BEAM Plus Interiors

Commercial, Retail and Institutional

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HKGBC
香港綠色建築議會

BEAM
建築環保評估協會

1 BEAM PLUS INTERIORS

1.1 INTRODUCTION

This document describes the BEAM Plus Interiors grading system for benchmarking sustainability in the fit-out, renovation and refurbishment of non-domestic, occupied interior spaces.

Owned and operated by the BEAM Society Limited (BSL), BEAM Plus Interiors is one of a series of rating systems that also cover the design and construction of new buildings, and the operation and management of existing buildings.

BEAM Plus defines best practice criteria for a range of sustainability issues across the whole life-cycle of buildings and projects. Projects are submitted for certification on a voluntary basis, with the outcomes conveyed via the BEAM Plus certificate and grading – Platinum, Gold, Silver or Bronze – reflecting the level of performance achieved.

1.1.1 ORIGINS OF BEAM PLUS INTERIORS

First initiated in 1996, BEAM Plus (formerly known as HK-BEAM) is – on a per capita basis – one of the most widely used voluntary green building certification schemes of its kind in the world.

The BSL commissioned the creation of BEAM Plus Interiors in 2012 in response to strong market demand for a localised system for occupied interior spaces in Hong Kong. In creating a system to meet the needs of the Hong Kong marketplace, particular attention has been devoted to:

i. the unique sustainability challenges associated with Hong Kong's high-rise, high density urban environment;

ii. Hong Kong's comparatively short leasing periods, and often high turnover of occupancies; and

iii. local practices relating to design and construction management, and the procurement and sourcing of materials.

BEAM Plus Interiors can be used by the occupants or tenants of a new building, a new occupant in an existing building, or where an occupant renovates their existing space. More information on the history of BEAM is provided in Section 1.6.6.

1.1.2 DEVELOPMENT OF BEAM PLUS INTERIORS

The development of BEAM Plus Interiors was led by a BSL Steering Committee comprising BSL members and invited 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, credit criteria, submission requirements, and rating system. Research and development was undertaken by an independent consultant. BSL Steering Committee members comprise:

Mr Benny Au	Prof John Ng
Ms Christine Bruckner	Ms Agnes Ng
Ir Prof Daniel W T Chan	Mr Dan Rusu
Mr John Herbert	Mr Alan Sin
Ms Yvonne Ieong	Ir Dr Raymond Yau
Ir Sr Jonathan Lee	Ms Alice Yeung
Ms Ivy Lee	Dr Conn Yuen
Mr Derek Murphy	

1.1.3 THE BEAM SOCIETY LIMITED

The BSL is an independent, non-profit organisation whose membership is drawn from the many professional and interest groups that are part of Hong Kong's building construction and real estate sectors. BSL members work continuously and on a wholly voluntary basis to refine and enhance the BEAM Plus framework to meet the expectations of interested parties, including building users, and help the local industry to move towards sustainable development.

The BSL owns and operates BEAM Plus and undertakes assessments, training and examinations as a basis for certification and accreditation by HKGBC. Oversight of BEAM Plus Interiors, including assessment monitoring and deliberation of Credit Interpretation Requests (CIR), is performed by the BSL Technical Review Committee (TRC).

Further information is available from www.beamsociety.org.hk.

1.1.4 THE HONG KONG GREEN BUILDING COUNCIL

The Hong Kong Green Building Council (HKGBC) was established in 2009 as Hong Kong's industry body that coordinates efforts towards green building. HKGBC certifies BEAM Plus projects and accredits BEAM Professionals (BEAM Pro) and BEAM Assessors (BAS).

1.1.5 DISCLAIMER

The BEAM Building Environmental Assessment Method is intended for use by Applicant and project teams engaged in new buildings and interiors design, and owners and operators of existing facilities as a guide to more environmentally sustainable building design and operation. The Method 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.

BSL reserves the right to amend, update and change this manual from time to time without prior notice.

This document represents the BSL's efforts to develop a standard that improves the performance of buildings and interiors using the latest techniques, practices and standards compatible with prevailing economic constraints. These are subject to changes, which will be included through periodic updating.

