (if any);ii. Layouts and calculations;iii. Record photographs of green walls, vertical greenings or shading devices; andiv. Catalogue or laboratory test reports on solar reflectance (SR) of paving materials.

Background

Urban greenery and vegetation in a densely built city can lower the temperature of unprotected open space and roof in summer and also mitigate the heat island effect. Also, vegetation helps to increase the rainwater retention time such that local thermal comfort can be enhanced [1]. Installing shading device, using paving material with high reflectance materials and water features are some of the strategies to mitigate the effect of urban heat island. More details can be found in the publications by Green Power [2] and USGBC LEED [3] etc.

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- 1 Buildings Department. CEPAS for Buildings, Operation Stage. Retrieved 1 March 2016, from <http://www.bd.gov.hk/english/documents/code/cepas/OperationStageE.pdf>
 - 2 Green Power. Report on Urban Heat Island Effect in Hong Kong. Retrieved 1 March 2016, from http://www.greenpower.org.hk/html/download/concern/gp_urban_heat_island_report_2012.pdf
 - 3 USGBC. LEED v4 for Building Operations and Maintenance.

SA 5 Green Roof

Exclusion	None.
Objective	To ensure the microclimate at the roof areas and reduce the temperature underneath, which in turn saving air-conditioning energy.
Credit Attainable	1 Bonus
Credit Requirement	1 Bonus credit for providing green roof and/or organic farm for at least 20% of the available main roof area.
Assessment	<p><u>Criteria</u></p> <p>Green roof and/or organic farm shall cover at least 20% of available main roof area. Areas occupied by mechanical equipment shall be excluded from total main roof area.</p> <p>All green roof and/or organic farm areas shall be measured horizontally based on the soil areas as shown on the plan. Greenery in movable pots shall not be accounted.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">Layouts and calculations; andRecord photographs of the green roof/ organic farm.
Background	<p>Apart from enhancing the landscape and the environment of our city, attenuating the heat island effect and improving air quality, roof greening can also improve the performance and increase the life span of waterproof and insulation facilities on the roof. Consequently, roof greening is also conducive to energy conservation.</p> <p>The extent of greening is determined by the use and design of the roof, which usually include the provision of planters, soft and hard landscaping, paving, decking and related waterproofing, irrigation and drainage system works. More details can be found in Greening, Landscape and Tree Management Section of Development Bureau [1].</p> <p>Organic farm in a building can advocate sustainability by providing benefits such as producing healthy and nutritious food free from harmful chemical residues, conserving natural resources, encouraging an abundance of species living in balanced, harmonious ecosystems, etc. More details can be found in Agriculture, Fisheries and Conservation Department (AFCD) website for Organic Farming [2].</p>

1 Development Bureau. Greening, Landscape and Tree Management Section. Retrieved 1 March 2016, from <http://www.greening.gov.hk/en/home/index.html>

2 Agriculture, Fisheries and Conservation Department. Organic Farming. Retrieved 1 March 2016, from https://www.afcd.gov.hk/english/agriculture/agr_orgfarm/agr_orgfarm.html

	SA 6	Corporate Social Responsibility Facilities/ Services
Exclusion	None.	
Objective	To encourage development as an asset to the society and promotes Corporate Social Responsibility (CSR).	
Credit Attainable	4	
Credit Requirement	Maximum 4 credits for providing the following listed CSR facilities/ services: <ul style="list-style-type: none">i. Allowing persons with visual impairment to bring along with their guide dogs;ii. Automated External Defibrillator;iii. Baby-care room;iv. Bicycle parking;v. Breast feeding room;vi. Free baby stroller lending service;vii. Free drinking fountain;viii. Free wheelchair lending service;ix. Free Wi-Fi in common area;x. Organic farm;xi. Permanent art work;xii. Permanent green building education show board; andxiii. Others to be proposed by the Applicant.	
Assessment	<u>Criteria</u> 1 credit can be achieved for the provision of each of the above listed items. Same type of provision in multiple locations can only be counted once. The organic farm can be double-counted in section SA 4 Heat Island Effect and SA 5 Green roof if the requirements in both sections are complied. The size of organic farm is not regulated under this section. Each of the claimed facilities/ services shall be supported with record photographs for verification. <u>Documentation</u> The Applicant shall provide the following documents: <ul style="list-style-type: none">i. Location plan to indicate the facilities/ services; andii. Record photographs.	
Background	The provision of CSR facilities/ services does not only provide convenience to the building users, but also to the community and society. It is one of the many opportunities to demonstrate the commitment of an organisation on CSR. CSR facilities/ services are essential to the mental and physical well-	

beings of individuals and the community as a whole. It contributes to the quality of life of building users and hence sustainability.

Applicants are encouraged to propose other CSR facilities/ activities which are subject to the approval of Technical Review Committee (TRC) on case-by-case basis.

	SA 7 Amenities for Operation and Maintenance
Exclusion	None.
Objective	To facilitate the maintenance staff in carrying out operation and maintenance of the building and its engineering services.
Credit Attainable	3
Credit Requirement	<p>Maximum 3 credits for providing the following listed amenities that improve the operation and maintenance of the building and its engineering services:</p> <ul style="list-style-type: none">i. Aerial working platform;ii. Building Management System (BMS);iii. Cat ladder;iv. Davit arm system;v. External pipe duct;vi. Fall arrest system;vii. Gondola system;viii. Guard room;ix. Maintenance platform;x. Maintenance workshop;xi. Movable platform, andxii. Others to be proposed by the Applicant.
Assessment	<p><u>Criteria</u></p> <p>1 credit can be achieved for providing each of the above listed items. Same type of amenity in multiple locations can only be counted once.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ul style="list-style-type: none">i. Summary table listing each type of amenities and their locations; andii. Record photographs.
Background	<p>Availability of maintenance tools for maintenance staff is one of the key factors determining the effectiveness of the building and its engineering services for maintaining building performance and value.</p> <p>BEAM Plus encourages the Applicant to provide adequate maintenance tools and amenities to facilitate the maintenance staff in improving operation and maintenance of the building and its engineering services.</p>

	SA 8	Barrier Free Access
Exclusion		None.
Objective		To ensure full access to pertinent building facilities for persons with disability.
Credit Attainable		3
Credit Requirement		Maximum 3 credits for providing enhanced barrier free access provisions as per the latest version of the Design Manual of Barrier Free Access.
Assessment		<p><u>Criteria</u></p> <p>1 credit can be achieved for the provision of each of the enhanced provisions as stipulated in the “Recommended Design Requirements” of The Code of Practice for Barrier Free Access 2008 [1]. Same type of provision in multiple locations can only be counted once.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">Summary table listing the enhanced provisions, and their locations;Location plan to indicate the facilities/ services; andRecord photographs.
Background		<p>In order to enhance social integration, disabled persons shall have the same rights as any other individuals. Under the Disability Discrimination Ordinance, discrimination against persons with a disability by failing to provide means of access to any premises that the public is entitled to enter or use, or by refusing to provide appropriate facilities is prohibited, unless the premises are designed to be inaccessible to persons with a disability.</p> <p>Full access for disabled persons means more than just being able to enter and leave a building, or use the toilets. It enables persons with a disability to make full use of the basic facilities in a building without assistance and undue difficulties. The Code of Practice for Barrier Free Access sets out design requirements to cater for the special needs of persons with locomotor disabilities, visual impairment and hearing impairment.</p> <p>Facilities that cater for the special needs of the physically impaired shall be provided, which include but not limited to shaded areas for walking and sitting, accessibility to public toilets, adequate lighting, emergency phones, visual-free walking areas, ramps with handrails;</p>

1 Buildings Department. Design Manual - Barrier Free Access 2008. Retrieved 1 March 2016, from http://www.bd.gov.hk/english/documents/code/e_bfa2008.htm

and car or bus dropping-off points near to venues.

4	Materials and Waste Aspects	4.P Prerequisite
		4.1 Selection of materials
		4.2 Waste management and reduction

Background	The amount and the types of materials used and the waste generated in the operation and maintenance and fitting-out of buildings represents a significant use of natural resources. There are opportunities to reduce environmental impacts through interior design methods and choice of materials and products, in terms of extracted raw materials, emissions, and the embodied energy. Discussion on waste management in Hong Kong is more critical than before. It is important to encourage the stakeholders to recognise the importance of the waste management for existing buildings in Hong Kong.
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4.P Prerequisite	MWA P1 Waste Recycling Facilities
	MWA P2 Materials Purchasing Plan

Background	This part is to set out the minimum requirement for materials and waste aspects in terms of provision of waste recycling facilities, and the plan of environmentally friendly material procurement.
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4.1 Selection of materials	MWA 1 Materials Purchasing Practices
	MWA 2 Use of Certified Green Products
	MWA 3 Ozone Depleting Substances

Background	The selection of materials that can be planted and harvested within a relatively short time, that are otherwise sustainable, have significant recycled content, or otherwise have relatively low environmental impacts in their life cycle, should be considered for maintenance, redecoration, fit-out and renovations.
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4.2 Waste management and reduction	MWA 4 Waste Management Plan
	MWA 5 Recycling Facilities for Different Waste Streams
	MWA 6 Food Waste Management
	MWA 7 Waste Treatment Equipment
	MWA 8 Action to Waste Reduction

Background	Hong Kong is running out of land for waste disposal, and if no action is taken sooner, the existing landfill sites will be filled up in the next 3 to 5 years. To tackle the problem, much effort has been put in reducing waste generation and identifying outlets for reusing recycled materials. With adequate provisions for waste collection and sorting, and a proactive approach in seeking opportunities for recycling, the management of waste from buildings can be improved significantly.
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MWA P1 Waste Recycling Facilities

Exclusion	None.
Objective	To reduce pressure on landfill sites and help to preserve non-renewable resources by promoting recycling of waste materials.
Requirement	Providing spaces for the collection, sorting, storage and disposal of waste and recovered materials.
Assessment	<u>Criteria</u>

Scenario 1 – If the Project is assessed under BEAM Plus for New Buildings in any version, this prerequisite is automatically fulfilled. Certification under BEAM 4/04 or any other versions shall not be deemed as fulfilling the requirement and should follow Scenarios 2 or 3.

Alternatively

Scenario 2 – Otherwise, the Project shall comply with the prevailing regulation in respect of refuse collection chamber and/or material recovery room at the time of building completion. (Note: It is not necessary to comply with the latest version of PNAP APP-35).

Alternatively

Scenario 3 – For aged buildings which are not required to provide any refuse collection chamber and/or material recovery room as per Government's requirements, storage facilities shall be provided at prominent locations (i.e. cannot be located in car park or other non-occupied areas) for the collection of paper, plastic and metal waste for recycling. Collection agreement is required.

Documentation

The Applicant shall provide the following documents:

Scenario 1

- ii. BEAM Plus New Buildings certificate or assessment result; and
- iii. Photographs of the as-built recycling facilities and refuse collection room(s).

Alternatively

Scenario 2

- i. Latest location plan, equipment details and record photographs to illustrate the compliance with the prevailing regulation at the time of building completion.

Alternatively

Scenario 3

- i. Latest location plan, equipment details and record photographs to illustrate the compliance with the prevailing regulation at the time of building completion;
- ii. Summary table listing the quantities of various waste type and locations of the recycling facilities;
- iii. Location plan to indicate the recycling facilities;
- iv. Record photographs; and
- v. Collection organisation/ recycler information, including:
 - a. Company name and address;
 - b. Collection frequency; and
 - c. Collection agreement, signed by Building Owner/ Building Management Company.

Background

Recycling can reduce the amount of waste disposed on landfills. Therefore well managed facilities are essential in encouraging recycle of waste materials. Locating the facility in prominent location with good directional signage, encouraging occupants to separate different types of waste and supporting recycling activities are important steps in contributing to Hong Kong's environmental movement.

MWA P2 Materials Purchasing Plan

Exclusion	None.
Objective	To encourage purchasing practices which aim at reducing the environmental impacts of products used through formulating the purchasing procedure or plan into a more environmentally friendly way.
Requirement	Demonstrating that the plan of material procurement (sub-section under MAN P1 Green Purchasing Plan) and its procedures for both on-going consumables and durable goods either following the internal company guideline or other international standards are in place.
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall provide a materials purchasing plan including but not limited to the following items:</p> <ol style="list-style-type: none">i. Endorsed policy;ii. Objectives;iii. Short term (3 years) and long term (5 years) targets;iv. Responsibility;v. 5R principles (rethink, reduce, reuse, replace and recycle);vi. Environmental attributes;vii. Specified on-going consumables;viii. Specified durable goods; andix. Monitoring and checking. <p>The plan shall be endorsed by top management of Building Owner/ Building Management Company and reviewed regularly.</p> <p>This prerequisite only assesses the procurement plan for materials/ products, where procurement for services is assessed under section MAN P1 Green Purchasing plan. The implementation of materials procurement practice is not necessary for fulfilling this prerequisite. The performance of implementation is assessed under section MWA 1 Green Product Procurement Practices.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following document:</p> <ol style="list-style-type: none">i. Materials purchasing plan endorsed by top management.
Background	Although life-cycle analysis can be used to assess materials and products, there are no well-defined criteria for categorizing materials as green or environmentally friendly. This involves the identification and quantification of all of the raw materials and energy consumed in the production, use, and disposal of the product, as well as the pollutants and by-products generated. Two of the most significant environmental impact caused by materials used in buildings are waste

streams and the possible impacts on the health and comfort of occupants. There are many environmentally friendly alternatives that are available in market to substitute the products currently used in buildings. More details and green procurement specification can be found in Environmental Protection Department (EPD) website [1].

Typical Environmental Attributes

- i. Minimise the use of virgin materials;
- ii. Reduce energy/ water consumption;
- iii. Reduce or cease the use of toxic substances;
- iv. Use products that are generated from environmentally certified processes;
- v. Reusable and recyclable at the end of product life;
- vi. Minimised packaging; and
- vii. With proper way of disposal etc.

Examples for On-going Consumables

Goods/ Products	Environmental Attributes
Batteries	- Rechargeable
Envelops, business cards etc.	- Certified (e.g. FSC) - Chlorine free - Coating free - Recycled content
Paper towel and toilet tissue	- Non-chlorine bleached paper - Recycled paper
Plastic bags	- Biodegradable
Printing paper	- Certified (e.g. FSC) - Chlorine free - Coating free - Recycled content
Toner cartridges	- Refillable

Examples for Durable Goods

Goods/ Products	Environmental Attributes
Computers	- With Energy Label
Lamps	- With Energy Label
Office furniture	- Volatile Organic Compounds (VOCs) free - 2 nd hand product
Paint	- VOCs free - Water-based

1 Environmental Protection Department. Green Procurement. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/english/how_help/green_procure/green_procure.html

	MWA 1	Materials Purchasing Practices
Exclusion		None.
Objective		To encourage purchasing practices which reduce the environmental impacts of products used by implementing Materials Purchasing Plan.
Credit Attainable		5 + 1 Bonus
Credit Requirement		<p>1 to 2 credit(s) for demonstrating at least 50% or 70% of purchased on-going consumables are environmentally friendly products for the past 12 months as minimum.</p> <p>1 to 2 credit(s) for demonstrating at least 50% or 70% of purchased durable goods are environmentally friendly products for the past 12 months as minimum.</p> <p>1 credit for demonstrating at least 70% of purchased both on-going consumables and durable goods are environmentally friendly products for the past 24 months.</p> <p>1 Bonus credit for demonstrating at least 70% of purchased both on-going consumables and durable goods are environmentally friendly products for the past 36 months.</p>
Assessment		<p><u>Criteria</u></p> <p>The Applicant shall quantify the procurement in dollar values. The items of environmentally friendly on-going consumables/ durable goods shall be listed in the endorsed materials purchasing plan under section MWA P2.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. Summary table listing the product type, manufacturer, quantities, and environmental attribute [#];ii. Calculations [#];iii. Documents showing the environmental attributes [#].iv. Purchase records [#]; andv. Record photographs [#].
Background		See MWA P2.

	MWA 2	Use of Certified Green Products
Exclusion		None.
Objective		To encourage the purchase of certified green products that have low environmental impacts.
Credit Attainable		2 Bonus
Credit Requirement		Maximum 2 Bonus credits for purchasing green products certified by Construction Industry Council (CIC) Carbon Labelling Scheme/ HKGBC Green Product Accreditation and Standards (HK G-PASS) or other internationally recognised schemes.
Assessment		<p><u>Criteria</u></p> <p>1 Bonus credit of having 5% of the green products in any one of the product categories as specified in CIC Carbon Labelling Scheme/ HK G-PASS or other internationally recognised schemes.</p> <p>2 Bonus credits for having 5% of certified green products for at least 3 product categories (each category should have at least 5%) as specified in CIC Carbon Labelling Scheme/ HK G-PASS or other internationally recognised schemes.</p> <p>The percentage calculation can be in mass, volume, quantity, area or dollar's value. All items including existing and newly purchased items shall be included in the calculation.</p> <p>For any green products which have been certified under other internationally recognised schemes, the Applicant shall provide the technical information of the product with justification for TRC consideration.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">Summary table listing the product type, manufacturer, certification body, environmental attribute [#];Calculations [#];Certificate(s) of the green products [#];Purchase records [#]; andRecord photographs [#].
Background		The CIC initiates the Carbon Labelling Scheme for construction products to promote green building practices and sustainable development. The Scheme aims to provide the communication of verifiable and accurate information on the carbon footprint of construction products for client bodies, designers, contractors and end users to select 'low carbon' materials. As a Hong Kong-based voluntary scheme, it aims at encouraging the demand for, and supply of, low

carbon products, thereby contributing to the transition to a low carbon economy [1].

CIC Product Category (Tentatively):

- i. Cement;
- ii. Reinforcing bar; and
- iii. Structural steel.

To address increasing concerns about the environmental performance of building materials and products, the HKGBC has taken the initiative to develop a specific yet comprehensive Green Product Accreditation and Standards, in accordance with the ISO 14024 standard. There are five levels of Green Building Product Labels from 'Platinum' to 'Green', awarded to the products with satisfied assessment results. It aims to provide a pragmatic and meaningful differentiation of safer, healthier, more efficient and sustainable building products for the construction industry [2].

HK G-PASS Product Category (Tentatively):

- i. Extruded Aluminium Product;
- ii. Glazing;
- iii. Panel Board;
- iv. Ceramic Tile;
- v. Stone;
- vi. Furniture;
- vii. Plant-based Fibre Composite;
- viii. Paint & Coating;
- ix. Wall Covering;
- x. Adhesive & Sealant;
- xi. Chiller;
- xii. Compact Fluorescent Lamps (CFLs);
- xiii. LED Lighting;
- xiv. Electronic Ballast; and
- xv. Cable & Wire.