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 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

The BSL does not endorse any self-assessed grading awarded by the use of BEAM Plus Interiors.

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

1.2 APPLICATION AND ELIGIBILITY

BEAM Plus Interiors covers the planning, design, construction and "as-built" condition of the fit-out, renovation and refurbishment of non-domestic, normally occupied spaces within buildings.

Certification under BEAM Plus Interiors is designed to take place as a one-stage process at the end of the fit-out, renovation or refurbishment works and associated testing and commissioning. This helps to ensure that design commitments have been implemented, construction practices met the required standards, and that testing and commissioning has verified the installation's performance. Projects cannot be certified before their completion.

It is the BSL's aim for certification to be granted as soon as possible upon project completion so that Applicants are able to promote their achievements at the earliest opportunity.

1.2.1 ELIGIBLE PREMISES TYPES

BEAM Plus Interiors targets the most frequently encountered non-domestic interior fit-out projects in Hong Kong, namely:

i. office premises;
ii. retail premises;
iii. restaurants;
iv. educational facilities and libraries; and
v. institutional facilities including hospitals, etc.

Table A illustrates the typical functions and installations within the premises for which BEAM Plus Interiors criteria are provided.

TABLE A - ELIGIBLE TYPES OF PREMISES

Office Premises
Typical scope of works in:
- main office areas (open plan / cellular)
- entrance / lobby / reception areas
- conference / meeting rooms
- printer / copier rooms
- pantry / store room / social areas
- washroom facilities (if included)

Restaurants
Typical scope of works in:
- eating / dining areas
- multi-media / AV system rooms
- washroom facilities (if included)

Clubhouse
Typical scope of works in:
- library / reading rooms
- gym / playroom

Commercial
Typical scope of works in:
- dentist office
- doctor surgery
- washroom facilities (if included)

Institutional (including educational facilities and hospitals etc)
Typical scope of works in:
- classrooms / teaching rooms
- assembly / sports halls, etc.
- general ward areas, consultation rooms
- entrance / reception / circulation areas
- washroom facilities (if included)
- printer / copier / multi-media / AV system rooms

Retail Premises / Libraries
Typical scope of works in:
- retail / library floor areas
- occupied office / administration areas
- including display racking, shelving and lighting
- printer / copier / multi-media / AV rooms
- washroom facilities (if included)

Note: process related equipment, services and functions that involve specialist design requirements, such as those described in Section 1.2.2, are excluded from assessment.

1.2.2

SPECIALIST USES AND INSTALLATIONS

To avoid undue complexity, BEAM Plus Interiors excludes process related equipment and services associated with specialist design and operational requirements. Examples include: PABX/MDF equipment; IT server rooms; water meter cabinets; auditoria; lecture theatres; kitchen equipment; karaoke rooms; swimming pools; saunas; clean rooms; cold rooms; car parks and loading bays, etc.

Such facilities are excluded from assessment. For example, auditoria (often not provided with natural daylight) would be excluded from the assessment of natural daylight related criteria.

1.2.3

EXEMPTION

The Applicant can exempt certain discrete area in the assessment if such area is less than $20m^2$. Such exempted area must be clearly indicated in the drawings during the assessment stage.

1.2.4

TYPES OF SPACE CONDITIONING

The BEAM Plus Interiors rating system can be applied to the above kinds of premises whether they are:

i. served by a central air-conditioning system (usually the landlord's);

ii. served by de-centralised equipment provided by landlord / tenants (e.g. window unit, split-unit or mechanical ventilation);

iii. naturally ventilated (i.e. with operable windows); or

iv. combination of the above.

1.2.5

BASE PROVISIONS WITHIN THE HOST BUILDING

The performance of any interior space is significantly influenced by the host building in which it is located (for example, the energy efficiency of the central air conditioning system). In this respect, it is important to note that BEAM Plus Interiors seeks to reflect the overall performance of the interior space within the context of its host building.

As such, certification covers all provisions within the space, whether these are original to the host building, have been retained but modified during the fit-out, or are newly installed for the tenant / occupant.

In other words, BEAM Plus Interiors credits are determined whether its criteria have been satisfied (or not) by the actions of the occupier / tenant, or by the actions of the building owner / landlord, or by the base provisions within the host building.

This approach seeks to encourage occupants to select buildings with improved sustainability attributes and performance levels (arising from the host building's location, design, construction and/or management).

1.2.6

SCHEDULE OF WORKS TO BE INCLUDED

The scope of work included in a fit-out project is defined by the Applicant's brief or Owner's Project Requirements (OPR). OPR is a written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project and design goals, measurable performance criteria, budgets, schedules, success criteria, owner's directives and supporting information. Whilst the scope can vary, BEAM Plus Interiors covers the following fundamental elements:

i. site works and management;

ii. MVAC and electrical installations;

iii. fixtures, finishes and furniture; and

iv. occupant equipment and appliances.

Table B highlights the key items most commonly included within each of the above. Applicants are required to declare their scope of works at the start of certification to ensure a representative assessment.

TABLE B - TYPICAL SCHEDULE OF WORKS

Site Works / Management
Planning and sequencing of works
Site preparation and management
Occupational health and safety measures
Noise / dust protection (adjacent premises)
Temporary protection materials
Temporary utilities connection
Co-ordination and liaison with other parties
Shop drawings / as-fitted drawings
Demolition / modification / builders works
Dismantling (ceiling, wall, floor finishes, etc.)
Waste separation / recycling / disposal
Storage of materials
Testing & commissioning
Submission of O&M manuals
Demonstration and training

Fixtures & Finishes
Installation methods
Flooring (carpeted / tiled / reconstituted, etc.)
Ceiling (exposed / false ceiling)
Walls / partitions
Doors (internal / entrances)
Paints / adhesives, etc. (wall, floor, ceiling)
Fixed furniture (reception, pantry, cabinets, etc.)
Acoustic panels / signage

Furniture & Fittings
Workstations / desks
Conference tables / coffee tables
Chairs / seating
Movable partitions
Planter boxes
Blinds / curtains / solar glazing films

Electrical Installations
MCB board / power cabling
Power & ELV wiring / trunking / conduits
Power points / outlets / sockets
Lighting panels / luminaires / switching
Fixed lamps / control ballasts
Desk / task / spot lighting
Photo sensor / control panel
Telephone / IT conduit points
Security system / emergency signage
Entrance call bell / motorised doors
Energy metering systems

MVAC Installations
Supply / return air ducts / grilles
Fan coils / VAV boxes
Air handling units / exhaust systems
Motors / insulation
Thermostatic / motion / user controls
Energy metering systems

Plumbing & Drainage / Fire Services
Pantry / sink / drinking water points
Water check meter
Sprinkler heads / piping
Alarm system / conduit / wiring
Portable extinguishers
Hose reel / pre-action hydrant cabinets

Appliances
Computer / server / telecoms / IT
Pantry (refrigerator, heater, oven, etc.)
Drinking fountain
Air purifiers (pantry and printing room)
Food waste decomposer / green wall

1.2.7 ASSESSMENT COVERAGE

The scope of BEAM Plus Interiors is confined to the factors over which the Applicant has direct control or can significantly influence. For the most part this is defined by the footprint or boundary of the space being leased or occupied, plus key areas of interface with its surroundings:

i. the overall sustainability attributes of the host building and its location, in the Green Building Attributes category;

ii. the control of nuisance (dust, noise, etc.) to adjacent premises during the renovation works, in the Management category;

iii. the host buildings' envelope and types of building services (unless the space is served solely by its own system), in the Energy Use category;

iv. potable water quality in the host building, in the Water Use category; and

v. thermal comfort, visual comfort, aural comfort and indoor air quality aspects influenced by the host buildings' centralised systems in the Indoor Environmental Quality category.

Other than these, all remaining aspects – including the important category of Materials Aspects – are confined to the footprint or boundary of the space being occupied or leased.

The overall coverage of the BEAM Plus Interiors performance categories are presented in Section 1.7 Summary of Credits.