1 Construction Industry Council. Carbon Labelling Scheme. Retrieved 1 March 2016, from <http://zcb.hkcic.org/Eng/CarbonLabelling/AboutScheme/Overview.aspx>

2 Hong Kong Green Building Council Limited. Green Product Accreditation and Standards. Retrieved 1 March 2016, from <http://hkqpass.hkgbc.org.hk/nindex.php>

	MWA 3	Ozone Depleting Substances
Exclusion		None.
Objective		To reduce the release of ozone depletion substances into the atmosphere.
Credit Attainable		3
Credit Requirement		<p>a) Newly and Existing Installed Equipment using Refrigerants</p> <p>1 credit for all the equipment (both newly purchased and existing) using the refrigerants with Global Warming Potential (GWP) less than 1,900.</p> <p>Alternatively, for equipment with refrigerant GWP value > 1,900, credit can be achieved when the Applicant can demonstrate a phased programme of refrigerant replacement.</p> <p>1 credit for using refrigerants with a combined value less than or equal to the threshold for the combined contributions to ozone depletion and global warming potentials for all new and existing HVAC&R equipment that under the control of Applicant.</p> <p>b) Fire Suppression Materials</p> <p>1 credit for using the fire suppression and other materials that avoids the use of ozone depleting substances in their manufacture, composition or use.</p>
Assessment		<p><u>Criteria</u></p> <p>a) Newly and Existing Installed Equipment using Refrigerants</p> <p>1 credit can be achieved for newly and existing installed equipment using refrigerants with GWP less than 1,900. For equipment with refrigerant GWP value > 1,900, credit can be achieved if the Applicant can demonstrate that a phased programme of refrigerant replacement is planned with budget reserved for implementation.</p> <p>1 credit can be achieved if the newly and existing installed equipment using refrigerants do not exceed the maximum threshold for the combined contributions to ozone depletion and global warming potentials. The threshold can be determined using the following formula:</p>

$LCGWP + LCODP \times 10^5 \leq 13$, where:

LCGWP	=	$[GWPr \times (Lr \times Life + Mr) \times Rc] / Life$
LCODP	=	$[ODPr \times (Lr \times Life + Mr) \times Rc] / Life$
GWPr	=	Global Warming Potential of Refrigerant (0 to 12,000kg CO ₂ /kg r)
ODPr	=	Ozone Depletion Potential of Refrigerant (0 to 0.2kg CFC 11/kg r)
Lr	=	Refrigerant Leakage Rate (2.0%)
Mr	=	End-of-life Refrigerant Loss (10%)
Rc	=	Refrigerant Charge (0.065 to 0.65kg of refrigerant per kW of AHRI rated or Eurovent Certified cooling capacity.)
Life	=	Equipment Life (10 years; default based on equipment type, unless otherwise demonstrated.)

b) Fire Suppression Materials

All portable fire extinguishers shall avoid the use of ozone depleting substances (ODS) in their manufacturing process, composition or use. For permanent system/ equipment (e.g. replacement of fire suppressants, thermal insulations, and other applications), only newly installed materials would be assessed.

For all sections

The newly installed equipment is defined as the equipment that is installed within the past 12 months.

Documentation

The Applicant shall provide the following documents:

a) Newly and Existing Installed Equipment using Refrigerants

- i. Summary table listing the newly and existing installed equipment, type, model number and refrigerant type [#];
- ii. Calculation [#];
- iii. Equipment catalogue/ technical sheets [#]; and
- iv. Record photographs [#].

b) Fire Suppression Materials

- i. Summary table listing the quantity and types of portable fire extinguishers and fixed fire protection system [#];
- ii. Equipment catalogue/ technical sheets [#]; and
- iii. Phase out plan (for intermediate stage only).

Background

In Hong Kong, Ozone Layer Protection Ordinance (Cap 403) 1989 demonstrates the international obligations Hong Kong has taken to control the manufacture, import and export of ODS [1]. Ozone Layer Protection (Controlled Refrigerants) Regulation 1994 requires the conservation of controlled refrigerants used in large scale installations and motor vehicles [2]. Ozone Layer Protection (Products Containing Scheduled Substances) (Import Banning) Regulation 1993 prohibits the import of portable fire extinguishers containing halons and other controlled products from a country or place not a party to the Montreal Protocol unless the Authority considers that it complies with the requirements of the Protocol. CFCs generally have high ODP and GWP. HCFCs generally have much lower ODP and GWP. HFCs offer near-zero ODP, but some have comparatively high GWPs. EPD started to ban the import of products containing HCFCs in phases since 2010 [3]. For ozone depletion potential, global warming potentials and calculation method, details can be found in EPD website [4] and USGBC LEED v4 manual [5].

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- 1 Environmental Protection Department. A Concise Guide to the Ozone Layer Protection Ordinance. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/files/cgto_olpo_eng.pdf
 - 2 Environmental Protection Department. A Concise Guide to the Ozone Layer Protection (Controlled Refrigerants) Regulation. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/files/cgt_olp_cr_eng.pdf
 - 3 Environmental Protection Department. Ozone Layer Protection. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/english/environmentinhk/air/ozone_layer_protection/wn6_info.html
 - 4 Environmental Protection Department. Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, Residential or Institutional Purposes) in Hong Kong. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/sites/default/files/epd/english/climate_change/files/Guidelines_English_2010.pdf
 - 5 USGBC. LEED v4 for Building Operations and Maintenance.

	MWA 4 Waste Management Plan
Exclusion	None.
Objective	To encourage best practice for the management of waste, including sorting, recycling and disposal of waste.
Credit Attainable	1
Credit Requirement	1 credit for developing a waste management plan.
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall provide a waste management plan including but not limited to the following items:</p> <ol style="list-style-type: none">i. Objectives;ii. Responsibility;iii. Waste minimisation programme;iv. Waste recycle/ reuse programme;v. Waste data collection system;vi. Influence on building users (e.g. training/ workshop/ campaign);vii. Resource allocation;viii. Training for staff; andix. Reporting to top management. <p>The plan shall be endorsed by top management of Building Owner/ Building Management Company and reviewed regularly.</p> <p>The implementation of waste management plan is not necessary for attaining this credit. This is assessed under section MWA 8 Waste Management Implementation and Continual Improvement.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following document:</p> <ol style="list-style-type: none">i. Waste management plan endorsed by top management.
Background	<p>The building management can achieve a great deal in improving waste management and recycling, especially through positive engagement with building users. Where waste management is in an emergent stage, the starting point is a waste stream audit to establish current waste benchmarks, then to evaluate how each type of waste can be reduced through source reduction, reuse and recycling. Development of a waste management system, suitably resourced with facilities, staff and time, should follow. Targets should include the reduction of incoming waste streams, compliance with regulations in respect of hazardous waste, reducing waste disposal at landfill, identifying recycling opportunities, etc. Pro-active management should consider reducing use of toxic materials, or at least ensure environmentally sound disposal.</p>

Hong Kong generates various types of waste, and each has its own requirements for handling. EPD keeps regular statistics on each waste type, such as composition, quantity sent for disposal and quantity recycled, for example, municipal solid waste, waste paper, plastic waste and glass bottles [1]. More details can be found in Hong Kong Waste Reduction Website [2].

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- 1 Environmental Protection Department. Waste Reduction Factsheet. Retrieved 1 March 2016, from https://www.wastereduction.gov.hk/en/assistancewizard/recyc_fact_sheet.htm
 - 2 Environmental Protection Department. Hong Kong Waste Reduction Website. Retrieved 1 March 2016, from <https://www.wastereduction.gov.hk/en/index.htm>

MWA 5 Recycling Facilities for Different Waste Streams

Exclusion	None.
Objective	To reduce pressure on landfill sites and help to preserve non-renewable resources by promoting recycling of waste materials.
Credit Attainable	4
Credit Requirement	<p>Maximum 4 credits for providing the following listed on-site recycling facilities and implementing the materials collection arrangement:</p> <ul style="list-style-type: none">i. Fluorescent lamp (CFLs and fluorescent tubes);ii. Glass bottle;iii. Rechargeable battery; andiv. Waste Electrical and Electronic Equipment (WEEE).
Assessment	<p><u>Criteria</u></p> <p>1 credit can be achieved for providing recycling facilities for each of the above listed items. Same type of provision in multiple locations can only be counted once.</p> <p>For each waste stream, provide at least one storage bin/ storage area for recycling. The recycling facilities shall be located at prominent location(s) (i.e. cannot be located in car park or other non-occupied areas). The size and collection frequency are not regulated.</p> <p>The collection organisation/ recycler shall be employed by either Building Owner or Building Management Company.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ul style="list-style-type: none">i. Summary table to illustrate the quantities and locations of the facilities;ii. Location plan to indicate the facilities;iii. Record photographs;iv. Collection organisation/ recycler information, including:<ul style="list-style-type: none">a. Company name and address;b. List of recycled material;c. Collection frequency; andd. Collection agreement, signed by Building Owner/ Building Management Company.

Background

Well managed facilities for the recycling of solid waste encourage recycling and results in reductions in the disposal at landfill sites. Buildings should be provided with facilities for waste separation and sorting, and short term storage at appropriate locations.

The assessment seeks to establish the extent to which facilities are provided to allow for the recycling of waste. The means to facilitate waste recycling is not prescribed as much depends on the design and type of building, and the activities carried out within.

MWA 6 Food Waste Management

Exclusion	None.
Objective	To reduce pressure on landfill sites by promoting the reduction and recycling of food waste.
Credit Attainable	1 + 1 Bonus
Credit Requirement	1 credit for signing the Food Wise Charter and demonstrating the implementation of food waste reduction good practice guide as per Hong Kong Food Wise Campaign. 1 Bonus credit for providing on-site used cooking oil collection facility and implementing the collection arrangement.

Assessment

Criteria

The Applicant shall sign the Food Wise Charter and contribute to reduce food waste following the good practice guide as per Hong Kong Food Wise Campaign. The record of the implementation in the past 12 months shall also be provided.

Currently the Food Wise Hong Kong Campaign has issued good practice guides covering market, F&B, hotel, residential, shopping mall and school. The good practices for other building types shall be made reference with these existing practice guides.

The Bonus credit can be individually achieved even the Applicant cannot achieve the normal credit under this section.

Documentation

The Applicant shall provide the following documents:

- i. Certified true copy of the signed Food Wise Charter [#];
- ii. Summary table listing the implementation of good practices with justification and reference [#];
- iii. Location plan to indicate the facilities/ posters; and
- iv. Record photographs.

For Bonus Credit, the Applicant shall provide the following additional documents:

- i. Narrative of used cooking oil collection facilities;
- ii. Performance record [#]; and
- iii. Collection organisation/ recycler information, including:
 - a. Company name and address;
 - b. Collection frequency; and
 - c. Collection agreement, signed by Building Owner/ Building Management.

Background

Hong Kong faces an imminent waste problem. In 2013, over 3,600 tonnes of food waste, accounting for about 38 percent of municipal solid waste, were disposed of at landfills every day. While the Government has been adopting a multi-pronged approach to tackle the problem, more action is required and active participation from the community is also needed to alleviate the waste problem.

To take forward the Chief Executive's pledge to promote food waste reduction, the Environment Bureau announced on 3 December 2012 the setting up of the Food Wise Hong Kong Steering Committee. The Steering Committee is tasked to formulate and oversee the implementation strategies of the Food Wise Hong Kong Campaign, so as to reduce food waste to be disposed of at landfills. More information on the Food Wise Hong Kong Campaign, Food Wise Charter and good practice guides can be found in EPD [1] and Food Wise Hong Kong Campaign website [2].

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- 1 Environmental Protection Department. Food Waste Challenge. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/english/environmentinhk/waste/prob_solutions/food_waste_challenge.html
 - 2 Food Wise Hong Kong Campaign. Retrieved 1 March 2016, from <http://www.foodwisehk.gov.hk/en/index.php>

	MWA 7	Waste Treatment Equipment
Exclusion		None.
Objective		To reduce the environmental impact arising from the transportation of waste to the landfill sites by promoting on-site waste treatment.
Credit Attainable		1 Bonus
Credit Requirement		1 Bonus credit for providing at least one set of waste treatment equipment.
Assessment		<p><u>Criteria</u></p> <p>Given that the nature and extent of the waste will vary with the type and scale of the project, types of the equipment is hence not be specified. The Building Owner/ Building Management Company shall provide project specific rationale of the waste treatment equipment selection, and justify how it is suitable for Project's size, nature and operation. Valid collection arrangement is required.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. Summary indicating the equipment model, type of the treated waste, quantity, equipment capacity and operation procedure and frequency;ii. Location plan to indicate the equipment location;iii. Performance records [#];iv. Equipment catalogue/ technical sheet; andv. Record photographs.
Background		Building Owner/ Building Management Company can facilitate or actually practise the waste treatment in order to reduce the pressure on landfill sites.

	MWA 8	Action to Waste Reduction
Exclusion		None.
Objective		To advocate the continual improvement for waste management.
Credit Attainable		3 + 2 Bonus
Credit Requirement		<p>a) Implementation of the Waste Management Plan</p> <p>1 credit for demonstrating the implementation of the waste management plan.</p> <p>b) Waste Stream Audit</p> <p>1 Bonus credit for undertaking a waste stream audit.</p> <p>c) Waste and Recycling Records</p> <p>1 credit for the collection of the waste and recycling records for past 12 months.</p> <p>1 Bonus credit for the collection of the waste and recycling records for the past 24 months.</p> <p>d) New Targets on Waste Recycle/ Reduction</p> <p>1 credit for providing new targets on the waste recycle items, recycle rate and reduction rate based on the performance of the past 12 months.</p>
Assessment	<u>Criteria</u>	<p>a) Implementation of the Waste Management Plan</p> <p>The Applicant shall evaluate the implementation of the waste management plan stipulated in section MWA 4. It is not necessary to complete all targeted actions. Regular review and recommendation for continual improvement are required.</p> <p>b) Waste Stream Audit</p> <p>The Applicant shall conduct a waste audit for the prevailing waste streams that identifies the types of waste, quantities that are expected regularly (from day to day use) etc. The audit should determine the amounts of materials that have potential for recycling (paper, plastics, metals, obsolete equipment, etc.), and the potential for recycling. Site survey and recommendations are required. The waste stream audit shall be conducted once a year.</p>

c) Waste and Recycling Records

The Applicant shall document the waste and recycling records.

d) New Targets on Waste Recycle/ Reduction

The Applicant shall provide new targets on the waste recycle items based on past 12-month's performance.

Documentation

The Applicant shall provide the following documents:

a) Implementation of the Waste Management Plan

- i. Documents substantiating the compliance (e.g. records, record photographs etc.) [#]; and
- ii. Regular review and recommendation for continual improvement.

b) Waste Stream Audit

- i. Waste audit report [#].

c) Collection of the Waste and Recycling Records

- i. Waste flow table [#];
- ii. All waste and recycle records [#]; and
- iii. Collection organisation/ recycler information, including:
 - a. Company name and address;
 - b. List of collected materials;
 - c. Collection frequency; and
 - d. Collection agreement, signed by Building Owner/ Building Management.

d) New Targets on Waste Recycle/ Reduction

- i. Documentation listing the new targets on waste recycle items, recycle rate and reduction rate, etc. [#]

Background

See MWA 4.

5 Energy Use

5.P Prerequisites

5.1 Energy management and analysis

5.2 Commissioning

5.3 Energy efficient improvement

5.4 Enhancement

Background

An objective of BEAM Plus is to encourage thorough evaluation of the performance of building and services system designs, and greater investments into measures that will help to improve the energy performance of existing buildings, 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.P Prerequisites

EU P1 Minimum Energy Performance

Background

This section sets the minimum requirement on regular energy audit, which can provide a proactive building energy management by identifying the types, quantities, and effectiveness of energy used, and thus the room for improvements.

5.1 Energy management and analysis

EU 1 Energy Management

EU 2 Energy Analysis

Background

The management and operation of a building and the way that the tenants use the building can have a major impact on its energy consumption.

Energy management should be fully integrated into the organisation's management systems; have monitoring and targeting systems in place based on sub-metering of the energy used; include regular reports and reviews of the monitored data; set targets for energy efficiency improvements supported by an action plan.

5.2 Commissioning

EU 3 Commissioning

Background

One of the major reasons why buildings fail to meet performance expectations is the lack of adequate commissioning of systems and equipment, and the inadequacy of operations and maintenance, commissioning data, and as-installed equipment data and drawings. Successful commissioning shall help systems to properly operate and maintain throughout their life cycle.

5.3 Energy efficient improvement

EU 4 Energy Benchmarking and Improvement

Background

To further encourage energy efficiency and improvement, this section requires not only benchmarking the project building's energy performance against comparable buildings with similar space use, occupancy and operations, but also to establish saving targets and apply measures for building's continual improvement in energy performance.

5.4 Enhancement

EU 5 Enhancement

Background

Whilst the estimation of annual energy use and maximum electricity demand takes into account improvements to the efficiency of air-conditioning and lighting systems and equipment it does not embrace all aspects of energy use in buildings. Therefore, BEAM credits additional measures, new technologies and techniques that can improve the energy performance of buildings.

	EU P1 Minimum Energy Performance
Exclusion	Buildings not covered by Buildings Energy Efficiency Ordinance.
Objective	To establish the minimum level of energy audit for the project building.
Requirement	Conducting energy audit in accordance with the Buildings Energy Efficiency Ordinance (Cap 610) requirements for existing buildings.
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall provide an energy audit report confirming that an energy audit has been completed in accordance with the Buildings Energy Efficiency Ordinance (Cap 610) requirements for existing buildings.</p> <p>The energy audit report shall meet the following requirements:</p> <ol style="list-style-type: none">i. Conducted within the past 5 years from the date of submission;ii. Endorsed by a Registered Energy Assessor (REA) with REA registration number stated in the report; andiii. Include all elements as stipulated in the Code of Practice for Building Energy Audit issued by Electrical and Mechanical Services Department (EMSD). <p><u>Documentation</u></p> <p>The Applicant shall provide the following document:</p> <ol style="list-style-type: none">i. An energy audit report fulfilling the criteria stated above.
Background	<p>In accordance with the Buildings Energy Efficiency Ordinance (Cap 610), existing building owner is required to conduct energy audit for their building in every 10 years. However, BEAM Plus seeks proactive building management by requiring energy audit to be conducted in every 5 years. More regular energy audit can provide the building management at an earlier time with a clear picture about the types and quantities of energy being used in a building and for what purposes, whether energy has been used efficiently and effectively, and the room for improvements. This requirement shall allow the building management to have more time in planning budget and better management to conduct the improvement works.</p>

	EU 1	Energy Management
Exclusion		None.
Objective		To encourage high level management to involve in the improvement of energy efficiency and conservation.
Credit Attainable	4	
Credit Requirement		<p>a) Energy Management Policy</p> <p>1 credit for an energy management policy endorsed by top management.</p> <p>b) Energy Management Plan</p> <p>1 credit for energy management plan covering less than 3 years. 2 credits for energy management plan covering 3 years or more.</p> <p>c) Appointment of Energy Warden</p> <p>1 credit for appointing an Energy Warden in the Building Management Company.</p>
Assessment		<p><u>Criteria</u></p> <p>a) Energy Management Policy</p> <p>The Applicant shall provide an energy management policy endorsed by the top management of Building Owner/ Building Management Company to demonstrate the commitment.</p> <p>b) Energy Management Plan</p> <p>The Applicant shall provide an energy management plan containing the following elements as a minimum:</p> <ul style="list-style-type: none">i. Objective and Target; andii. Reporting to top management on progress. <p>c) Appointment of Energy Warden</p> <p>The Applicant shall provide evidence of appointment of at least one Energy Warden as key member in the building management team for the building. The scope of work for the energy warden shall also be indicated.</p> <p>The energy warden shall meet all of the following requirements:</p> <ul style="list-style-type: none">i. An employee of the Building Management Company; andii. Participated in more than 80% of the property management meetings.

Documentation

The Applicant shall provide the following documents:

a) Energy Management Policy

- i. An energy management policy endorsed by the top management of Building Owner/ Building Management Company.

b) Energy Management Plan

- i. An energy management plan endorsed by the top management of Building Owner/ Building Management Company [#].

c) Appointment of Energy Warden

- i. Scope of the work for the energy warden(s);
- ii. Resume of energy warden(s); and
- iii. Meeting minutes showing the attendance and/or action items by the appointed energy warden [#].

Background

Commitment from top management is crucial for building's energy conservation. The implementation of the Energy Management Plan can be achieved with the support from the top management. BEAM Plus encourages high level management to involve in the improvement of energy efficiency and conservation.