1.3 CERTIFICATION FRAMEWORK

Certification assessments are conducted by the BSL with project certification granted by the HKGBC. In view of the short duration of leases in Hong Kong (often 3 years), certification is designed to be a one-stage process – taking place upon completion of fit-out works and associated testing and commissioning – with minimal need for longer-term follow-up.

The BSL aims for certification to be granted as soon as possible upon project completion so that Applicants are able to indicate their achievements at the earliest opportunity. It is the sole responsibility of the Applicant to provide a comprehensive submission in the first instance. Inadequate submissions cause additional administration and will delay the assessment process.

1.3.1 CERTIFICATION TIMING

BEAM Plus Interiors covers the planning, design and construction of fit-out projects, in addition to the "as-built" condition of the completed space. As such, formal certification should be initiated at the time of – or within three to six months of project completion.

Projects cannot be certified before their completion (i.e. for the "design intent"), since BEAM Plus Interiors emphasises the importance of "as-built" performance in addition to good design and construction practices.

Certification is also unlikely to be beneficial if requested too-long after completion of a project, unless the Applicant can furnish the necessary documentation to demonstrate that design, construction and material specification requirements, etc., have been fulfilled.

It should be noted that, whilst certification does not take place until the completion of works, the Applicant's preparations must start much earlier during the projects' conception. This includes the Applicants' engagement of an accredited BEAM Pro, recommended to advise on the integration of BEAM Plus sustainability measures as the project evolves.

1.3.2 CERTIFICATION PROCESS

Certification under BEAM Plus Interiors comprises the following steps:

i. the Applicant applies for registration of the project via the HKGBC website, submitting a registration form that is used to check the project's eligibility for certification under BEAM Plus Interiors;

ii. if eligible, the project will be added to the database of registered projects with details including client, location, size (floor area) and anticipated completion date;

iii. BSL will assign a Certification Coordinator to the project, and provide the Applicant with access to resources including submission templates, CIRs from previous assessments, and register of BEAM Pro;

iv. Applicants are strongly encouraged to engage at least one accredited BEAM Pro within the project team to provide guidance on compliance throughout project planning, design, construction and completion and prepare submission materials;

v. Applicants (usually via the BEAM Pro) are able to make requests for CIR, subject to published charges, where necessary to clarify technical queries relating to their projects;

vi. upon completion of the fit-out and associated commissioning and testing works, the Applicant (usually via the BEAM Pro) submits the completed templates and supporting information to the BSL;

vii. the BSL will engage an independent BEAM Assessor to the project, whom remains anonymous to the Applicant and project team and does not visit the site during assessment;

viii. the BEAM Assessor will review the submitted details. Should any Applicant clarifications be required, these will be made via BSL to the relevant published charges;

ix. day-to-day enquiries regarding assessment status etc. are maintained between the Applicant and the BSL's secretariat (there is no contact between Applicant and BEAM Assessor);

x. where required, the BEAM Assessor will obtain technical clarifications from the BSL TRC;

xi. the BSL TRC reviews and, if satisfied, approves the recommendation of the BEAM Assessor and confirms the grade of award achieved; and

xii. the Applicant is notified of the outcome, and HKGBC issues the BEAM Plus Interiors certificate for the project.

Further guidance material is made available on the BSL website.

1.3.3

SITE INSPECTION

BSL reserves the right to conduct on-site inspections at any time without advance notice to verify and validate Applicants' submission.

1.3.4

APPLICANT PREPARATIONS PRIOR TO CERTIFICATION

Whilst BEAM Plus Interiors certification is not finalised until commissioning of the completed project works, it is important for Applicants to make the necessary preparations well beforehand.

The BEAM Plus Interiors grading system can be used as a form of design guide, helping to identify sustainability measures that can be implemented into a project during its planning, design, sourcing, construction and commissioning.

The greatest benefit is derived where the Applicant engages sustainability expertise, for example via an accredited BEAM Pro, at the outset of the project. Sustainability measures can then be integrated into the project from the earliest stage, and likely compliance with the BEAM Plus Interiors best practice criteria monitored as the project progresses.