An energy management team should be established to execute energy management activities, and a senior staff member as energy warden should also be appointed as the team leader responsible for the overall coordination of the program.

After setting up the energy management policy and an energy management team, a management plan should then be formulated. The management plan will be a guide on how the team to improve energy efficiency. It should include the specific reduction targets of energy and cost, as well as the organisation of management resources.

	EU 2	Energy Analysis
Exclusion		<p>For the first credit under part a), Buildings to compulsorily comply with Building Energy Code (BEC) 2012 or later version.</p> <p>For the second credit under part a), Residential buildings.</p>
Objective		<p>To enable and encourage building operators to measure, record, monitor and analyse energy performance of the building's engineering systems, particularly concerning energy use.</p>
Credit Attainable	11	
Credit Requirement		<p>a) Data Collection Facilities</p> <p>1 credit for providing sub-metering systems for any 3 of the following electrical loads where applicable:</p> <ul style="list-style-type: none">i. Chiller plant;ii. Cooling tower plant;iii. Lift;iv. Escalator;v. Lighting; andvi. Plumbing & drainage. <p>1 credit for having Building Management System (BMS) to log operation data (e.g. pressure, temperature, flow rate, on/ off status) for monitoring operation and function of the system including the following as a minimum:</p> <ul style="list-style-type: none">i. Air side;ii. Water side;iii. Cooling load; andiv. Lighting control. <p>b) Data Collection Record</p> <p>1 credit for providing energy consumption data record of at least 1 year for major electrical loads.</p> <p>2 credits for providing energy consumption data record of 3 years or more for major electrical loads.</p> <p>c) Data Analysis</p> <p>1 credit for calculating the Energy Use Intensity (EUI) of the following services in data analysis:</p> <ul style="list-style-type: none">i. Air-conditioning system;ii. Lift & escalator (if any);iii. Lighting; andiv. Others.

d) Energy Audit Report

3 credits for filling up Table (II) to Table (VIII) under the Template 1 on Additional Information to Executive Summary of Energy Audit Report.

2 credits for completing the entire Template 1 on Additional Information to Executive Summary of Energy Audit Report to EMSD.

e) Carbon Audit Report

1 credit for conducting carbon audit in accordance with the requirements as stipulated in the guideline issued by the Authority.

Assessment

Criteria

a) Data Collection Facilities

The Applicant shall provide the description of the sub-metering system and/or BMS installed and data record sample, in order to demonstrate that electricity use pattern and/or operation data for 3 or more major systems can be adequately monitored for audit purposes.

Metering shall provide record at intervals of one hour or less and capable to record both consumption and demand (i.e. kW, kVA, kWh). The whole facilities (i.e. meters, BMS, computer) are capable to store all meter data for at least 36 months.

Monitoring system for central chiller plant shall allow the overall performance of the plant and individual chillers to be determined for all operating modes and range of operating conditions. As a minimum, temperature, flow rate and pressure measurements shall be monitored.

b) Data Collection Record

The Applicant shall provide record of energy consumption data for major electrical loads in order to demonstrate that proper record keeping practice has been implemented. It is a good practice to have energy consumption data record separately for different system types of major electrical load. However, this is not an assessment criterion for this credit (i.e. one electrical meter that records several different system types of major electrical load can be accepted in this credit.).

c) Data Analysis

The Applicant shall provide EUI data for the air-conditioning system, lift & escalator system (if any), lighting system, and others (e.g. plumbing & drainage, hot water, etc.). If energy consumption for the systems required cannot be provided separately according to system types due to lack of sub-metering provision, then calculation based on technical data (e.g. manufacturer technical specification, testing and commissioning records, measured power, power calculated based on

measured voltage, ampere, flow rate, pressure drop, etc.) can be accepted for this credit.

d) Energy Audit Report

The Applicant shall provide filled Table (II) to Table (VIII) in Template 1 [1] on Additional Information to Executive Summary of Energy Audit Report for the 3 credits and completed entire Template 1 on Additional Information to Executive Summary of Energy Audit Report to EMSD for the additional 2 credits. Relevant calculation and/or measured data as supporting to the filled data in Template 1 should also be provided. The report shall be endorsed by a Registered Energy Assessor (REA).

e) Carbon Audit Report

The Applicant shall provide a carbon audit or Greenhouse Gas (GHG) Emissions audit report in accordance with the latest version Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, Residential or Intentional Purposes) in Hong Kong, issued by Electrical & Mechanical Services Department (EMSD) and Environmental Protection Department (EPD). The report shall be endorsed by a Qualified Service Provider (QSP).

Documentation

The Applicant shall provide the following documents:

a) Data Collection Facilities

For Sub-metering System,

- i. Drawings, as-built electrical schematic;
- ii. Manufacturer technical specification, technical data sheets for meter, transducers, and sensors;
- iii. Operation manual;
- iv. Testing and commissioning records;
- v. Data record samples, and
- vi. Record photographs.

For BMS,

- i. Drawings, as-built schematic, point schedule;
- ii. Manufacturer technical specification, technical data sheets for meter, transducers, and sensors;
- iii. Operation manual;
- iv. Testing and commissioning records; and
- v. Record photographs.

1 Template for Additional Information (adoption on voluntary basis, refer to TG-EAC clause 8.5), Energy Audit Code (EAC) 2012 Edition

b) Data Collection Record

- i. Energy consumption data record for major electrical loads (e.g. BMS log data, metering log data, manually recorded data) [#]; and
- ii. Spreadsheet summarising the energy consumption data according to major systems with monthly bar chart plotted [#].

c) Data Analysis

- i. Spreadsheet summarising EUI for the required systems; and
- ii. Calculation and/or measured data as supporting to the EUI.

d) Energy Audit Report

- i. An energy audit report endorsed by REA;
- ii. Filled Table (II) to Table (VIII) in Template 1 on Additional Information to Executive Summary of Energy Audit Report for 3 credits;
- iii. Completed Template 1 on Additional Information to Executive Summary of Energy Audit Report and submission record to EMSD for additional 2 credits; and
- iv. Calculation and/or measured data as supporting to the data filled in the template for both credits.

e) Carbon Audit Report

- i. A carbon audit or GHG emission audit report endorsed by a QSP.

Background

Surveys of a large number of buildings in Hong Kong [2] revealed that buildings are in general insufficiently equipped with measuring and monitoring devices for measurement of energy performance. This makes it particularly difficult to improve the energy efficiency of buildings and major plant, such as the central chiller plant.

Opportunities for reducing energy consumption can be identified only if it is possible to monitor performance of the systems. Good monitoring systems can allow better control of part load performance, not only improving efficiency, but also improving the control of the building's thermal comfort conditions. Plant control can be altered and the results monitored to show how energy consumption changes. Unseen plant faults, which are not evident during routine maintenance, can be identified from analysis of performance trend data. Control problems can be detected and control strategies improved to match the building demand.

The cost of instrumentation is not significant when compared with installation costs and the accuracy should be such as to provide meaningful readings. The payback on improved performance can be

2 Yik F W H, Chiu T W. Measuring instruments in chiller plants and uncertainties in performance evaluation. Transactions, The Hong Kong Institution of Engineers, 5(3) 95-99.

very high taking into account the reduction in electricity consumption and demand charges resulting from more efficient plant operation.

Similar to the function of financial audit to a company, energy audit needs to be conducted at regular intervals to provide the building management with a clear picture about the types and quantities of energy being used in a building and for what purposes, whether energy has been used efficiently and effectively, and the room for improvements.

	EU 3 Commissioning
Exclusion	None.
Objective	To establish action plan for management team to follow and to use the commissioning process to improve building energy performance.
Credit Attainable	Max. 12
Credit Requirement	<p>a) Action Plan</p> <p>1 credit for action plan covering less than 3 years. 2 credits for action plan covering 3 years or more.</p> <p>b) Commissioning</p> <p>1 credit for providing original/ retro-commissioning (RetroCx) for electrical services systems. 1 credit for providing original/ retro-commissioning (RetroCx) for plumbing and drainage system. 1 credit for providing original/ retro-commissioning (RetroCx) for lift and escalator system (if any).</p> <p>For buildings with chiller system:</p> <p>1 credit for providing original/ retro-commissioning (RetroCx) for water side equipment of central air-conditioning system. 1 credit for providing original/ retro-commissioning (RetroCx) for air side equipment of central air-conditioning system.</p> <p>For buildings without chiller system:</p> <p>1 credit for providing original/ retro-commissioning (RetroCx) for air-conditioning system.</p> <p>c) On-going Commissioning</p> <p>1 credit for providing an ongoing commissioning plan detailing the works and person-in-charge for electrical services if on-going commissioning have been conducted for electrical system and/or for Heating, Ventilating, and Air-Conditioning (HVAC) system if on-going commissioning have been conducted for HVAC system.</p> <p>1 credit for the execution of any 2 of the following measures for power quality management regularly. 2 credits for the execution of any 4 of the following measures for power quality management regularly.</p> <ol style="list-style-type: none">i. Power factor monitoring & correction;ii. 3-phase load balancing;iii. Maximum demand monitoring;iv. Demand Side Management (DSM);

- v. Total Harmonic Distortion (THD); and
- vi. Thermal scan on electrical distribution system.

For buildings with chiller system:

1 credit for ongoing commissioning for water side equipment of central air-conditioning system.

1 credit for ongoing commissioning for air side equipment of central air-conditioning system.

For buildings without chiller system:

1 credit for ongoing commissioning for all HVAC equipment.

Assessment

Criteria

a) Action Plan

The Applicant shall provide action plan for energy performance improvement including the following as a minimum:

- i. Budget;
- ii. Upgrading/ retrofitting works;
- iii. Projected saving and payback;
- iv. Target implementation date; and
- v. Monitoring & Verification on completed works.

Records (e.g. delivery order, contract, record photographs) shall also be provided to demonstrate the implementation of improvement works covering the claimed periods.

b) Commissioning

The Applicant shall provide copies of original commissioning/ retro-commissioning (RetroCx) records and/or testing and commissioning records following changes to systems and equipment, the procedures of the testing and commissioning and the personnel involved.

c) On-going Commissioning

The Applicant shall provide ongoing commissioning plan and records for electrical system and/or HVAC system for at least the past 12 months detailing:

- i. Person-in-charge;
- ii. Monitoring requirements (type of measurement, measurement device, monitoring frequency and duration, and acceptable values);
- iii. Record of measured parameters; and
- iv. References used to evaluate performance.

In order to demonstrate the implementation of power quality management, the work records showing listed measures have been carried out regularly (at least once in every 5 years) shall be provided. Specific works required for the listed measures of power quality management are shown below:

- i. Power factor monitoring & correction
 - Measure current power factor;
 - Actions taken to correct power factor; and
 - Measure corrected power factor to verify (if action is needed).
- ii. 3-phase load balancing
 - Measure power for all three-phases;
 - Actions taken to balance the loads; and
 - Measure the corrected loads.
- iii. Maximum demand monitoring
 - Monitor the major equipment's power in interval of 5 minutes for one selected week in the hottest month; and
 - Major equipment shall include: chiller, cooling tower (if any), HVAC pumps, air-conditioning units, fan motors, plumbing and drainage, lift and escalator and tenant's plug loads.
- iv. Demand Side Management (DSM)
 - Based on the data collected from demand monitoring, identify potential activities to reduce the maximum demand;
 - Potential activities include but not limited to: energy reduction programmes (e.g. upgrade/ adjust to more efficient equipment, power factor correction), load management programmes (e.g. changing the load pattern such as by frequency sensitive relays triggering circuit breakers (ripple control), by timer, or by using special tariffs to influence building user's behaviour); and
 - Monitor (if activities implemented) the demand to verify the effect.
- v. Total Harmonic Distortion (THD)
 - Measure harmonics for all circuits exceeding 400A current rating based on circuit protective device;
 - Actions taken to lower the THD; and
 - Measure the corrected THD.
- vi. Thermal scan on electrical distribution system
 - All major electrical distribution system, such as switchgears, low voltage switchboards, cables and busbars, if any, managed by the Building Owner/ Building Management Company, shall be covered by thermal scan.

The work records required to demonstrate the annual implementation of ongoing commissioning for HVAC system shall follow the ongoing commissioning plan.

Documentation

The Applicant shall provide the following documents:

a) Action Plan

- i. An action plan; and
- ii. Implementation records [#].

b) Commissioning

- i. Original commissioning/ retro-commissioning (RetroCx) records; and
- ii. Testing and commissioning records following changes to systems and equipment (if any) [#].

c) On-going Commissioning

- i. Undertaking letter endorsed by top management of Building Owner/ Building Management Company showing the commitment of carrying out on-going commissioning within the next 5 years;
- ii. On-going commissioning plan; and/or
- iii. On-going commissioning records in the form of reports, measured data, record photographs, etc. showing works taken [#].

Background

Proactive management will seek to improve the performance of systems and equipment, i.e. improved energy efficiency, and promote energy conservation, i.e. minimise wastage of energy. Staff awareness of the importance of energy costs and efficiency is important if efficiency is to be improved through management procedures. Financial support for an action plan for implementing energy-saving measures is essential, either by a budget allocation or by allocation of all or part of saving in fuel bills. It is also vital that an appropriate senior person in the organisation be responsible for energy management.

Commissioning is a quality assurance process for buildings. It involves achieving, verifying, and documenting the performance of each system to meet the building's operational needs within the capabilities of the documented design and equipment capacities, according to the owner's functional criteria. Commissioning includes preparing project operational and maintenance documentation and training operation and maintenance personnel. The result shall be maintained throughout the life of the building.

CIBSE [1, 2, 3], BSRIA [4] and ASHRAE [5] publications provide guidance on commissioning requirements and procedures, such as management, design for commissioning, access, testing, measurements and tolerances, installed transducers, specification for portable measuring equipment, etc.

Ongoing commissioning and proper instructions on operations and maintenance procedures have been shown to improve the operating efficiency and environmental performance of a building over its life cycle. The systems to be commissioned are all installed building HVAC systems, equipment and components that affect energy use.

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- 1 The Chartered Institution of Building Services Engineers. Air distribution systems. CIBSE. Commissioning Code A. Retrieved 1 March 2016, from <http://www.cibse.org/index.cfm>.
 - 2 The Chartered Institution of Building Services Engineers. Water distribution systems. CIBSE Commissioning Code W.
 - 3 The Chartered Institution of Building Services Engineers. Automatic controls. CIBSE Commissioning Code C.
 - 4 Building Services Research and Information Association. Commissioning air systems. Application procedures for buildings. Retrieved 1 March 2016, from <http://www.bsria.co.uk/>.
 - 5 ASHRAE. New Building Commissioning. Retrieved 1 March 2016, from <http://www.ashrae.org/>.

EU 4 Energy Benchmarking and Improvement

Exclusion For part a), building types not covered by EMSD Benchmarking Tool.

For part b), none.

For part c), residential buildings or buildings not charged by either Bulk Tariff, Large Power Tariff or Maximum Demand Tariff*.

Objective To reduce the consumption of non-renewable energy resources and the consequent harmful emissions of carbon dioxide (CO₂) to the atmosphere and encourage energy conservation and methods to reduce peak electricity demand.

Credit Attainable Max. 12 + 2 Bonus

Credit Requirement a) Benchmarking

For applicable types of buildings:

Credit(s) can be achieved based on the benchmarking results obtained from EMSD Benchmarking Tool.

No. of Credit(s)	1	3	5	1 Bonus	2 Bonus
Percentile	50 th	40 th	30 th	20 th	10 th

Alternative for Commercial Buildings:

Credit(s) can be achieved based on the label obtained from HKGBC Benchmarking & Energy Saving Tool – Office Buildings (HK BESTOF).

No. of Credit(s)	1	3	5	1 Bonus	2 Bonus
HK BESTOF	Green	Bronze	Silver	Gold	Platinum

b) Self-Improvement

Credit(s) can be achieved based on the reduction percentage by comparing electricity bill, Towngas bill or metering data in the category determined in part a) Benchmarking. (Baseline year can be any year in the past 5 years).

i. For buildings ranked at the 40th percentile or below under EMSD Benchmarking Tool/ "Bronze" or below label obtained from HK BESTOF:

No. of Credit(s)	1	2	3	4
Annual energy use reduction	2%	4%	6%	8%

ii. For buildings ranked at the 20th or 30th percentile under EMSD

Benchmarking Tool/ "Gold" or "Silver" label obtained from HK BESTOF:

No. of Credit(s)	1	2	3	4
Annual energy use reduction	1%	2%	3%	4%

iii. For buildings ranked at the 10th percentile under EMSD Benchmarking Tool or "Platinum" label obtained from HK BESTOF:

No. of Credit(s)	1	2	3	4
Annual energy use reduction	0.5%	1%	1.5%	2%

iv. For buildings which are excluded in part (a) Benchmarking:

No. of Credit(s)	1	2	3	4	1 Bonus	2 Bonus
Annual energy use reduction	1%	2%	3%	4%	6%	8%

c) Peak Electricity Demand Reduction

Credit(s) can be achieved based on the reduction percentage in the peak electricity demand.

No. of Credit(s)	1	2	3
Commercial and Hotel Buildings	10%	15%	20%
Educational Buildings (Centralised Air-Conditioning System)	10%	15%	20%
Educational Buildings (Unitary Air-conditioner)	5%	10%	15%
Other Building Types	5%	10%	15%

Assessment

Criteria

a) Benchmarking

The number of credit(s) to be achieved shall be determined by referencing to result obtained from EMSD Benchmarking Tool [1] or label obtained from HK BESTOF. The data used for the benchmarking shall be within the past 2nd to 5th year at the time of submission.

b) Self-Improvement

The number of credit(s) to be achieved shall be determined by referencing to the reduction percentage using the electricity bill,

1 Electrical and Mechanical Services Department. Energy Consumption Indicators & Benchmarking Tools. Retrieved 1 March 2016, from <http://www.emsd.gov.hk/emsd/eng/pee/ecib.shtml>

Towngas bill or metering data in the category determined in part a) Benchmarking. Data in the past 12 months at the time of submission shall be used to compare with the Baseline year. Baseline year can be any year in the past 5 years.

c) Peak Electricity Demand Reduction

The number of credit(s) to be achieved shall be determined by referencing to the reduction percentage using the electricity/ metering data in the past 12 months at the time of submission. Baseline year can be any year in the past 5 years.

Documentation

The Applicant shall provide the following documents:

a) Benchmarking

- i. Screenshots of the input for the benchmarking and relevant supporting documents; and
- ii. Result obtained from EMSD/ HK BESTOF [#].

b) Self-Improvement

- i. Spreadsheet showing the energy consumption extracted from the bills/ metering data and the calculation showing the percentage of reduction [#].

c) Peak Electricity Demand Reduction

- i. Electricity bills [#]; and
- ii. Spreadsheet showing the electricity data extracted from the bills and the calculation showing the reduction percentage [#].

Background

BEAM Plus encourages energy-efficient buildings and reduction in maximum electricity demand. To further encourage energy efficiency and improvement, this section requires not only benchmarking the project building's energy performance against comparable buildings with similar space use, occupancy and operations, but also to establish saving targets for building's continual improvement in energy performance.

Remarks*

EU 4c) only applies to those buildings where electricity charges are based either on the Bulk Tariff, Large Power Tariff (CLP Power) or Maximum Demand Tariff (Hongkong Electric) for all electricity meters serving the common areas of the buildings.

	EU 5 Enhancement
Exclusion	None.
Objective	To encourage adoption of practices, new technologies and techniques that have yet to find application in Hong Kong or provision for performance enhancements over and above stated performance criteria in BEAM Plus for Existing Buildings.
Credit Attainable	7 Bonus
Credit Requirement	<p>Maximum of 1 Bonus credit for each energy conservation approach is allowed but the award of credit is subject to final approval of BSL's Technical Review Committee (TRC) based on the estimated energy reduction, justification and/or the innovation of the proposed approaches.</p> <p>Note: Energy saving measures that rely on building user's behaviour or manual control (such as, turning up the set temperature manually for air-conditioning; turning off lighting by hand in accordance to staff energy management manual) will not be considered energy saving features in this section.</p> <p>Some of the prescriptive approaches include:</p> <p>a) Research and Development in Energy</p> <p>1 Bonus credit for conducting research and development or participating in competition with published paper related to energy aspects.</p> <p>b) Compliance with the BEC</p> <p>Maximum 4 Bonus credits for compliance with the latest version of the following listed BEC (This bonus credit does not apply to those buildings that are required to comply with the latest version of the BEC):</p> <ol style="list-style-type: none">i. Energy Efficiency Requirements of Air-Conditioning Installations;ii. Energy Efficiency Requirements of Electrical Installations;iii. Energy Efficiency Requirements of Lighting Installations; and/oriv. Energy Efficiency Requirements of Lift and Escalator Installations. <p>c) Renewable Energy System</p> <p>1 Bonus credit where at least 0.2% of building energy consumption in communal area is obtained from renewable energy sources.</p> <p>d) Separate Energy Charges</p> <p>1 Bonus credit where separate charges are made for energy use.</p>

e) Other Approaches

Maximum 7 Bonus credits for adopting other energy conservation approach not prescribed above.

Assessment

Criteria

a) Research and Development in Energy

The Applicant shall provide brief description of how the published paper has positive impact on building energy aspect, a copy of the published paper and evidence showing the paper is published in one of the recognised channels. Recognised channels include but not limited to: CPD events organised by professional institutes (conference, seminar, workshop, competition, etc.), World Sustainable Building Conference, professional institute journal (e.g. HKIE monthly journal), educational journal (e.g. Building and Environment Journal).

b) Compliance with the BEC

1 Bonus credit can be achieved for the compliance with each of the above listed codes.

The Applicant shall provide Form of Compliance (FOC) issued by EMSD to demonstrate compliance with the latest version of the BEC.

c) Renewable Energy System

The Applicant shall provide the narrative of the renewable energy system. In order to demonstrate the amount of energy generation or energy reduction from renewable energy sources, calculation shall be provided for system operate less than 1 year; or measurement shall be provided for system operate for more than 1 year.

In the case of systems that generate electricity from renewable sources (e.g. photovoltaic panels), the estimated amount of electricity that will be generated by the system for use by equipment in the building, either instantaneously or from an associated storage system.

In the case of using systems that produce services directly from renewable sources, which will otherwise require the use of fuel or electricity to produce those services (e.g. hot water supply from solar panels or chilled water supply from absorption chillers powered by solar heat), the equivalent amount of electricity use that will be avoided.

The calculation/ measurement shall take due account of the diurnal and seasonal variations in the external environmental conditions (e.g. solar intensity and wind speed and direction) and in the demand for the electricity and/or services generated by the systems. Any energy use and losses by the systems shall be discounted from their output. The total building energy consumption in communal areas (i.e. in charged

by the Applicant) shall be referenced to the electricity bills and Towngas bills (if applicable) in any one selected year over the past 5 years.

d) Separate Energy Charges

The Applicant shall provide evidence to demonstrate that building users pay for their own energy consumption cost within their spaces, including air-conditioning, lighting, small power, etc.

e) Other Approaches

1 Bonus credit can be achieved for adopting each other energy conservation approach not prescribed above

Despite the listed approaches above, BEAM Plus also encourages the Applicant to adopt other types of approach that can improve the energy performance of the subject building or advance the industry's knowledge or movement.

In order to demonstrate substantial environmental benefits by the adoption of the claimed approach, the Applicant shall provide evidence of the application of new practices, technologies and techniques and the associated benefits. The benefits related to lower energy use, support of new technology, are all encouraged.

The Applicant shall also provide calculation showing the estimated energy saving achieved by the adoption of each or all the proposed approaches. In the case of non-quantifiable benefit resulted from the approach, justification should be provided.

The Applicant's submission shall identify the intent of the proposed innovative approach, the proposed criteria for assessing compliance, and the assessment criteria. The Assessor shall refer the proposal to BSL TRC who will consider each application on its merit.

Bonus credit in this section shall be granted at the sole discretion of BSL TRC.

Documentation

The Applicant shall provide the following documents:

a) Research and Development in Energy

- i. Brief description of how the published paper has positive impact on building energy aspect;
- ii. A copy of the published paper; and
- iii. Evidence to demonstrate the publication (e.g. letter from editor of the journal, copy of the publication).

b) Compliance with the BEC

- i. FOC issued by EMSD.

c) Renewable energy system

- i. Manufacturer specification/ catalogue, as-built drawings, record photographs of the renewable energy system, etc.;
- ii. Results of calculated/ measured energy generation or energy reduction; and
- iii. Electricity bills and Towngas bills (if applicable).

d) Separate Energy Charges

- i. As-built electrical schematic, as-built MVAC water side schematic, location layouts;
- ii. Consumption records, meter readings, logbook or printed output (sensitive information can be blacked out if needed, such as tenant's name);
- iii. Payment records showing that building users pay for their own energy consumption within their spaces;
- iv. Manufacturer's technical specification, technical data sheets for the tenant electricity meters and/or thermal energy meters for chilled water sub-metering; and
- v. Record photographs showing meter installation.

e) Other Approaches

- i. Description and intent of the approach;
- ii. Proposed criteria for assessing compliance and the assessment criteria;
- iii. Quantified environmental benefits; and
- iv. Other types of supporting (e.g. manufacturer specification/ catalogue, laboratory report, calculation, published papers, project reference, etc.)

6 Water Use

6.P Prerequisites

6.1 Water conservation

6.2 Water management

6.3 Effluent

Background

Water is known to be in scarce supply in many parts of the world. Globally, water conservation is already a major issue. Hong Kong has long enjoyed a reliable and economic supply of most of its fresh water needs from the Mainland China.

However, with increased industrialisation of Guangdong Province there is likely to be greater competition for water supply, meaning that water conservation may become a significant issue for Hong Kong in the future. Hong Kong should look into ways to improve the utilisation and conservation of water resources.

6.P Prerequisites

WU P1 Water Conservation Plan

WU P2 Water Efficient Devices

WU P3 Water Quality Survey

Background

In Hong Kong, the WSD controls water quality in terms of physical, chemical, bacteriological, biological and radiological parameters, in order to provide water that meets the Guidelines for Drinking-water Quality recommended by the World Health Organization (WHO). Samples are taken at treatment works, service reservoirs, consumer taps and analysed at site and at WSD's laboratories. Nevertheless, the unsatisfactory quality of potable water delivered at taps may be due to the corrosion of water pipes or the cleanliness of water tanks. As a consequence the use of bottled water is common, but is not considered to be an environmentally preferred solution due to the production and transport requirements. To ensure the health of building users, designers need to ensure optimal potable water quality at the tap - potable water that is safe for drinking.

It is also necessary to reduce the potable water consumption. This can be achieved through the application of water saving fixtures and the use of non-potable water (e.g. harvested rainwater and recycled grey water) and implementation of a water conservation plan.

6.1 Water conservation

WU 1 Water Efficient Devices

WU 2 Water Use For Irrigation

WU 3 Cooling Tower Water

WU 4 Water Recycling

WU 5 Water Saving Performance

Background	<p>Despite the continued decline in industrial consumption there is an annual trend of rising consumption due to increasing domestic consumption. Based on projected population growth for the period, the domestic and service uses, being the key components of our fresh water consumption, are expected to increase. Industrial use, for the same period, is expected to drop because of further decline in water intensive industries. Wider use of fresh water in water-cooled air-conditioning systems (WACS) will contribute to consumption by the non-domestic sector.</p> <p>Raw water from the Dongjiang River in Guangdong continues to be Hong Kong's main source of supply and makes up about 70-80% of Hong Kong's needs. Hong Kong has few options to reduce dependency on the Mainland, where water resources are becoming increasingly limited. There is opportunity to reduce potable water use through better design, management and user awareness. There are also opportunities to recycle used water and rain water in order to reduce the use of potable water. Additional benefits of potable water conservation are reduced energy use for transport and the cost of treatment of raw water.</p>
6.2 Water management	WU 6 Quality Water Supply Scheme for Buildings – Fresh Water WU 7 Water Metering WU 8 Water Audit WU 9 Enhancement WU 10 Twin-tank System
Background	<p>A comprehensive water management program can help to reduce water consumption and ensure the quality of water supplied. It is encouraged to regularly inspect the plumbing system, keep tracking the water consumption, promote and implement water conservation measures and practices.</p>
6.3 Effluent	WU 11 Water Efficient Flushing System WU 12 Quality Water Supply Scheme for Buildings – Flushing Water
Background	<p>Whilst 80% of users in Hong Kong are supplied with seawater for flushing purposes there are environmental impacts associated with the treatment and delivery of seawater, and the load imposed on municipal sewage treatment plants. Measures taken to reduce the effluent discharge can have significant environmental benefits.</p>

	WU P1	Water Conservation Plan
Exclusion		None.
Objective		To formulate short-term and long-term strategies in conserving fresh water.
Requirement		Developing a water conservation plan endorsed by top management.
Assessment		<p><u>Criteria</u></p> <p>The Applicant shall provide the water conservation plan which is endorsed by top management of Building Owner/ Building Management Company to demonstrate the commitment.</p> <p>The water conservation plan shall include the following as minimum:</p> <ol style="list-style-type: none">i. Objectivesii. The short-term (3 years) and long-term (5 years) water saving targets;iii. Strategies in reducing the fresh water consumption, including those already completed, those in progress and those for future implementation;iv. Monitoring of fresh water consumption;v. Frequency of water audit; andvi. Feedback channels. <p><u>Documentation</u></p> <p>The Applicant shall provide the following document:</p> <ol style="list-style-type: none">i. Water conservation plan endorsed by top management.
Background		<p>Fresh water is a precious natural resource. Supply of clean and safe drinking water is a problem in many parts of the world. Every society shares the global responsibility to promote sustainable use of fresh water resources on the Earth. A water conversation plan can provide opportunities for Building Owners/ Building Management Company in setting water saving targets and implement water conservation measures to reduce the fresh water use.</p>

WU P2 Water Efficient Devices

Exclusion Water devices installed at tenants' areas can be excluded from the assessment.

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

Requirement At least 80% of all water taps and shower heads for bathing (if any) installed are with Water Efficiency Labelling Scheme (WELS) Grade 2 or above.

Alternatively

Demonstrating that the use of water efficient devices leads to an estimated aggregate annual saving of 5%.

Assessment

Criteria

The Applicant shall provide evidence to demonstrate that at least 80% of water taps and shower heads for bathing (if any) installed at the locations under the control of the Applicant are with WELS Grade 2 or above.

Alternatively

Calculation shall be provided to determine the annual fresh water saving at the locations under the control of the Applicant is at least 5% lower than the BEAM Plus baseline value. The calculation shall take into account the number of persons, the number of operational days per annum, operating pressure and limited to the water usage from the water taps and shower heads (if any).

In case the flow rate of the water fixture is unavailable, on-site measurement data shall also be accepted in evaluating the actual performance.

Documentation

The Applicant shall provide the following documents:

- i. Schedule of water taps and shower heads for bathing (if any) installed at the locations under the control of the Applicant;
- ii. Manufacturer specification or catalogues of water taps and shower heads for bathing (if any);
- iii. Registry of the WELS products extracted from Water Supplies Department (WSD)'s website or registration certificate of WELS issued by WSD showing the WELS Grade of the water taps and shower heads for bathing (if any); and
- iv. On-site photographs.

Alternatively

- i. Schedule of water taps and shower heads for bathing (if any) installed at the locations under the control of the Applicant;
- ii. Manufacturer specification or catalogues of water taps and shower heads for bathing (if any);
- iii. Annual water saving calculations (baseline values can be found in [Appendix 9.1](#)) which take into account of the water pressure;
- iv. On-site measurement data (if required); and
- v. On site photographs of the water fixtures.

Background

Hong Kong differs from most other places in the world in that the majority of buildings have saltwater for flushing rather than using fresh water. Therefore the scope for fresh water reductions may be more limited here than elsewhere. Neither the quantification of water use nor the potential for savings has been addressed in local research literature. Nevertheless, evidence from other countries suggests that reductions in water use may be achieved through the use of water efficient devices and automatic controls.

The WELS is a water conservation initiative of the HKSAR Government [1]. WELS intends to cover the common types of plumbing fixtures and water-consuming appliances. Products participating in WELS will incorporate a water efficiency label that will tell consumers the level of water consumption and water efficiency to help consumers choose water efficient products for water conservation. Currently 5 products are included in the WELS, i.e. showers for bathing, water taps, washing machines, urinal equipment and flow controllers.

1 Water Supplies Department. Voluntary Water Efficiency Labelling Scheme. Retrieved 1 March 2016, from http://www.wsd.gov.hk/en/plumbing_and_engineering/wels/index.html

WU P3 Water Quality Survey

Exclusion	None.
Objective	To ensure that the quality of fresh water is satisfactory.
Requirement	Demonstrating that the quality of fresh water at all fresh water tanks and the farthest supply point of each water tank meets WSD's requirements.
Assessment	<u>Criteria</u>

Samples of drinking water for physical, chemical and bacteriological examinations under shall be collected, preserved, handled and tested in accordance with the requirements in relevant WSD Circular Letters [1] in force and the latest version of Quality Water Supply Schemes for Buildings – Fresh Water (Plus) [2]. If all the water samples can comply with the requirements in relevant WSD Circular Letters in force and the latest version of Quality Water Supply Scheme for Buildings – Fresh Water (Plus), this pre-requisite is fulfilled.

Documentation

The Applicant shall provide the following documents:

- i. Plumbing schematic diagrams with indication of the sampling locations; and
- ii. Laboratory test report showing the compliance of water samples with the requirements in relevant WSD Circular Letters in force and the latest version of Quality Water Supply Scheme for Buildings – Fresh Water (Plus).

Background

Hong Kong enjoys one of the safest water supplies in the world. The quality of the drinking water fully conforms to the Guidelines for Drinking-water Quality recommended by the World Health Organisation. WSD is committed to supplying the public with water that is clear, odourless, wholesome and free from pathogenic bacteria.

Although the quality of water supplied to the consumers is strictly controlled and monitored, the quality of water drawn from consumers' taps may sometimes be affected by the condition of the inside plumbing, such as the phenomenon of discoloured water due to the presence of iron from rusty pipes and the solder materials etc.

To encourage the Building Owner/ Building Management Company to maintain their plumbing systems properly and with the endorsement of

1 Water Supplies Department. WSD Circular Letters. Retrieved 1 March 2016, from http://www.wsd.gov.hk/en/plumbing_and_engineering/circular_letters/index.html

2 Water Supplies Department. Quality Water Supply Schemes for Buildings – Fresh Water and Flushing Water. Retrieved 1 March 2016, from http://www.wsd.gov.hk/en/customer_services_and_water_bills/application_for_licence_certificate/quality_water_recognition_scheme_for_buildings/index.html

the Advisory Committee on Quality of Water Supplies (the predecessor of the Advisory Committee on Water Resources and Quality of Water Supplies (ACRQWS)), WSD launched the Fresh Water Plumbing Quality Maintenance Recognition Scheme in 2002. On 1 January 2008, the Scheme was renamed as Quality Water Recognition Scheme for Buildings (QWRSB). It was further renamed as “Quality Water Supply Scheme For Building – Fresh Water (Plus)” in 2015. The successful applicants will be awarded a Certificate to recognise proper maintenance of the plumbing systems inside a building for keeping the wholesomeness of government potable supply throughout the inside service up to the consumers’ taps.

WU 1 Water Efficient Devices

- Exclusion** Water devices installed at tenants' areas can be excluded from the assessment.
- Objective** To reduce the consumption of fresh water through the application of water saving devices that have proven performance and reliability.
- Credit Attainable** 4
- Credit Requirement** Credit(s) can be achieved based on the estimated aggregate annual saving by the use of water efficient devices.

No. of Credit(s)	1	2	3	4
Estimated aggregate annual fresh water saving	10%	15%	20%	25%

Assessment

Criteria

Calculation shall be provided to determine the annual fresh water saving at the locations under the control of the Applicant. The calculation methodology shall be consistent with WU P2. Confirmation of the award of credit(s) shall take into account the appropriateness of the data used and the estimated percentage of fresh water saved.

Documentation

The Applicant shall provide the following documents:

- i. Schedule of water taps and shower heads for bathing (if any) installed at the locations under the control of the Applicant;
- ii. Manufacturer specification or catalogues of water taps and shower heads for bathing (if any);
- iii. Annual water saving calculations (baseline values can be found in [Appendix 9.1](#)); and
- iv. On-site photographs.

	WU 2	Water Use for Irrigation
Exclusion		Project with soft landscape area less than 200m ² .
Objective		To reduce the reliance on fresh water for irrigation.
Credit Attainable		1 + 1 Bonus
Credit Requirement		1 credit for limited use of fresh water for irrigation.
		<i>Alternatively</i>
		1 credit for demonstrating the use of highly efficient irrigation technologies and/or harvested rainwater or/and recycled grey water to reduce irrigation water by 25% or more in comparison with conventional irrigation method.
		1 Bonus credit for reducing irrigation water by 50% or more.
Assessment		<u>Criteria</u>
		The Applicant shall provide the drawing of soft landscaping and the planting schedule and confirm that, after a period of establishment of the plants and vegetation, irrigation will require less amount of fresh water.
		<i>Alternatively</i>
		The Applicant shall demonstrate highly efficient irrigation technology and/or the use of harvested rainwater and/or recycled grey water to reduce the irrigation water by at least 25% or more in comparison with conventional irrigation method.
		<u>Documentation</u>
		The Applicant shall provide the following documents:
		i. Soft landscape drawing;
		ii. Planting schedule;
		iii. Establishment period of the plants; and
		iv. On-site photographs of the soft landscape area.
		<i>Alternatively</i>
		i. Soft landscape drawing;
		ii. Planting schedule;
		iii. Schematic and layout drawings for irrigation system including water source diagrams;
		iv. Calculations comparing water consumption between conventional system and highly efficient irrigation system; and
		v. On-site photographs of the soft landscape area and high efficient irrigation system(s).

Background

Where a building development contains significant landscaping, as defined by the coverage of soft landscaping, greenery and planters there is likely to be a significant consumption of fresh water. Irrigation by lower quality (harvested or recycled) water can be equally effective. Native plants can survive without additional watering, and require less fertiliser and pesticides, thereby reducing impacts on local waters.