Applicants can also refer to CIR from previous assessments, as published on the BSL website, to gain further insight on the application of BEAM Plus Interiors to their own project.

1.3.5

CERTIFICATE VALIDITY

BEAM Plus Interiors certificates are valid for five (5) years from the date of their issue, which covers the duration of most lease periods in Hong Kong (typically 3 years). Certified projects are listed in a website database to indicate their client, location, size, grading and validity period.

On the other hand, the certificate will also expire when the tenant moves out from the certified premises.

Upon certificate expiry, 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 for their subsequent fit-out, renovation and refurbishment alterations of their space as they occur.

1.3.6

CERTIFICATION FEES

Certification fees for BEAM Plus Interiors depend on the size and complexity of the project as determined by the HKGBC and BSL. Submission of CIR and Appeals are subject to separate published charges. Information on fees for BEAM Plus Interiors can be obtained from the BSL Secretariat.

1.3.7

CREDIT INTERPRETATION REQUEST (CIR)

The 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 Interiors for which credit is being sought, a description of the approach being adopted and, where appropriate, the proposed alternative and method for assessment.

Each CIR submission is subject to an additional published charge and can address only one individual credit. 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.

The Applicant shall only apply for CIR after project registration, and before the project is submitted for assessment. CIR applications after submission are not accepted.

CIRs and their associated rulings are deliberated and determined by the BSL TRC. They are listed on the BSL website and provide a valuable resource when studying for the BEAM Pro exam, researching product relevance and evaluating the likelihood of achieving BEAM Plus credits. More details can be found in HKGBC and BSL website [1].

1.3.8 APPEALS

After Assessment, the Applicant may lodge an Appeal, upon payment of the appropriate charge published on the BSL website.

The Appeal procedure for BEAM Plus Interiors is the same as other BEAM rating tools.

Up to a maximum of five credits can be appealed for each project.

The First Appeal and will be adjudicated by BSL. If the Applicant is dissatisfied with the Appeal ruling, they are at liberty to submit a Final Appeal which will be adjudicated by HKGBC.

1.3.9 BEAM PROFESSIONALS (BEAM PRO)

Accredited BEAM Pro are professionals with expertise and experience relating to green buildings who have been trained and passed an examination provided by the BSL. Upon passing their examination, BEAM Pro are accredited by HKGBC and act as ambassadors promoting green and sustainable building.

BEAM Pro are generally engaged by Applicants to provide advice on green building design, construction and management in accordance with the BEAM Plus rating systems, and also prepare and submit information to BSL.

BEAM Plus Interiors awards credit where the project team includes at least one BEAM Pro. A register of accredited BEAM Pro is provided on the HKGBC website.

1.3.10 BEAM ASSESSORS (BAS)

BEAM Plus Interiors certification assessments are undertaken by approved BAS assigned by the BSL. BAS undergo a rigorous selection process based upon their green building assessment related qualifications and experience, receive training assessment processes, and are accredited by the HKGBC.

BAS are engaged directly by the BSL and are completely independent and anonymous to the Applicant. Liaison between the Applicant and the Assessor is conducted via the BSL's Secretariat. However, BSL may

1 Credit Interpretation Request http://www.hkgbc.org.hk/upload/beamdocuments/beamplusdoc/beamplusV1.3/CIR_Page_20122011_v1.1.pdf

conduct site visits to verify any submitted documentation.

1.4 CREDIT PERFORMANCE CATEGORIES

Different assessment methods in use worldwide assign their aspects under different categories according to the preferences of the tool developer. In BEAM Plus Interiors, aspects are grouped within the following categories:

i. Green Building Attributes (GBA);
ii. Management (MAN);
iii. Materials Aspects (MA);
iv. Energy Use (EU);
v. Water Use (WU);
vi. Indoor Environmental Quality (IEQ); and
vii. Innovations (IV).

Whilst BEAM Plus Interiors adopts similar categories as other versions of BEAM Plus (for new and existing buildings), the number and nature of credits within each category is specific to the context of interior fit-out, renovation and refurbishment.