WU 3 Cooling Tower Water

Exclusion	Buildings without cooling tower or cooling tower with salt water.
Objective	To reduce the fresh water consumption for cooling tower makeup.
Credit Attainable	1 + 1 Bonus
Credit Requirement	<p>1 credit for reducing fresh water consumption by installing water treatment system which can achieve 6 cycles of concentration with acceptable water quality.</p> <p>1 Bonus credit for achieving 7 or more cycles of concentration with acceptable water quality.</p>
Assessment	<p><u>Criteria</u></p> <p>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 6, the assessment criteria are fulfilled.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. Narrative and on-site photographs of the water treatment system;ii. Water sampling records [#]; andiii. Calculations.
Background	<p>When water evaporates from the tower, dissolved solids (such as calcium, magnesium, chloride, and silica) are left behind. As more water evaporates, the concentration of dissolved solids increases. If the concentration gets too high, the solids can cause scale to form within the system or the dissolved solids can lead to corrosion problems. The concentration of dissolved solids is controlled by blowdown. Makeup water is then added to replace evaporative losses and blowdown volume. Cooling towers can therefore account for large portions of a building's total water use.</p> <p>Increasing the number of cycles can save thousands of gallons of fresh water during a building's peak cooling periods. Chemically analysing make-up water allows for calculation of optimal cycles. Cycles can also be increased by treating water to remove or sequester dissolved solids rather than relying only on blowdown and input of fresh makeup water.</p>

	WU 4	Water Recycling
Exclusion	None.	
Objective	To encourage harvesting of rainwater and recycling of grey water to reduce the consumption of fresh water.	
Credit Attainable	2 Bonus	
Credit Requirement	1 Bonus credit for harvesting rainwater and/or recycling grey water that leads to a reduction of at least 2.5% in the consumption of fresh water. 1 additional Bonus credit if the reduction can achieve 5% or above.	
Assessment	<u>Criteria</u> The Applicant shall provide details on the rainwater harvesting and/or grey water systems including the drawings showing the general arrangement and the schematic diagrams. The calculation of the expected fresh water saving shall also be provided. Where it can be demonstrated that the savings in fresh water use is at least 2.5% or more of the total amount of fresh water consumption, the bonus credit(s) is/are achieved. The percentage of fresh water saving can be determined by the amount of rainwater and/or grey water recycled and reused per year (m ³) divided by the amount of fresh water meter reading from the building per year (m ³). <u>Documentation</u> The Applicant shall provide the following documents: i. Drawing and schematic diagrams of the rainwater harvesting and/or grey water recycling systems; ii. Calculation on the fresh water saving; and iii. On-site photographs of the water recycling system(s).	
Background	Rainwater harvesting is a process or technique of collecting, filtering, storing and using rainwater for irrigation or cleaning purpose. Grey water is defined as water discharge from bathtub, shower, washing basin (except for kitchen and clinical areas), condensate from air-conditioning system and water discharged from cooling tower, swimming pool and fountain. Using recycled water not only helps to reduce the demand for fresh water supply, but also provides a reliable source in case of supply interruptions. The problem for Hong Kong's high-rise dense built environment is that	

the potential for collecting rainwater is limited. Yang et al [1] provide the main parameters and their relationship to estimate the amount of rainwater that may be collected on different roof areas and different sizes of tanks, based on the amount of rainfall as recorded by the Hong Kong Observatory.

Well-populated buildings not supplied with saltwater for flushing would be a good candidate from water recycling, otherwise reuse is likely to be limited, depending on the extent of cleaning, irrigation and the types of equipment used for cooling.

1 Yang H X, Chow W H, Burnett J. Water and Energy Conservation of Rainwater Collection Systems on Building Roofs. *Advances in Building Technology*, Vol. 2. Elsevier. 2002. pp 1281-1288.

WU 5 Water Saving Performance

Exclusion	None.
Objective	To encourage to continual improvement in reducing fresh water consumption.
Credit Attainable	4 + 1 Bonus
Credit Requirement	Credit(s) can be achieved based on the reduction percentage by comparing water bill/ metering data. (Reference year can be any year in the past 5 years).

No. of Credit(s)	1	2	3	4	Bonus
Annual fresh water use reduction	3%	6%	9%	12%	15%

Assessment

Criteria

The Applicant shall compute the reduction of water consumption by the water bills or metering data. The numerator shall be the water consumption to be compared against the baseline year and it has to be the current year data. The denominator could be any years within 5 years at the time of submission.

A ratio indicator by a certain operational measuring unit (such as the number of building users) could be applied to allow for such comparison.

The Applicant shall also demonstrate what management initiatives (rather than changes in occupancy or use) or hardware upgrade have been implemented to reduce the water consumption.

Documentation

Credit(s) can be achieved when the Applicant provides the following documentation to demonstrate compliance:

- i. Plumbing schematic diagram or photographs showing the meters;
- ii. Water bills/ metering data for the baseline year and current year [#];
- iii. Water reduction calculation; and
- iv. Narratives on the management initiatives or evidence of hardware upgrade in reducing fresh water consumption.

Background

BEAM Plus encourages the continual improvement approach in reducing the fresh water consumption. The assessment criterion takes into account the reliable data and it can help the Building Owners/ Building Management Company to formulate a strategy plan to achieve continual improvement.

WU 6 Quality Water Supply Scheme for Buildings – Fresh Water

Exclusion	None.
Objective	To encourage Building Owner/ Building Management Company to maintain the plumbing systems in good condition to ensure the building users can enjoy good quality of water.
Credit Attainable	3
Credit Requirement	1 to 3 credits for buildings which have been certified with Quality Water Supply Scheme for Buildings – Fresh Water (Plus).

No. of Credit(s)	1	2	3
Type of Certificate	Blue	Silver	Gold

Assessment Criteria

The Applicant shall demonstrate:

- i. The water tanks are cleaned at least once every 3 months in the past 12 months;
- ii. The plumbing system is inspected at least once every 3 months in the past 12 months by licensed plumbers or qualified building services engineers or building surveyors and is found to be in good physical condition; and
- iii. All defects identified in the inspections are promptly rectified by licensed plumbers or qualified persons.

Documentation

The Applicant shall provide the following documents:

- i. Fresh water tanks cleaning records [#]
- ii. Fresh water plumbing system inspection records [#];
- iii. Defects rectification record (if any) [#]; and
- iv. Certificate of the Quality Water Supply Scheme for Buildings – Fresh Water (Plus) issued by WSD [#].

Background

The quality of treated water from WSD fully complies with the WHO guidelines for drinking water. To ensure good quality of water at the taps, the maintenance of the fresh water plumbing systems in buildings has to be consistently kept at a high standard.

According to Waterworks Ordinance, the responsibility for fresh water plumbing maintenance lies with the Building Owners/ Building Management Companies. However, some of them are not aware of this. As a result, their fresh water plumbing systems are not properly maintained. The tap water may become discoloured or dirty. Choked or burst water pipes cause weak water flow or no water supply at taps. To avoid these problems, the fresh water plumbing systems have to be inspected regularly and any defects identified have to be rectified

immediately. The water tanks have to be cleaned regularly.

In order to encourage Building Owner/ Building Management Company to maintain their plumbing systems properly and with the endorsement of the then Advisory Committee on Quality of Water Supplies (the predecessor of ACRQWS), WSD launched the Fresh Water Plumbing Quality Maintenance Recognition Scheme (which was renamed as QWRSB on 1 January 2008). QWRSB was re-titled "Quality Water Supply Scheme for Buildings - Fresh Water (Plus)" in 2015.

The successful applicants will be awarded one of three grades to recognise proper maintenance of the plumbing systems inside a building for keeping the good quality of government supplied water throughout the inside service up to the consumers' taps. There are three grades of Certificates: Blue, Silver and Gold. The Certificate is valid for one or two years subject to the satisfactory maintenance of the plumbing system and the number of years of participation in the scheme. The Certificate may be displayed in the building, and on stationeries and promotional materials. The Scheme aims to:

- i. Enable local residents and overseas visitors to have greater confidence of the water quality at the tap;
- ii. Strengthen the capability of Building Owners/ Building Management Company to achieve value-added performance in meeting the needs of consumers with respect to quality of tap water;
- iii. Give recognition to those Building Owners/ Building Management Company who can demonstrate consistent compliance of the prescribed criteria under the Scheme; and
- iv. Assist the Building Owners/ Building Management Company to conduct self-assessments on plumbing conditions and to identify areas for necessary maintenance.

	WU 7	Water Metering
Exclusion		None.
Objective		To provide opportunity to reduce the water use by tracking the water consumption records on different water systems.
Credit Attainable		1 + 1 Bonus
Credit Requirement		<p>1 credit for permanently installation of water meters for at least 2 of the following water sub-systems:</p> <ul style="list-style-type: none">i. Irrigation;ii. Indoor plumbing fixtures and fittings;iii. Cooling towers;iv. Water features/ pools; andv. Other process water. <p>1 Bonus credit for installation of devices for detecting water leakage at the communal water supply system within the building lot, i.e. underground buried pipes and all fresh water pump rooms.</p>
Assessment		<p><u>Criteria</u></p> <p>The Applicant shall provide sufficient water meters so that the water usage for different systems can be tracked. The water meters may be manually read/ equipped with data logging capability/ connected to Building Management System (BMS), where the Applicant shall provide water meters for at least 2 water systems as stated above, the first credit can be achieved.</p> <p>For the second credit, the applicant shall install water leakage detectors such as infra-red or moisture detectors for the communal water supply pipes at underground and/or fresh water pump rooms to demonstrate compliance.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <p>For the first credit,</p> <ul style="list-style-type: none">i. Narrative of the water sub-metering system;ii. Plumbing schematic diagrams or layout drawings showing the provisions of the water metering for at least two water sub-systems;iii. Data logging records [#]; andiv. On-site photographs of the water meters. <p>For the Bonus credit,</p> <ul style="list-style-type: none">i. System description of the water leakage system;

- ii. Plumbing schematic diagrams or layout drawings showing the provisions of the water leakage detectors;
- iii. Equipment catalogues of the water leakage detectors; and
- iv. On-site photographs of the water leakage detectors (if any).

Background

Generally in Hong Kong buildings, there is very limited provision for monitoring water use other than the meters required for utility billing purposes. The provision of water sub-meters for major water uses can assist the Building Owners/ Building Management Company to audit water use by tracking the water consumption records. This provides opportunities to implement water saving strategies.

Water seepage has been a cause for concern to a number of Government departments including the Buildings Department. Detection of water leaks in service pipework also presents an opportunity to save water, and perhaps more importantly, reduce the potential for structural damage as well as the creation of unhygienic conditions.

Causes of water seepage vary but one of the common sources of seepage is water-borne piping embedded in the structural members of a building. Water seepage arising from embedded piping causes not only nuisance but also deterioration to the structural member of a building if unattended for a prolonged period. Designers are strongly advised to design the routing of all water-borne piping off structural elements to meet the indispensable need for repair and replacement of such piping during the design life of the building, which would normally outlast the design life of the piping. The huge benefit to the consumers and the public that this will bring about in terms of easy maintenance of the building for its entire design life will certainly outweigh the efforts at the design stage of a building project.

	WU 8	Water Audit
Exclusion	None.	
Objective	To establish a water use inventory and provide opportunity to reduce water consumption.	
Credit Attainable	2	
Credit Requirement	2 credits for undertaking a water audit and maintaining a water use inventory.	
Assessment	<u>Criteria</u> The Applicant shall undertake a water audit and compose a water audit report. The frequency of the water audit is not regulated but it shall be conducted on a regular basis. The report shall include water consumption records, operation and maintenance records, etc. for all areas of water use, but may exclude water consumption by tenants. The report shall include: <ol style="list-style-type: none">i. Breakdown of usage across the site and site activities, reconciled against total metered water consumption;ii. Inspection of equipment, devices and processes across the site as part of preparing a usage inventory investigation of consumption by major equipment, devices and processes;iii. Investigation of usage trends and patterns using monitoring as detailed below in this section;iv. Preparation of Key Performance Indicators (KPIs) of consumption (using baseline data) in relation to an appropriate indicator (such as L/m²); andv. Demonstration of the implementation of water conservation plan. <u>Documentation</u> The Applicant shall provide the following documents: <ol style="list-style-type: none">i. Water audit report; andii. Water use inventory of the building.	
Background	Water audit is an important water management tool. It is a process to analyse the water use inside the building and provide opportunities for water saving.	

	WU 9 Enhancement
Exclusion	None.
Objective	To encourage further fresh water saving by implementing the upgrading of hard wares, management practice and education.
Credit Attainable	2
Credit Requirement	<p>a) Implementation of water saving recommendations</p> <p>1 credit for implementing the water saving recommendations as stipulated in the water audit.</p> <p>b) Educational/ promotional campaign</p> <p>1 credit for the Building Owner/ Building Management Company to encourage building users to establish a good habit of water conservation by organising promotion campaign.</p>
Assessment	<p><u>Criteria</u></p> <p>a) Implementation of water saving recommendations</p> <p>The Applicant shall provide evidence to demonstrate the recommendations as stipulated in the water audit, no matter management practices or upgrade of water fixtures, are properly implemented. It is not necessary for the Applicant to implement all the recommendations as stipulated in the report at the time of submission. However, the Applicant shall provide a timetable to implement the remaining recommendation and/or justifications not to implement such measures.</p> <p>b) Educational/ promotional campaign</p> <p>The Applicant shall demonstrate the Building Owner/ Building Management Company has organised promotional campaigns to encourage building users to establish a good habit of conserving water. The number of campaigns to be organised in each calendar year is not regulated. However, the Applicant is required to demonstrate such campaign is being held on regular basis.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <p>a) Implementation of water saving recommendations</p> <ol style="list-style-type: none">i. The progress of the implementation of the recommendations as stipulated in the water audit report; andii. On-site photographs;

b) Educational/ promotional campaign

- i. Schedule of water saving campaign;
- ii. Promotional materials such as posters, notice of the water saving campaign; and
- iii. Photographs of the campaign.

Background

Water audit is an important water management tool. It is a process to analyse the water use inside the building and provide opportunities for water saving.

Education is an essential element to change the behaviour of the citizens in consuming fresh water. WSD has launched a 'Let's Save 10L Water' campaign [1] in March 2014. This campaign aims to encourage the public to actively reduce their daily domestic water consumption by 10 litres or more and to establish good habits of conserving water, contributing to utilise our precious water resources wisely in daily life. Individual members of the public are welcome to sign the 'Commitment Certificate', pledging to participate in the 'Let's Save 10L Water' Campaign in support of using precious water wisely.

1 Water Supplies Department. Quality Let's Save 10L Water webpage. Retrieved 1 March 2016, from <http://www.waterconservation.hk/en/main.html>

	WU 10	Twin-tank System
Exclusion		None.
Objective		To reduce the water wastage during the maintenance or cleaning of the water tanks and provide an uninterrupted fresh and flush water supply to building users.
Credit Attainable		2 Bonus
Credit Requirement		Maximum 2 Bonus credits for providing twin-tank system for: i. Fresh water supply system; and ii. Flushing water supply system.
Assessment	<u>Criteria</u>	<p>1 Bonus credit can be achieved for providing twin-tank for each of the above listed water supply systems.</p> <p>The Applicant shall provide evidence that the twin-tank for fresh and/or flushing supply water systems are installed for each building of the assessment boundary.</p> <u>Documentation</u> The Applicant shall provide the following documents: i. Plumbing schematic diagrams showing the provisions of the twin-tank system for fresh water and/or flush water; and ii. On-site photographs of the twin-tank system.
Background		<p>Water tanks installed on the roof of buildings for both the fresh and flushing water supply systems used to be single-compartment tanks. As the water is supplied from one single source (a tank with single compartment), the water supply will be affected if that single source is interrupted.</p> <p>The Hong Kong Waterworks Standard Requirements has recommended that all fresh and flushing water tanks to be thoroughly cleaned at least once every three months. Water supply interruption during tank cleansing often causes inconvenience to residents. Normally, water supply will be suspended for a few hours when the tank is cleaned. Building users may need to store fresh water for temporary use or use fresh water to flush toilets during the cleaning period. There is also considerable wastage when water remained in the tank has to be drained for tank cleansing. This situation can be improved with the introduction of the twin-tank water supply system.</p>

In the twin-tank [1] system, the water tank is divided into two compartments. The system adopts an "alternately operating" approach in its operations. When one of the compartments is being cleaned, the other one is still in operation, ensuring continual water supply and the least, if any, disruption to residents.

Each compartment of the twin-tank shall be equipped with:

- i. A duplicate sets of inlet, outlet and associated overflow and drainage pipeworks;
- ii. 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
- iii. 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.

To make the water tanks more long-lasting, it is recommended that more durable materials such as epoxy-coated reinforcement bars and Grade 45 waterproof concrete be used to build the tanks.

1 Water Supplies Department. Twin-tank system. Retrieved 1 March 2016, from http://www.wsd.gov.hk/en/plumbing_and_engineering/tts/index.html

WU 11 Water Efficient Flushing System

Exclusion	Flushing system installed at tenants' areas can be excluded from the assessment.
Objective	To reduce the volumes of sewage discharged from buildings thereby reducing burdens on municipal sewage supply and treatment facilities.
Credit Attainable	2
Credit Requirement	1 credit for installing dual flush for the water closets under the control of the Applicant. 1 credit for installing urinal with WELS Grade 2 or above.
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall demonstrate that the flushing systems are water efficient with the following criteria:</p> <ul style="list-style-type: none">i. 80% of toilets are furnished with dual flush system; andii. 80% of the urinals are certified with Water Efficiency Labelling Scheme Grade 2 or above. Alternatively, if the urinals are not certified by WELS, the Applicant can provide a calculation to demonstrate the installed urinals have equivalent performance with the WELS Grade 2 certified products. <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ul style="list-style-type: none">i. Schedule of the water closets and urinals installed;ii. Catalogues of the dual flush system and the urinals with flow rate data indicated (if any);iii. The WELS certificate; andiv. On-site photographs of the water efficient flushing system.
Background	With the application of modern technology in the design of water closet flushing systems, the effectiveness of flushing can be maintained with a reduced discharge. Similarly, the concentration of sewage in discharges can be reduced at the building level to reduce the burden on sewage treatment plants.

WU 12 Quality Water Supply Scheme for Buildings – Flushing Water

Exclusion	None
Objective	To enhance the awareness of Building Owners/ Building Management Companies on proper maintenance of the flushing system.
Credit Attainable	3
Credit Requirement	1 to 3 credits for buildings which have been certified with Quality Water Supply Scheme for Buildings – Flushing Water.

No. of Credit(s)	1	2	3
Type of Certificate	Blue	Silver	Gold

Assessment Criteria

The Applicant shall demonstrate:

- i. The flushing water tanks are cleaned at least once every 6 months in the past 12 months.
- ii. The plumbing system is inspected at least once every 3 months in the past 12 months by licensed plumbers or qualified building services engineers or building surveyors and is found to be in good physical condition; and
- iii. All defects identified in the inspections are promptly rectified by licensed plumbers or qualified persons.

Documentation

The Applicant shall provide the following documents:

- i. Flushing water tanks cleaning record for the past 12 months [#];
- ii. Plumbing system inspection record for the past 12 months [#];
- iii. Defects rectification record for the past 12 months (if any) [#]; and
- iv. Certificate of the Quality Water Supply Scheme for Buildings – Flushing Water issued by WSD [#].

Background

The Flushing Water Plumbing Quality Maintenance Scheme was launched in July 2013 and it was retitled as Quality Water Supply Scheme for Buildings - Flushing Water [1] in March 2015. The objectives of the Scheme are:

- i. Strengthen the capability of Building Owners/ Building Management Company to achieve value-added performance in meeting the expectation of consumers with respect to the reliability of flushing system;

1 Water Supplies Department. Quality Water Supply Schemes for Buildings. Retrieved 1 March 2016, from http://www.wsd.gov.hk/en/customer_services_and_water_bills/application_for_licence_certificate/fwpmrs/index.html

- ii. Give recognition to those Building Owners/ Building Management Company who can demonstrate consistent compliance of the prescribed criteria under the scheme;
- iii. Assist the Building Owners/ Building Management Company in conducting self-assessments on plumbing conditions and to identify areas for necessary maintenance; and
- iv. Minimise the failure frequency of inside services of flushing system.

Successful buildings will be awarded certificates, which are classified into three grades according to the length of the continuous period for which a building has joined the scheme, to recognise that their flushing water plumbing systems have been properly maintained. The three grades of certificates are:

- i. Blue certificates: New participation or continuous participation of less than 3 years;
- ii. Silver certificates: Continuous participation of 3 years or more but less than 5 years; and
- iii. Gold certificates: Continuous participation with 5 years or more.