1.4.1 GREEN BUILDING ATTRIBUTES (GBA)

Encourages the selection of a "host building" that itself has been certified using BEAM Plus or similar recognised framework, or alternatively has integrated best practice environmental sustainability measures into its design and day-to-day management:

i. selection of a host building with green building attributes.

It should be noted that BEAM Plus Interiors does not include direct credits relating to overall building emissions, site greening and local microclimate, etc., since Applicants are usually unable to significantly influence these.

1.4.2 MANAGEMENT (MAN)

Encourages responsible management practices during the fit-out works process, and provisions to enable more sustainable management of the space during its occupancy:

i. engagement of an accredited BEAM Pro for the project;
ii. construction management practices (IAQ, noise, waste, safety); and
iii. provisions for sustainable operational management (user guidance, user facilities, and green cleaning).

Management aspects remain similar in principle no matter what type of interiors, premises or usage they are applied to.

1.4.3 MATERIALS ASPECTS (MA)

The majority of materials used in fit-out projects are sourced outside Hong Kong, therefore, all efforts to reduce imported material waste contribute to lower environmental impacts. This category encourages the adoption of low-waste and low environmental impact materials, works practices and occupant facilities:

i. use of less ozone-depleting substances in refrigerants and thermal insulation materials installed during the project (pre-requisite credits);
ii. provide facilities for effective recycling programmes during occupancy (pre-requisite credit for base provisions, with additional credits available);
iii. selection of more eco-friendly materials (recycled, rapidly renewable, regional, sustainable and vinyl chloride free);
iv. reduce the use of non-environmentally friendly materials such as CFC, PVC etc; and

v. reduce waste through modular design and reuse of materials, furniture and finishing.

Materials aspects will remain similar in principle no matter what type of interiors premises or usage is being assessed. Materials aspects relating to indoor air quality are covered in the IEQ category.

1.4.4 ENERGY USE (EU)

Encourages the adoption of low-energy design, selection of efficient systems, and energy management provisions for first through host building selection and the occupants:

i. meet a minimum energy performance level for the installed systems (as a pre-requisite), plus progressive performance improvements;

ii. undertake thorough testing and commissioning upon completion;

iii. provide energy metering & monitoring;

iv. select efficient appliances; and

v. provide operation & maintenance manuals, energy manual and training for the occupants.

Assessment of Energy Use depends on the engineering services provided by the tenant in addition to the services in the host building. For example, an office fit-out may only include lighting, basic plumbing and water heating equipment, etc., whilst a data centre could require additional HVACR systems with externally located plant. BEAM Plus Interiors provides alternative credit routes for the systems employed.

BEAM Plus Interiors generally provides Applicants the option to use either a computational approach (computer modelling) or prescriptive approach (based on the efficiency of installed systems) to benchmark predicted energy usage in the space.

1.4.5 WATER USE (WU)

Encourages the provision of acceptable potable quality and features that improve utilisation and reduce effluent:

i. ensure satisfactory potable water quality for occupants;

ii. conservation measures to reduce annual water usage;

iii. reduction of effluent discharges; and

iv. discourage the use of bottle-water dispensers.

Water Use aspects remain similar in principle no matter what type of interiors, premises or usage is being assessed.

1.4.6 INDOOR ENVIRONMENTAL QUALITY (IEQ)

Indoor Environmental Quality (IEQ) aspects in BEAM Plus Interiors are 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:

i. enhanced indoor air quality via pre-occupancy flush-out, and separate ventilation of printing / copier rooms;

ii. adoption of low-polluting adhesives, finishes and furnishings;

iii. provision of indoor planting;

iv. minimum ventilation performance;

v. enhancing thermal comfort, acoustics and noise; and

vi. maximising natural lighting and views.

IEQ aspects remain similar in principle no matter what type of interiors premises or usage is being assessed. Not included are the technical performance aspects of specialist premises, such as acoustic qualities of concert venues, stage lighting, or air quality in clean rooms.

1.4.7

INNOVATIONS (IV)

BEAM Plus Interiors does not presume to be comprehensive in its coverage. Applicants are encouraged to submit proposals for credits in the Innovations category 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 Interiors.