7 Indoor Environmental Quality	7.P Prerequisites
	7.1 Occupants satisfaction
	7.2 Ventilation
	7.3 Thermal comfort
	7.4 Hygiene
	7.5 Indoor air quality
	7.6 Lighting quality
	7.7 Acoustics and noise

Background

This section considers some of the broader issues of sustainable buildings as well as the most significant indoor performance issues. Indoor environmental quality (IEQ) includes indoor air quality and ventilation provisions that safeguard health. Considerations of these issues, as well as thermal comfort, lighting, acoustics and noise, impact on well-being, comfort and productivity.

Given that on average people in Hong Kong spend around 85% of their time indoors, indoor environmental conditions have a significant impact on the quality of life. Buildings should provide safe, healthy and comfortable indoor spaces. Poor indoor environments in commercial and institutional buildings can impact on productivity and may pose health risks to users. The design, management, operation and maintenance of buildings should seek to provide a good quality indoor environment, but with optimum use of energy and other resources.

7.P Prerequisites

IEQ P1 Minimum Ventilation Performance

Background

This requirement ensures that ventilation systems of the air-conditioned premises have been designed according to recognised procedures to provide a minimum ventilation rate of sufficient quality and quantity.

7.1 Occupants satisfaction Background

IEQ 1 Building Users Satisfaction Survey on Indoor Comfort

Collecting feedback from occupants in a systematic way on their satisfaction with the indoor environmental quality helps building managers to reveal problems that may not be observed in daily building operations. Taking corrective actions on area indicated with dissatisfaction will contribute toward continual improvement.

7.2 Ventilation

**IEQ 2 Ventilation in Common Areas
IEQ 3 Localised Ventilation**

Background	<p>It is not possible to use CO₂ as a measure of satisfactory performance in unoccupied premises but it is possible to determine if ventilation will be satisfactory through measurement of ventilation rate and ventilation effectiveness. There are three basic requirements for ventilation of occupied rooms and rooms used for habitation; background ventilation, local exhaust, and source control. Background ventilation is intended to dilute the unavoidable contaminant emissions from people and materials. Background ventilation should be provided for control of radon levels in occupied and habitable rooms, and reduces possibility of mould growth under conditions of high humidity. Local exhaust is intended to remove contaminants from those specific rooms, such as kitchens, in which concentrated sources are expected.</p>
7.3 Thermal comfort	IEQ 4 Thermal Comfort in Air-Conditioned Premises
Background	<p>BEAM Plus seeks to ensure that buildings and systems are tested as far as practicable and the specified thermal comfort conditions can be achieved under conditions of normal occupancy.</p>
7.4 Hygiene	IEQ 5 Biological Contamination IEQ 6 Waste Disposal Facilities IEQ 7 Control of Environmental Tobacco Smoke
Background	<p>Post-SARS, a lot more attention has been paid to building hygiene. Clearly, certain features of building and building services design, e.g. plumbing and drainage systems, are likely to contribute to health problems. Proper provisions for inspection, cleaning and maintenance allows for comprehensive management of hygiene in buildings.</p>
7.5 Indoor air quality	IEQ 8 IAQ Monitoring IEQ 9 IAQ in Car Parks
Background	<p>Indoor air quality (IAQ) is defined by a list of the constituents, in both solid and gaseous states, in air. A key factor in determining appropriate standards for IAQ is the duration of exposure. Exposure to indoor pollutants for a matter of minutes (e.g. car parks), hours (e.g. entertainment establishments), or over a working day (e.g. offices, classrooms, etc.) will be different for most parameters depending on dose and response.</p>
7.6 Lighting quality	IEQ 10 Interior Lighting in Normally Occupied Areas IEQ 11 Interior Lighting in Areas Not Normally Occupied
Background	<p>A consequence of poor lighting in work places is discomfort and loss of working efficiency. Although interior lighting in workplaces is one of the most challenging design tasks, unfortunately often relatively little attention is given to design for work spaces where productive and creative activities take place. To focus only on luminance level on the horizontal plane is insufficient.</p> <p>The quality of an interior lighting scheme cannot be specified or demonstrated through measurement of light sources and outputs alone, but needs to consider the relationship of the light sources to the nature of the space being illuminated, and visual tasks of users in the space.</p>

7.7 Acoustics and noise **IEQ 12 Background Noise**
IEQ 13 Room Acoustics
IEQ 14 Noise Isolation
IEQ 15 Vibration

Background

When indoor noise is above a certain level, it can cause discomfort, irritation and interference with workplace activities. In addition, poor acoustics in certain premises will interfere with speech intelligibility. Background noise inside buildings comes from a number of sources, including noise break-in from the surrounding environment and noise produced inside the building, such as from building services equipment and adjoining premises. Background noise should be limited to a level which are suitable for the use of the premises in a building development.

Many Hong Kong buildings are built close to roads and railway lines such that ground transportation noise can cause nuisance to occupants. Noise from fixed sources and aircraft may also pose a problem for some developments.

The selection and erection of building services systems and equipment can influence the background noise levels in certain locations, and may also induce unwanted vibration. The sound insulation properties of floors and internal walls are crucial in controlling noise propagation inside a building. It is also necessary to consider how the design of premises affects speech intelligibility.

IEQ P1 Minimum Ventilation Performance

Exclusion	Naturally ventilated spaces.
Objective	To ensure that a minimum quality and quantity of outdoor air is supplied to spaces in the project in order to support the well-being and comfort of building users.
Requirement	Demonstrate that the project is in compliance with the minimum requirements of ANSI/ASHRAE 62.1-2013 [1] in respect of Outdoor Air Quality and Minimum Ventilation Rate.

Alternatively

In case of the minimum ventilation rate of ANSI/ASHRAE 62.1-2013 is not complied due to the physical constraints of the existing ventilation system, demonstrate that the system is operated at maximum outdoor air delivery rate and provide not less than 5 l/s per person of combined outdoor air rate.

Assessment

Criteria

The Applicant shall conduct the air measurement at the intake location to check whether the outdoor air pollutants carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃) and respirable suspended particulates (RSP) conform to the Indoor Air Quality (IAQ) Certification Scheme Good Air Quality level.

The Applicant shall demonstrate that the ventilation rates at normally occupied areas comply with ANSI/ASHRAE 62.1-2013's requirement. Normally occupied areas are enclosed areas where people will stay more than 1 hour there. Examples of normally occupied area can be found in [Appendix 9.2 Glossary](#).

Alternatively

In case of the minimum ventilation rate of ANSI/ASHRAE 62.1-2013 is not complied due to the physical constraints of the existing ventilation system, a report endorsed by a Registered Professional Engineer (R.P.E.) in Building Services, Environmental or Mechanical discipline shall be submitted to provide the details of the system's maximum ventilation rate, and demonstrate that the system is operated at maximum capacity to deliver outdoor air into the space and provide not less than 5 l/s per person of combined outdoor air rate.

Documentation

The Applicant shall provide the following documents:

1 ANSI/ASHRAE 62.1-2013. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

- i. Measurement report of CO, NO₂, O₃ and RSP at the outdoor air intake location; and
- ii. A report identifying each of the ventilation zones, the space types, occupant densities, and the ventilation rates; demonstrating compliance with the minimum ventilation rate(s).

Alternatively

In case of the minimum ventilation rate of ANSI/ASHRAE 62.1-2013 is not complied, a report endorsed by a R.P.E. is required to demonstrate credit compliance.

Background

The purpose of this prerequisite is to provide the minimum outdoor air ventilation for the control of odours, that is, the supply, distribution and control of ventilation to maintain carbon dioxide (CO₂) levels within design targets in normally occupied spaces, and the control of indoor pollutants such as Total Volatile Organic Compound (TVOC), formaldehyde, etc.

The assessment for building follows requirements of ANSI/ASHRAE 62.1-2013. The standard includes significant requirements other than outdoor air rates, such as requirements for equipment to reduce the potential for microbial growth, air cleaning requirements, and start-up and commissioning requirements. All of these requirements must be met to comply with this prerequisite.

	IEQ 1	Building User Satisfaction Survey on Indoor Comfort
Exclusion	None.	
Objective	To obtain building users' satisfaction rate regarding indoor environmental quality.	
Credit Attainable	2	
Credit Requirement	1 credit for conducting regular building user satisfaction surveys to collect anonymous responses regarding the indoor environmental quality (e.g. hygiene, IAQ, ventilation, thermal comfort, lighting quality, aural environment etc.).	
	1 credit for implementing the recommendations for improvement of IEQ as stipulated in the survey report.	
Assessment	<u>Criteria</u>	
	The Applicant shall conduct at least one building user satisfaction survey every 2 years to collect anonymous responses from the building users. The survey shall cover at least the following topics:	
	<ul style="list-style-type: none">i. Thermal comfort;ii. Indoor air quality;iii. Aural comfort;iv. Lighting; andv. Building cleanliness.	
	The survey shall include representative samples of building users contributing at least 30% of the total building tenants. The credit(s) can be achieved by presenting the survey results.	
	The Applicant shall develop and implement a corrective action plan to address comfort issues if the results indicate that more than 20% of tenants are dissatisfied.	
	<u>Documentation</u>	
	The Applicant shall provide the following documents:	
	<ul style="list-style-type: none">i. A report of the building user satisfaction survey [#]; andii. A plan and implementation records of the corrective actions for discomfort [#].	

Background

Traditional building management focuses on measuring and regulating the resource efficiency of buildings and systems. Less attention has been paid on how well buildings meet their design intent for the building users. Collecting direct feedback from the building users on their satisfaction with the building's comfort level can reveal problems that may not be observed in daily operations, which helps building management to improve the indoor environmental quality. The challenge is to collect and analyse this input in a systematic and meaningful manner; to identify the cause of the problem, and taking corrective action.

	IEQ 2	Ventilation in Common Areas
Exclusion		None.
Objective		To ensure adequate ventilation in enclosed common areas and circulation routes within the building and to avoid cross-contamination between areas.
Credit Attainable		1
Credit Requirement		1 credit for providing adequate ventilation for 90% of mechanically ventilated common areas in a building.

Alternatively

For naturally ventilated premises, 1 credit for demonstrating that 80% of the common areas in a building are provided by natural ventilation.

Assessment

Criteria

Enclosed common areas include corridors, lift lobbies, entrance lobbies, circulation areas etc. Rooms/ areas with significant indoor pollution sources such as toilets, carpark, refuse room, plantroom, etc. and staircases shall be excluded from the assessment.

For mechanical ventilated common areas, the design ventilation rates shall comply with recommendations from recognised authorities, e.g. ANSI/ASHRAE 62.1-2013 [1] or equivalent. Compliance shall be demonstrated by calculations, or measurements on a representative sample of each type of space.

For naturally ventilated enclosed common areas, the Applicant shall demonstrate that the ventilation rate (ACH of higher than 0.5) is achieved under average wind conditions in at least 80% of the common areas, aggregated by floor area. Compliance may be demonstrated by suitable commissioning measurements such as a tracer gas test [2] on a representative sample of spaces, including worst cases, or by appropriate modelling techniques, such as wind tunnel test and Computational Fluid Dynamics (CFD) study.

When modelling approach is adopted, the model shall include building and surrounding large structures within radius of 2 building heights. A minimum percentage occurrence of prevailing winds of 75% annual is required. At least 8 of the prevailing wind directions shall be tested.

1 ANSI/ASHRAE 62.1-2013. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
2 ASTM International. E 741-11. Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution.

Documentation

The Applicant shall provide the following documents:

- i. The design criteria adopted for each type of common areas; and
- ii. The report of methodology and results of calculations, simulations and/or measurements in the specified sample of spaces to demonstrate compliance with the assessment criteria.

Background

The Buildings Department seeks to improve building design in the context of environmental hygiene. Designers are recommended to consider the provision of ventilation to common areas, such as corridors, lift lobbies, entrance lobbies, etc. Where design constraints render the provision of natural ventilation not feasible, mechanical ventilation should be provided to improve the indoor environment. Good practices when designing mechanical ventilation in public areas require:

- i. The ventilation system to be capable of providing sufficient fresh air taking into account the anticipated population;
- ii. Intake and exhaust points be properly designed to prevent contamination of fresh air supply and avoid short-circuiting; and
- iii. The ventilation system and its associated ductwork, where provided, should be conveniently accessible for maintenance.

Ventilation for bathrooms, kitchens, and refuse rooms may be sources of pollution affecting common areas.

Cross ventilation is important to control temperature and to dilute pollutants and odours. Recommended practice is to place ventilation openings so that cross ventilation can occur. However, wind driven cross ventilation can only happen when there is a reliable higher pressure on one side of openings than on the other. For an isolated building this may be easily achieved by simple consideration of prevailing winds and the building form. For buildings within dense groupings, however, local wind direction may be less apparent. A more sophisticated analysis of the behaviour of the wind is necessary to ensure beneficial cross flows.

	IEQ 3	Localised Ventilation
Exclusion		None.
Objective		To prevent exposure of building users to concentrated indoor sources of pollutants.
Credit Attainable		1
Credit Requirement		1 credit for providing adequate ventilation system for rooms/ areas with significant indoor pollution sources.
Assessment		<p><u>Criteria</u></p> <p>The Applicant shall provide sufficient local exhaust for rooms/ areas under Building Owner/ Building Management Company's control where concentrated pollutant sources are likely to be present. The design exhaust rates shall comply with recommendations from recognised international standards such as ANSI/ASHRAE 62.1-2013 or local regulation requirements.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. A summary table detailing the design criteria and the ventilation system designs providing local exhaust;ii. Drawings showing the locations with significant indoor pollution sources and associated ventilation system layouts;iii. Calculation indicating that the exhaust rate is achieved; andiv. Photographs or drawings showing the location of the exhaust point.
Background		<p>Concentrated pollution sources are best managed at source. The provision of localised ventilation, segregated from the general ventilation, is an appropriate strategy. In commercial and similar premises, pollutant sources such as photocopying equipment, toilets, etc. should be provided with dedicated exhaust systems. In other buildings, local exhaust is intended to remove contaminants from specific rooms such as kitchens, in which concentrated sources are expected.</p>

IEQ 4 Thermal Comfort in Air-Conditioned Premises

Exclusion	Premises without any air-conditioning provisions.
Objective	To ensure the thermal comfort of the building users.
Credit Attainable	2
Credit Requirement	<p>1 credit for sustaining the air temperature at the design value within $\pm 1.5^{\circ}\text{C}$ when the air side system is operating at steady state under normally occupied periods.</p> <p>1 credit for demonstrating an appropriate temperature (i.e. $<25.5^{\circ}\text{C}$), relative humidity (i.e. $<70\%$) and air velocity (i.e. $<0.3\text{ m/s}$) in the building.</p>
Assessment	<p><u>Criteria</u></p> <p>The measurement report shall be prepared and endorsed by Indoor Air Quality Certificate Issuing Bodies (CIB). The measurement protocols such as the equipment used, measurement methodologies, number of points required and the contents of the report shall in accordance with the Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places issued by the Government of the Hong Kong Special Administrative Region [1].</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. Measurement report endorsed by a CIB; andii. Drawings showing the location of measurement locations and ventilation system layouts.
Background	<p>The Heating, Ventilating, and Air-Conditioning (HVAC) system should be able to maintain room conditions (within acceptable tolerances) under normal occupied periods. Measurements under such circumstances can demonstrate compliance with the operating requirements.</p>

1 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 1 March 2016, from <http://www.iaq.gov.hk/media/8694/certguide-eng.pdf>

	IEQ 5	Biological Contamination
Exclusion	None.	
Objective	To reduce the risk of biological contamination from the operation of the HVAC and water systems.	
Credit Attainable	1	
Credit Requirement	1 credit for complying with the recommendations given in the Code of Practice - Prevention of Legionnaires Disease, in respect of air-conditioning and ventilation systems and water systems.	
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall provide document detailing how the design and installation of the HVAC and water systems meet with the requirements and recommendation contained in the Code of Practice - Prevention of Legionnaires Disease [1]. The report shall also detail how water supply, particularly hot water supply, and water use in features such as spas, fountains, etc., are designed and installed in compliance with the Code of Practice.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following document:</p> <ol style="list-style-type: none">i. The design and justification on fulfilling the credit requirement [#].	
Background	<p>Most cases of legionnaires' disease (LD) are caused by the bacterium <i>Legionella pneumophila</i>. There are many other species of the organism which have been implicated in human disease, but other milder illnesses may be caused by these organisms. All illnesses due to legionella species are known collectively as 'legionellosis'. Pontiac Fever is one of the milder conditions. <i>Legionella pneumophila</i> is found in natural water supplies and in soil. It is also found in many recirculating and water supply systems.</p> <p>Measurements in a newly completed building are unlikely to reveal problems with biological contamination caused by either air-conditioning and ventilation systems, or water systems. Consequently, BEAM Plus requires proper maintenance of the MVAC and water system to reduce the risk of biological contamination.</p>	

1 Prevention of Legionnaires' Disease Committee, EMSD. Code of Practice for the Prevention of Legionnaires' Disease in Hong Kong 2012 Edition. Retrieved 1 March 2016, from http://www.emsd.gov.hk/filemanager/en/content_296/COP-PLD_2012.pdf

	IEQ 6	Waste Disposal Facilities
Exclusion		None.
Objective		To reduce the risk of odours from the waste disposal facilities entering occupied areas or public areas.
Credit Attainable		1
Credit Requirement		1 credit for providing de-odourising system in all rooms designated for refuse storage or materials recovery.
Assessment		<p><u>Criteria</u></p> <p>When a centralised ventilation system is adopted, a single air purifier or carbon filter may be installed before final discharge into the atmosphere.</p> <p>Air purifying devices such as 'Chemical Air Scrubber', 'Bio-oxygen Generator', 'Photo-oxidation Generator' or other appropriate devices are also accepted.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">Drawings showing the locations of refuse room or refuse collection chambers; andCatalogues and photographs of the air purification system and de-odourising system.
Background		Where refuse contains large amounts of food and other organic waste there are potential odours and health problems if refuse is not well contained from the points of disposal by users to the place of final collection. Automatic systems are available to isolate refuse from users, which could also help to minimise the problem.

	IEQ 7	Control of Environmental Tobacco Smoke
Exclusion		None.
Objective		To protect the health of building users and reduce the risk of environmental tobacco smoke entering the occupied areas or public areas.
Credit Attainable		1
Credit Requirement		1 credit for implementing no smoking policy outside the building except in designated smoking areas.
Assessment		<p><u>Criteria</u></p> <p>The Applicant shall provide documentation to demonstrate the following measures are implemented in the external areas of the building:</p> <ol style="list-style-type: none">i. For those areas with business purposes: Smoking shall be prohibited.ii. For those areas without business purposes: Smoking shall be prohibited within the site boundary, except in designated smoking areas located at least 7.5 m from all entries, outdoor air intakes, and operable window.iii. Post the signage at all building entrances indicating the no smoking policy and the boundary of no smoking areas. <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. No smoking policy;ii. Layout plan showing the designated smoking areas are located at least 7.5 m from all entries, outdoor air intakes, and operable window; andiii. Photos of the signage indicating the no smoking policy and the boundary of no smoking area.
Background		<p>According to WHO, tobacco use is one of the main risk factors for a number of chronic diseases, including cancer, lung diseases, and cardiovascular diseases. There are six million people died due to tobacco use (smoking and smokeless) every year and a total of 600,000 people are also estimated to die from the effects of second-hand smoke.</p> <p>In accordance with the Smoking (Public Health) Ordinance (Cap 371), statutory no smoking areas cover the indoor areas of all restaurant premises, indoor workplaces, public indoor places, and some public outdoor places in Hong Kong. No person shall smoke or carry a lighted cigarette, cigar, or pipe in no smoking areas.</p>

In particular, certain public outdoor places are designated as statutory no smoking areas under section 3 and Schedule 2 of Cap 371, including escalators, public pleasure grounds, bathing beaches and the vicinities including adjacent barbeque areas as well as public swimming pools and the vicinities including sidewalks, diving boards, and spectator stands. Furthermore, Hong Kong Wetland Park, the running tracks, sidewalks, and spectator's stands at Hong Kong Stadium and Mong Kok Stadium are also designated statutory no smoking areas.

Extension of no smoking areas within the site boundary would help to reduce the risk of environmental tobacco smoke entering the occupied areas or public areas and thus protect the health of building users.

	IEQ 8	IAQ Monitoring
Exclusion	None.	
Objective	To ensure good IAQ level in normally occupied spaces.	
Credit Attainable	7 + 2 Bonus	
Credit Requirement	<p>Maximum 7 credits for demonstrating compliance with appropriate criteria for indoor pollutant levels, for following parameters:</p> <ul style="list-style-type: none">i. Carbon Dioxide;ii. Carbon Monoxide, Nitrogen Dioxide and Ozone;iii. Respirable Suspended Particulate;iv. Formaldehyde;v. Total Volatile Organic Compounds;vi. Radon; andvii. Bacteria. <p>1 Bonus credit where the whole building (i.e. including the tenant areas) is certified by the Good Class of 'Indoor Air Quality Certification Scheme for Office and Public Place'.</p> <p>1 Bonus credit for demonstrating the continuous participation in the 'Indoor Air Quality Certification Scheme for Office and Public Place' for past 3 consecutive years.</p>	
Assessment	<p><u>Criteria</u></p> <p>1 credit can be achieved for demonstrating compliance for each of the above listed parameters.</p> <p>Credit(s) compliance shall be demonstrated by measurements. The measurement protocol, i.e. the measuring equipment used, duration of measurements, number of the sampling points, shall be made with reference to the latest version of the Environmental Protection Department (EPD)'s IAQ Certification Scheme. The criteria shall be those defined under Good Class of the scheme.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ul style="list-style-type: none">i. Measurement report issued by a Hong Kong Accreditation Service (HKAS) accredited IAQ Certificate Issuing Body (CIB) with measurement methodology, number of sampling points required under IAQ Certification Scheme, measuring date, time and conditions of the interiors space, the measurement results and the calibration certificates of the measuring equipment.	

Alternatively

A valid IAQ Certificate issued by EPD. (Note: it is not necessary to submit the first measurement results)

- ii. For the first Bonus credit, valid IAQ Certificate covering the whole building issued by EPD [#].
- iii. For the second Bonus credit, IAQ Certificate in the past three years issued by EPD [#].

Background

EPD has launched the IAQ Certification Scheme in 2003 in order to improve the indoor air quality and promote public awareness of the importance of IAQ. There are two objectives of the Certification Scheme: a) to recognise good IAQ management practice; and b) to provide incentives for Building Owner/ Building Management Companies to pursue the best level of IAQ. More details of the IAQ Certification Scheme can be found in EPD website [1].

1 Indoor Air Quality Information Centre. Background. Retrieved 1 March 2016, from <http://www.iaq.gov.hk/en/iaq-certification-scheme.aspx>

	IEQ 9	IAQ in Car Parks
Exclusion		Buildings without carpark or with carpark area less than 10% of construction floor area.
Objective		To ensure the air quality in car parks is within acceptable level.
Credit Attainable	1	
Credit Requirement		1 credit for complying with the recommended CO and NO ₂ level as stipulated in ProPECC PN 2/96.
Assessment	<u>Criteria</u>	<p>Credit compliance shall be demonstrated by measurements. The measurement protocol, i.e. the measuring equipment used, duration of measurements, number of the sampling points, shall be made with reference to the guidelines given in ProPECC PN 2/96 [1].</p> <p>Semi-enclosed car park without any mechanical ventilation shall also be included in the assessment.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following document:</p> <ol style="list-style-type: none">Measurement report issued by a Hong Kong Accreditation Service (HKAS) accredited IAQ Certificate Issuing Body (CIB) with measurement methodology, number of sampling points required under IAQ Certification Scheme, measuring date, time and conditions of the interiors space, the measurement results and the calibration certificates of the measuring equipment.
Background		CO and NO ₂ are the most relevant air pollutants inside car parks in Hong Kong. As a generalisation, petrol engine vehicles (mainly cars) are the source of most but not all CO while diesel engine vehicles are the source of most but not all NO ₂ in car parks. CO blocks the absorption of oxygen by the blood and this can lead to dizziness, unconsciousness, or death depending on the concentration. NO ₂ affects the lungs and can cause breathing difficulties, prompts asthma attacks and causes long term damage to the lungs.

1 Environmental Protection Department. Practice Notes for Professional Persons. ProPECC PN 2/96. Control of Air Pollution in Car Parks. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/sites/default/files/epd/english/resources_pub/publications/files/pn96_2.pdf

IEQ 10 Interior Lighting in Normally Occupied Areas

Exclusion	Residential units, hotels and apartment buildings.
Objective	To ensure the adequacy and maintenance of visual comfort conditions achieved by the electric lighting provisions in occupied areas.
Credit Attainable	3 + 1 Bonus
Credit Requirement	<p>Maximum 3 credits for achieving the prescribed lighting performance in each type of premises, regarding the illuminance and lighting quality as listed below:</p> <ul style="list-style-type: none">i. Maintained illuminance and illuminance uniformity;ii. Achieving the limiting unified glare rating; andiii. Light sources with an appropriate colour rendering index. <p>1 Bonus credit for fulfilling the above requirement in tenant's areas with at least 50% coverage.</p>
Assessment	<p><u>Criteria</u></p> <p>Normally occupied areas are enclosed areas where people will stay more than 1 hour there. Examples of normally occupied area can be found in Appendix 9.2 Glossary.</p> <p>The lighting performance criteria adopted shall be based on authoritative guidance, such as CIE [1,2,3] or CIBSE [4] publications, or equivalent. Compliance with the assessment criteria shall be demonstrated either by measurements using a standardised measurement protocol appropriate to the parameter being assessed, and/or by modelling (calculation), providing the calculation method or software used is based on a standardised method, and uses data/assumptions appropriate to the circumstances.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ul style="list-style-type: none">i. The layout plan showing all the normally occupied areas;ii. A summary table indicating the uniformity, unified glare rating and colour rendering index (by measurements or simulations) at each zone of the normally occupied areas; andiii. Catalogues or other supporting documents showing that the colour rendering index of the lighting system.

1 Commission Internationale de l'Eclairage (CIE). Lighting of Indoor Work Places. CIE Standard S 008/E.
2 Commission Internationale de l'Eclairage (CIE). Discomfort Glare in Interior Lighting. CIE 117-1995.
3 Commission Internationale de l'Eclairage (CIE). Calculation and Presentation of Unified Glare Rating Tables for Indoor Lighting Luminaires. CIE 190-2010
4 The Chartered Institution of Building Services Engineers. Code for Lighting. London. CIBSE.

**Measured
Performance**

For lighting installations that are already installed, illuminance on the task area can be measured using a lux meter.

The colour quality of lamps can be assessed from the lamp specifications. Colour appearance (correlated colour temperature) can be checked from the specification provided by the suppliers.

Computation

'Uniformity' which is concerned with illuminance conditions on the task and immediate surroundings.

The uniformity can be calculated according to that described in CIBSE Code for Lighting. The calculated uniformity (minimum to average illuminance) over any task area and immediate surroundings should not be checked for compliance with the recommendations given in CIBSE Code for Lighting.

The unified glare rating (UGR) can be calculated according to CIBSE Code for Lighting, CIE 117 and CIE 190.

The calculated UGR shall be checked for compliance with the recommendations given in CIE [1] or CIBSE Code for Lighting.

A validated computer program such as Dialux, Radiance and Lightscape etc. can be used for the calculation. The calculated results will then be checked for compliance.

Background

Lighting quality is a complicated subject and is an integration of task performance, visual comfort, social communication, mood, health, safety and well-being and aesthetic judgement. It is also related to economics and the environment in respect of the installation, maintenance and operation of the lighting system.

The uniformity of illuminance distribution on the task area and its surrounding area have a great impact on how quickly, safely and comfortably a person perceives and carries out a visual task. A task area is not usually the entire area of a workstation. On an office desk, for example, the task area may only be about the size of a desk, but in interiors such as drawing offices the visual task may cover the whole area of a drawing board. Where task areas may be located anywhere over an area of a room, the recommendation applies to all potential task areas within that area.

Glare is another important factor which affects lighting quality. It describes the sensation produced by bright areas in the field of view, and may be experienced either as discomfort glare or as disability glare. In any proposed lighting installation, the likelihood of discomfort glare being experienced can be estimated by calculating the UGR.

It is also important for visual performance and the feeling of comfort when objects and human skin are rendered naturally and correctly. To provide an objective indication of the colour rendering properties of a light source, the general colour rendering index, Ra, has been

introduced. The maximum value of Ra is 100, which stands for the quality of natural light, and this figure decreases with decreasing colour rendering quality.

	IEQ 11 Interior Lighting in Areas Not Normally Occupied
Exclusion	None
Objective	To ensure the adequacy of artificial lighting provisions in common areas and service areas
Credit Attainable	3
Credit Requirement	<p>Maximum 3 credits for achieving the prescribed lighting performance in each type of not normally occupied areas, regarding the illuminance and lighting quality as listed below:</p> <ul style="list-style-type: none">i. Maintained illuminance and illuminance uniformity;ii. Achieving the limiting unified glare rating; andiii. Light sources with an appropriate colour rendering index.
Assessment	<p><u>Criteria</u></p> <p>Not normally occupied areas are enclosed areas where people normally stay less than 1 hour there. Examples of not normally occupied area can be found in Appendix 9.2 Glossary.</p> <p>Compliance with the assessment criteria shall be demonstrated either by measurements using a standardised measurement protocol appropriate to the parameter being assessed, and/or by modelling (calculation), providing the calculation method or software used is based on a standardised method, and uses data/ assumptions appropriate to the circumstances.</p> <p>Reference should be made to Section IEQ 10 for further information on measurements and modelling on interior lighting systems.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ul style="list-style-type: none">i. The layout plan showing all common areas or service space;ii. A summary table indicating the illuminance level, unified glare rating and colour rendering index (by measurements or simulations) at each of the common areas or service space; andiii. Catalogues or other supporting documents showing that the colour rendering index of the lighting system.
Background	Lighting quality is a complicated subject and is an integration of task performance, visual comfort, social communication, mood, health, safety and well-being and aesthetic judgement. It is also related to economics and the environment in respect of the installation, maintenance and operation of the lighting system.

IEQ 12 Background Noise

Exclusion	Buildings/ premises which are inherently noisy.
Objective	To control as far as practicable the background noise at appropriate levels to the intended use of the premises.
Credit Attainable	1
Credit Requirement	<p>1 credit for demonstrating background noise levels from both external sources and building services equipment are within the prescribed criteria.</p> <p>Based on the nature of the building, relaxation shall be allowed in considering the acceptance of this credit. The Applicant shall provide submit both the design and calculation to justify such relaxation.</p>
Assessment	<p><u>Criteria</u></p> <p>Internal noise level:</p> <ol style="list-style-type: none">i. Office type premises: NR 40;ii. Classrooms and similar premises: NR 35;iii. Residential premises, hotel and apartments: NR 35;iv. Shopping malls (common areas): NR 45; andv. Indoor games halls & indoor swimming pools: NR 50. <p>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.</p> <p>Compliance shall be demonstrated by detailed calculations or measurements depending on the Applicant's preference. The measurement report and/or acoustic calculations shall be endorsed by a Corporate Member of Hong Kong Institute of Acoustics (HKIOA) or equivalent.</p> <p>Internal noise calculations or site measurements shall include at least one sample of each type of occupied space, taking account 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 standard.</p> <p>For most types of buildings, the assessment shall take into account noise from building services equipment under normal operation mode while for residential units, the assessment shall only consider the external noise sources.</p>

1 International Electrotechnical Commission. IEC 61672-1:2013 Electroacoustics - Sound level meters.

Documentation

The Applicant shall provide the following document:

- i. Acoustic measurement report endorsed by a HKIOA corporate member with valid calibration certificate of sound level meters or calculations to demonstrate compliance of NR level.

Background

The internal noise levels in occupied spaces are important to the well-being of a person. It can have major impacts on the concentration and productivity of the occupants. Higher noise levels may lead to hearing impairment and health hazard.

IEQ 13 Room Acoustics

Exclusion Buildings/ premises in which speech intelligibility is not important, and rooms of special acoustical nature.

Objective To improve the acoustical properties of rooms in which speech intelligibility is important.

Credit Attainable 1

Credit Requirement 1 credit for demonstrating that the mid-frequency reverberation time in applicable rooms meets the prescribed criteria of different types of premises.

Based on the nature of the building, relaxation shall be allowed in considering the acceptance of this credit. The Applicant submit both the design and calculation to justify such relaxation.

Assessment Criteria

The average reverberation time for mid frequencies (500Hz, 1kHz and 2kHz), shall be:

- i. Office type premises: 0.4 to 0.6s;
- ii. Classrooms and similar premises: 0.4 to 0.6s;
- iii. Residential premises, hotels and apartments: 0.4 to 0.6s;
- iv. Indoor games halls, indoor swimming pools: 1.5 to 2s; and
- v. Shopping malls (common areas): 1.0 to 1.5s.

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.

Compliance shall be demonstrated by detailed calculations or measurements depending on the Applicant's preference. The measurement report and/or acoustic calculations shall be endorsed by a Corporate Member of Hong Kong Institute of Acoustics or equivalent.

The reverberation time shall be assessed using Sabine's formula [1] or similar alternative taking into account the room details and appropriate assumptions about the materials in the space. Measurements during commissioning shall use the method given in ISO 3382 [2] or equal equivalent. The assessment shall include at least one sample of each type of occupied space.

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

2 International Standard Organization. ISO 3382. Acoustics - Measurement of the reverberation time of rooms with reference to other acoustical parameters.

Documentation

The Applicant shall provide the following document:

- i. Reverberation time measurement or calculation at representative locations with supporting documents of the absorption coefficients.

Background

An important first step in architectural acoustic design is to identify appropriate values of reverberation time for the intended use of a room and then to specify materials to be used in the construction which will achieve the desired value of the reverberation time for a given space and use.

The focus for BEAM Plus is on the acoustical qualities in workplaces such as offices and classrooms, libraries, and retails, etc. Whilst the matter of room acoustics is complex, and defining performance by a single indicator is problematic, an important acoustical measurement is the reverberation time. It is used to determine how quickly sound decays in a room, and offers a relatively simple assessment of acoustical design.

IEQ 14 Noise Isolation

- Exclusion** Buildings/ premises which are inherently noisy and unaffected by noise.
- Objective** To improve the noise isolation of normally occupied premises/ rooms to reduce impact of noise nuisance and enhance speech privacy.
- Credit Attainable** 1 + 1 Bonus
- Credit Requirement** 1 credit for demonstrating airborne noise isolation between rooms, spaces and premises fulfils the prescribed criteria.

For residential developments only,
1 Bonus credit for demonstrating impact noise isolation between floors fulfils the prescribed criteria.

Based on the nature of the building, relaxation shall be allowed in considering the acceptance of this credit. The Applicant shall submit both the design and calculation to justify the relaxation.

Assessment

Criteria

Compliance shall be demonstrated by computer simulation, detailed calculations, or measurements depending on the Applicant's preference. The performance of the weighted Sound Reduction Index (SRI)/ Level Difference shall fulfill the requirements as stated in below table. The measurement report and/or acoustic calculations shall be endorsed by a Corporate Member of Hong Kong Institute of Acoustics or equivalent.

Type of Premises	Weighted SRI	Level Difference
Between offices/ conference rooms/ retails shop	R_w 44	$D_{nT,w}$ 38
Between hotel rooms/ serviced apartments/ function rooms/ activity rooms	R_w 52	$D_{nT,w}$ 46
Between classrooms	R_w 37	$D_{nT,w}$ 31
Between bedroom to living room (same unit)	R_w 46	$D_{nT,w}$ 40
Between bedroom to bedroom/ living room to living room (different units)	R_w 52	$D_{nT,w}$ 46
Between bedroom to bedroom (same unit)	R_w 44	$D_{nT,w}$ 38

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

For the Bonus credit, the credit can be achieved if the Applicant can demonstrate the following by computer simulation or measurements depending on the Applicant's preference.

Type of Premises	Normalised Impact Sound Pressure Level (By laboratory)	Normalised Impact Sound Pressure Level (On site measurement)
Between floors	$L_{n,w} 64$	$L'_{n,w} 70$

The Applicant shall submit a schedule of the premises and spaces in the building, the noise isolation criteria adopted, relevant partition or slab details as they impact on noise isolation, the rooms/ premises subject to field tests or for which detailed calculations/ simulations have been made, underlying assumptions, and the results of tests or calculations/ simulations demonstrating compliance with the criteria.

Documentation

The Applicant shall provide the following document:

- i. Layout plan/ elevation drawings showing the location of the partition walls/ slab;
- ii. Construction details of the partition walls/ slab; and
- iii. Calculations/ Computer simulation results/ Field test measurement report endorsed by a Corporate Member of Hong Kong Institute of Acoustics or equivalent.

Note: It is not necessary to submit the construction details of the partitions/ slab if on-site measurement approach is adopted.

Background

The noise transmitted between spaces, through walls and through floors, which are not addressed under the local Building Regulations, but have been a matter for legislation elsewhere.

The extent to which walls and floor can attenuate unwanted noise from neighbours and neighbouring spaces is an important aspect of controlling noise levels in interiors. Ventilation openings, doors, etc., are likely to be the weakest part of the envelope enclosing a space as far as airborne noise transmission is concerned. Guidance on the design of walls and floors, and guidelines for assessing performance is available in the literature [1].

	IEQ 15	Vibration
Exclusion	None	
Objective	To avoid excessive vibration from building services equipment.	
Credit Attainable	1	
Credit Requirement	1 Bonus credit for vibration levels not exceeding the prescribed criteria.	
Assessment	<u>Criteria</u> Vibration generated from the building services equipment shall be in compliance with the criteria given in ISO 2631-2 [1]. The level of vibration in terms of root mean square acceleration shall be determined by on-site measurement. The vibration measurement report shall be endorsed by a Corporate Member of Hong Kong Institute of Acoustics or equivalent. <u>Documentation</u> The Applicant shall provide the following document: i. Vibration measurement report with valid calibration certificate of instrumentations to demonstrate compliance.	
Background	Excessive vibration in buildings can also be a source of annoyance to users. It is possible to mitigate against vibration caused by internal sources, such as building services equipment, through good design by installing vibration isolators.	

1 International Standard Organisation. ISO 2631-2. Evaluation of human exposure to whole-body vibration – Part 2 : Continuous and shock-induced vibration in buildings (1 to 80Hz).

8 Innovations and Additions

- IA 1 Innovative Techniques**
- IA 2 Performance Enhancements**
- IA 3 Provision of Venues or Public Spaces for Environmental Programme**
- IA 4 Engagement with Neighbourhoods**
- IA 5 Provision of Electrical Vehicle Charging Stations**
- IA 6 Recognition and Appreciation Awarded from Other Organisations**
- IA 7 Achievement of Hong Kong Green Organisation Certification**

Background

This section allows the Applicant to submit for consideration for the award of bonus credits 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.

Important Note: The Applicant shall expressly state the full extent, scope, and coverage of the intended Innovation submission.

Credits

Maximum 10 Bonus credits in this section.

	IA 1	Innovative Techniques
Exclusion		None.
Objective		To encourage adoption of practices, new technologies and techniques that have yet to find application in Hong Kong.
Credit Attainable		5 Bonus (total of IA 1 and IA 2)
Credit Requirement		Maximum 5 Bonus credits for implementation of each innovative technique which provides environmental benefits in addition to those already covered in this Manual.
Assessment		<p><u>Criteria</u></p> <p>The onus will be on the Applicant to present evidence of the application of new practices, technologies and techniques and the associated benefits. The benefits may be considered in relation to sustainable living, energy use, materials use, improved comfort, reduced pollution, etc. The Assessor will refer the proposal to the TRC of BSL who will consider each aspect on its merits and award credit(s) accordingly.</p> <p>The Applicant shall make a submission for granting additional credit(s) that identifies the intent of the proposed innovative technique, the proposed criteria for assessing compliance, and the assessment criteria. The weighting (number of credits) proposed would be considered in the light of existing weightings under the various environmental impacts categorised in BEAM Plus for Existing Buildings, i.e. a technique which can demonstrate a resource saving or reduced environmental loading would be compared to existing criteria deemed to achieve similar levels of benefit.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. Narrative to indicate the innovative techniques;ii. Calculation quantifying environmental benefits through application of proposed innovation technique; andiii. Record photographs.
Background		<p>In addition to those already covered in BEAM Plus Existing Buildings, there are advanced practices and new technologies that have not hitherto found application in Hong Kong or even elsewhere.</p> <p>To encourage adoption of innovative techniques to provide environmental benefits, buildings with innovative and/or unconventional designs, construction techniques or provisions for operation shall be awarded with Bonus credit.</p>

	IA 2	Performance Enhancements
Exclusion		None.
Objective		To encourage adoption of practices, technologies and techniques that provide for performance enhancements over and above stated performance criteria in this Manual.
Credit Attainable		5 Bonus (total of IA 1 and IA 2)
Credit Requirement		Maximum 5 Bonus credits for having exemplary performance of the requirement stipulated in this Manual.
Assessment		<p><u>Criteria</u></p> <p>The onus will be on the Applicant to present evidence of the performance gains as compared to existing criteria. The Assessor will refer the proposal to the TRC of BSL who will consider each aspect on its merits and award credit(s) accordingly.</p> <p>The Applicant shall make a submission for granting bonus credit(s) which identifies the level of enhancement in performance in any environmental aspect. The weighting (number of credits) proposed would be considered in the light of existing weightings provided under the various environmental impacts categorised in BEAM Plus, i.e. a demonstrated resource saving would be compared to existing criteria on a pro-rata basis to determine the bonus credit(s) to be achieved.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. Calculation quantifying exemplary performance over and above the criteria identified in any aspect of the BEAM Plus for Existing Buildings through proposed application; andii. Record photographs.
Background		To encourage aiming for excellent, buildings demonstrate with significant performance enhancements shall be awarded, i.e. strategies and techniques that greatly exceed the requirements of this Manual. For example, features that result in significantly higher levels of service, energy, water or materials savings.

	IA 3	Provision of Venues or Public Spaces for Environmental Programme
Exclusion	None.	
Objective	To encourage development that is an asset to the society in promoting environmental performance.	
Credit Attainable	1 Bonus	
Credit Requirement	1 Bonus credit for providing venue or public spaces for environmental programmes or events.	
Assessment	<u>Criteria</u> The Applicant shall provide venue or public spaces within the assessment boundary for other organisations to organise environmental programmes/ events, such as training, seminar and exhibition etc. The Bonus credit can be achieved by presenting evidence that at least one environmental programme organised by other organisation was being held in the past 12 months at the time of submission. <u>Documentation</u> The Applicant shall provide the following documents: i. Summary table showing the date and organiser(s) of the environmental programme/ event in the past 12 months [#]; ii. Promotional materials such as posters, notice of environmental related programme [#]; iii. Location plan to indicate the venue used [#]; and iv. Record photographs [#].	
Background	An individual can contribute directly to the communities by providing voluntary services and participating in charity activities. A building can contribute indirectly by providing venue for organisations to support their activities on green initiatives, and enhance social sustainability.	

	IA 4 Engagement with Neighbourhoods
Exclusion	None.
Objective	To encourage responsiveness to community needs by involving the people in the community in building operation and in decisions about how it shall be improved or changed over time.
Credit Attainable	1 Bonus
Credit Requirement	1 Bonus credit for planning, managing and conducting a significant and wide ranging social engagement, engaging the impacted and relevant constituents in the community.
Assessment	<p><u>Criteria</u></p> <p>The Applicant shall plan, manage and conduct a significant and wide ranging social engagement, engaging the impacted and relevant constituents in the community.</p> <p>Establish ongoing communication between the building management and the community. The Applicant shall conduct an interactive workshop at least once a year that is open to the public and includes, at a minimum, participation by a representative group of nearby property owners, residents, business owners, workers, and local and pertinent organisations, in building operation and environmental performance improvement.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. A report describing the formalised communication channels in place between the building management and the community;ii. Public notice indicating the meeting date and venue [#]; andiii. Meeting records [#].
Background	Operation of a building is closely related to the daily life of not only the building users, but also the people of the nearby community. Establishing effective channels to better listen, communicate and work with the public can identify points of consensus as well as points of conflict.

IA 5 Provision of Electrical Vehicle Charging Stations

Exclusion	None.
Objective	To promote the use of Electric Vehicles
Credit Attainable	1 Bonus
Credit Requirement	1 Bonus credit for providing quick charger(s) for Electric Vehicles (EVs) for 50% of the total parking capacity of the site.
Assessment	<p><u>Criteria</u></p> <p>Provide quick EV charger(s) for at least half of the car parking spaces (including visitor car parks) within the site. Such charging provision shall be above the legislative requirement.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following documents:</p> <ol style="list-style-type: none">i. Calculation and layout showing the quantities and locations of the quick charging station;ii. System drawing and equipment catalogue/ technical sheet of the charging facilities; andiii. Record photographs.
Background	<p>EVs have no tailpipe emissions and this can help improve roadside air quality and reduce greenhouse gas emissions. A wider use of EVs also contributes to the development of environmental industries. The availability of charging facilities is critical in promoting the wider adoption of EVs. The Environmental Protection Department (EPD) have been working with the private sector in expanding the EV charging infrastructure in Hong Kong [1].</p>

1 Environmental Protection Department. Promotion of Electric Vehicles in Hong Kong. Retrieved 1 March 2016, from http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/promotion_ev.html

	IA 6	Recognition and Appreciation Awarded from Other Organisations
Exclusion	None.	
Objective	To encourage building to benchmark their performance with others.	
Credit Attainable	2 Bonus	
Credit Requirement	Maximum 2 Bonus credits for obtaining/ achieving the following listed environmental award/ certification scheme/ campaign. i. EarthCheck Certification; ii. Green Building Award; iii. Green Globe Certification; iv. CLP Green ^{PLUS} Award; v. Hong Kong Awards for Environmental Excellence (HKAEE) “Sectoral Awards”; vi. Hong Kong Green Mark Certification Scheme; vii. Sustainable Building Index; viii. Voluntary Building Assessment Scheme (VBAS) – Environmental Awareness Quality Label; and ix. Other green building related award/ certification scheme/ campaign which is not listed above.	
Assessment	<u>Criteria</u> 1 Bonus credit can be achieved for obtaining each of the above listed environmental award/ certification scheme/ campaign. The Applicant shall provide documentation to demonstrate that the environmental award/ certification scheme/ campaign are obtained in the past 3 years or valid at the time of submission. For any other green building related award/ certification scheme/ campaign not listed above, the Applicant shall provide the award/ certification scheme/ campaign information with justification for BSL consideration. <u>Documentation</u> The Applicant shall provide the following documents: i. Certificates of the environmental award/ certification scheme/ campaign [#]; and ii. Justification on fulfilling the credits requirement.	
Background	There are vast of environmental related award schemes available locally and internationally for existing buildings. BEAM Plus encourages and recognises the previous efforts of the Applicant for extra achievement on top of minimum statutory requirement.	

	IA 7	Achievement of Hong Kong Green Organisation Certification
Exclusion		None.
Objective		To encourage building to benchmark and recognise their green management.
Credit Attainable		2 Bonus
Credit Requirement		Maximum 2 Bonus credits for obtaining the following certificate(s) of Hong Kong Green Organisation Certification (HKGOC): i. Wastewi\$e Certificate; ii. Energywi\$e Certificate; iii. IAQwi\$e Certificate; and iv. Carbon Reduction Certificate.
Assessment	<u>Criteria</u>	<p>1 Bonus credit can be achieved for obtaining each of the certificates listed above.</p> <p>The Applicant shall provide documentation to demonstrate that the HKGOC certificates in “Good Level” or “Excellence Level”; or the Carbon Reduction Certificate are obtained in the past 12 months or valid at the time of submission.</p> <p><u>Documentation</u></p> <p>The Applicant shall provide the following document:</p> <p>i. True copy of HKGOC certificate(s) and/or the Carbon Reduction Certificate [#].</p>
Background		HKGOC is led by the Environmental Campaign Committee alongside the EPD in conjunction with the other nine organisations. HKGOC aims to encourage businesses and organisations to adopt environmental practices, benchmark green organisations with achievement in green management, and recognise and acknowledge the efforts of and commitments to the environment [1].

1 Environmental Campaign Committee (ECC). The Hong Kong Awards for Environmental Excellence. Retrieved 1 March 2016, from <http://www.hkaee.gov.hk/eindex.html>

9 Appendices

9.1 Assumptions and Baselines for Water Consumption The following details the default assumptions for the calculation of the reduction in water use of the project building when compared with an equivalent baseline building.

Number of Working or Operational Days The number of operational days per annum (Nop) should be obtained from the design brief or OPR.

The number of non-operational days is equal to 365 - Nop.

The same values of operational and non-operational days will be used for both the project building and the baseline building.

Occupancy Considerations The number of occupants shall be taken from the design brief, or OPR. If the data is not obtainable then, in the absence of any other data, the occupant space allowance should be taken as 9m²/person. [1]

The male to female ratio should be determined from the design brief or OPR. If the data is not available then the default assumptions shall refer to the latest version of PNAP ADV-28 [2].

The percentage of the disable persons inside the building can make reference to the latest data available from the Census and Statistics Department [3].

The same occupancy load shall apply to the project building and the baseline building.

Flow Rate Considerations For the baseline value, the flow rate of the water appliance should be read as an absolute figure irrespective of the working pressure in predicting the water consumption. For the as-built case, working pressure should be considered when determining the flow rate of the water fixtures.

Hand Washing in Rest Rooms

- i. Number of hand wash operations per occupant per day = 5
- ii. Hand washing time = 10 seconds

For the baseline value, the tap flow rate is 6 litres/min.

Note that to obtain significant savings the project building would need to install automatic controls such as proximity sensors to reduce the tap operation time to less than the default assumption of 10 seconds per hand washing operation.

1 Buildings Department. Code of Practice for Fire Safety in Buildings. 2011
2 Buildings Department. Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers. PNAP No. ADV-28 Provision of Sanitary Fittings in Offices, Shopping Arcades, Department Stores, Places of Public Entertainment, Cinemas and Other Public Places.
3 Census and Statistics Department. Social data Collected via the General Household Survey: Special Topics Report - Report No.62. Persons with disabilities and chronic diseases. Retrieved 1 March 2016, from <http://www.censtatd.gov.hk/hkstat/sub/sp380.jsp?productCode=C0000055>

- Water Use in Pantries/ Kitchen**
- i. Number of pantry tap operations per occupant per day = 1
 - ii. Baseline faucet flow rate for non-mixer taps shall be 6 litres/min
 - iii. Baseline faucet flow rate for mixing taps shall be 9 litres/min
 - iv. Duration of use = 15 seconds
 - v. Utensil washing operation carried out by hand = 6 litres of water per operation
- Showers**
- i. Number of use of shower per occupant per day = 0.1
 - ii. The baseline shower flow rate = 9.5 litres/min
 - iii. The baseline bath pillar tap/ bath mixer tap flow rate = 15 litres/min
 - iv. Shower duration = 5 minutes (300 seconds)
- Other Appliances/ Equipment**
- Justification for capacities of appliance/ equipment used in the benchmark building shall be provided by making reference to regulations, standards, guides and other publication published by relevant authorities.

The format of water saving calculation shall align with example below:

Device (Reference catalogue ^(A))	Duration of each operation (seconds)	Daily number of uses per occupant	Rated flow rate (litres/minute)		Estimated daily consumption per occupant (litres)	
			Baseline	As-built	Baseline	As-built
Toilet Tap (Model 123)	10	5	6	5	5	4.2
Pantry Mixing Tap (Model 456)	15	1	9	6	2.3	1.5
Estimated total daily consumption per occupant (litres)					7.3	5.7
Number of occupants ^(B)					30	
Number of day					365	
Estimated total annual consumption (litres)					79,388	62,050
% of water saving:					21.8%	
Credit Anticipated:					3 credits	

Note:

- (A) Reference catalogues or manufacturer specification should show device type, model number, flow rate and WELS label (if provided) as substantiation to the information filled in the calculation, where important information in the reference catalogues or manufacturer specification shall be highlighted or circled for easy identification.
- (B) The number of occupants shall be taken from the design brief or OPR. If this data is not obtainable then, in the absence of any other data, the occupant space allowance should be reference to the Occupancy Considerations as shown above.

In the calculation, each type of water using device shall be listed and all data used shall be referenced to the source. The calculation shall include water taps for basin, pantry, kitchen, bath and also shower heads but exclude water closet, urinal, water features, appliance and irrigation. There should be separate entries for water use in male and female facilities.

9.2 Glossary

Alternative Assessment Method	Proposed criteria and assessment method submitted by Applicant when seeking alternative means of compliance with a particular credit.
Appeals	The process whereby Applicant's may appeal, a separate published charge, the allocation of individual credits, with First Appeal submissions reviewed by the BSL TRC and Final Appeal handled by HKGBC.
Applicant	The party authorised to seek BEAM Plus certification of the project (typically the client, occupier, tenant or representative therefore) whose will form a contractual relationship with HKGBC and BSL in the certification process.
Baseline	A line serving as the basis for comparison in Performance-based approach.
BEAM Assessors	A person engaged to conduct an independent assessment of the Project submissions on behalf of BSL and validated by BSL TRC.
BEAM Plus Category	In BEAM Plus for Existing Buildings, BEAM Plus Section refers to assessment sections such as MAN P1 Green Purchasing Plan, MWA P1 Waste Recycling Facilities, etc.
BEAM Plus Framework	The rating systems, assessment standards, credit criteria, training and examination processes applied to certification and accreditation under BEAM Plus for New Buildings, Existing Buildings and Interiors.
BEAM Plus Grading	The outcome of a certification assessment of a building expressed as a performance level of Bronze (above average), Silver (good), Gold (very good) or Platinum (excellent).
BEAM Pro	A trained professional to help integrate sustainability measures into the project and facilitate information submissions for assessment.
BEAM Affiliate	A BEAM Affiliate is a person accredited by the HKGBC as being competent to support green building design, construction and operations. The credential provides an individual who cannot yet meet the BEAM Pro requirement with an alternative route to become a BEAM Pro.
BEAM Society Limited	The independent, not-for-profit, member-based organisation that owns and operates BEAM Plus and undertakes assessments, training and examinations as a basis for certification and accreditation by HKGBC.
BSL Coordinator	An officer of the BSL that maintains day-to-day liaisons between the Applicant, the BSL, and the assigned BAS for the project.
Building Management System	BMS uses computer-based monitoring to coordinate, organise, and optimise building control subsystems, including HVAC, lighting, equipment scheduling, and alarm reporting. Sometimes known as Building Automation System.
Certificate Validity	The duration for which a BEAM Plus certificate and grading remain effective and officially recognised by the BSL.
Certification Scope	The construction floor area of the project, defined by the footprint or boundary of the space being leased or occupied, and its associated interfaces with its surroundings.

Chloro-fluorocarbons	CFCs cause ozone depletion when released into the atmosphere.
Commissioning	The process of putting Building Services systems into active service. This includes testing and adjusting HVAC, electrical, plumbing and other systems to assure proper balancing and adherence to design criteria, and instructing building representatives in their use.
Compliance	Demonstration of fulfilment of a particular credit requirement under BEAM Plus, furnished through the provision of information as specified in the relevant grading system and submission template.
Credit	In BEAM Plus Existing Buildings, Credit refers to credit(s) allocated for each BEAM Plus Section and credits are used to determine the category grade and overall grade according to the number of credits achieved.
Credit Interpretation Request	The process whereby Applicants can seek technical and administrative guidance from BSL TRC on the application of BEAM Plus credits to their projects.
FSC Certification	A certification system for timber products which confirms that timber has been harvested in a sustainable manner.
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.
Green cleaning	Green cleaning is the use of cleaning products and practices that have lower environmental impacts than conventional products and practices.
Hong Kong Green Building Council Limited	The industry body established in 2009 to coordinate efforts towards green building in Hong Kong. HKGBC certifies BEAM Plus projects and accredits BEAM Pro and BAS.
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.
Infiltration	Infiltration is uncontrolled air leakage into conditioned spaces through unintentional openings in ceilings, floors, and walls from unconditioned spaces or the outdoors.
MVAC	Mechanical ventilation and air-conditioning installations.
Normally Occupied Areas	Normally occupied areas are enclosed areas where people normally stay more than 1 hour there. Examples include activity room, auditorium, classroom, conference room, exhibition hall, hotel guest room, hotel lobby, indoor sport hall, lecture theatre, library, office, restaurant, retail shop etc.
Not Normally Occupied Areas	Not normally occupied areas are enclosed areas where people normally stay less than 1 hour there. Examples include corridors, entrance and lift lobby, locker room, plantroom etc.
Ozone Depleting Potential	ODP of a chemical compound is the relative amount of degradation to the ozone layer it can cause.

Performance Categories	The areas into which BEAM Plus criteria are divided based on their influence on the sustainability performance of a project (site, design and construction management, materials, energy use, water use, indoor environmental quality, innovations and performance enhancements).
Potable Water	Water that is safe enough to be consumed by humans, or used with low risk of immediate or long-term harm. Although the quality of water supplied to buildings in Hong Kong is strictly controlled, the quality of water drawn from consumers' taps may sometimes be affected by the condition of the inside plumbing such as discolouration from rusty pipes. Consumers are responsible for proper maintenance of internal plumbing and are required to engage a licensed plumber if the water quality is found to be affected due to defects in the inside plumbing.
Pre-requisite	Assigned credits, either legal requirements or key performance aspects (relating to management, materials aspects and water use), that must be satisfied to start the BEAM Plus assessment and obtain the certification.
Registration/ Registered Projects	The first step in seeking formal certification under BEAM Plus. Registered projects, subject to payment of a specified fee, are listed within the BSL projects database for public information.
Submissions Documents	Documentation (including drawings, specifications, photographs, reports, signed confirmations, etc., as specified under each BEAM Plus credit) required by the BSL to conduct the certification assessment of a project.
Technical Review Committee	The committee within the BSL that oversees the implementation and progress monitoring of BEAM Plus certification assessments, and resolves technical issues and Credit Interpretation Request.
Variable refrigerant flow	Variable refrigerant volume flow in a unitary air-conditioner where the cooling supply to the conditioned space is adjusted by modulating the flow of refrigerant.
Variable speed drive	A motor drive that controls the motor speed over a continuous range. This usually refers to the motor drive for HVAC's fans or pumps.