In such cases Applicants can submit proposals that:

i. detail the proposed technology / practice;

ii. demonstrate how the technology / practice is implemented and achieves the benefits that are claimed;

iii. quantify using a life-cycle basis the anticipated performance gains,

iv. provide actual performance data where available, and

v. explain and justify the proposed assessment criteria.

The onus is on the Applicant to present quantitative evidence of the performance gains as compared to existing criteria. Generic narratives that do not demonstrate performance gains cannot be entertained. Incomplete or inadequate submissions will increase administration and delay the assessment process.

The BEAM Assessor will refer the proposal to the BSL TRC, which will consider each proposal on its merits and award credits accordingly. Any credits gained in the Innovations category shall be regarded as 'Bonus' credits, counting towards the total credits obtained but not towards the total credits obtainable. BSL maintains a database of successful Innovations aspect submissions for others' reference.

1.4.8

ALTERNATIVE ASSESSMENT METHODS

BEAM Plus Interiors does not seek to be overly prescriptive in setting 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 or system designs, etc. In such cases Applicants can consider alternative approaches that meet the same objectives, and submit a Credit Interpretation Request (CIR) that details:

i. the BEAM Plus Interiors 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.

CIR incurs an additional published fee and are considered by the BSL TRC. A ruling shall be made to accept, accept with defined modifications, or reject the proposed method statement, which shall be binding on the assessment.

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.

Where an alternative approach is endorsed by the BSL TRC it may be incorporated in future revisions to the BEAM Plus Interiors Manuals, as deemed appropriate.

1.5 GRADING METHODOLOGY

BEAM Plus provides authoritative guidance to all stakeholders in the building construction and real estate sectors on practices that reduce the adverse effects of buildings on the environment, whilst providing quality indoor environments and services.

1.5.1 PRE-REQUISITE CREDITS

Green building certification encourages industry to set higher standards than minimum regulatory requirements. Compliance with codes, legal, regulatory and statutory requirements is a condition of project approval by the authorities, and as such is not assessed under BEAM Plus.

BEAM Plus Interiors sets pre-requisites for several key performance aspects that must be satisfied in order to commence the assessment process and obtain overall certification:

i. implementation of construction safety plan (MAN P1);

ii. avoiding chlorofluorocarbon (CFC)-based refrigerants in any HVAC&R equipment installed for the space during the fit-out (MA P1);

iii. providing basic facilities for effective recycling of paper, plastic and metal wastes during occupancy (MA P2); and

iv. avoiding the use of virgin timber resources during fit-out works (MA P3).

In the future if a BEAM credit becomes subject to legislation, it will no longer count towards the projects credit score. An addendum for that issue will be released at the time, with future versions of BEAM Plus Interiors amended accordingly.

1.5.2 BEAM PLUS INTERIORS GRADING

The final certificate grading for projects certified under BEAM Plus Interiors is conditional upon:

i. the overall credits achieved;

ii. meeting all specified pre-requisites; and

iii. obtaining a minimum credits for Materials, Energy Use, Indoor Environmental Quality aspects.

Threshold credit requirements are as follows:

	Overall	Materials	Energy	IEQ	
Platinum	75	15	18	17	(Excellent)
Gold	65	13	16	15	(Very Good)
Silver	55	11	12	12	(Good)
Bronze	40	9	10	10	(Above average)

1.6 MORE ABOUT BEAM PLUS

BEAM Plus provides authoritative guidance to all stakeholders in the building construction and real estate sectors on practices that reduce the adverse effects of buildings on the environment, whilst providing quality indoor environments and services.

1.6.1 THE BEAM PLUS FRAMEWORK

BEAM Plus defines criteria for exemplary performance for a range of sustainability issues relating to the planning, design, construction, commissioning, management, operation and maintenance, and use of buildings. 'Credits' are achieved where defined performance criteria are satisfied, with overall performance independently verified by the BSL and acknowledged through certification by the HKGBC. At the time of writing BEAM Plus comprises three 'green building' rating tools for:

i. New Buildings [2] – the planning, design, construction and commissioning of new buildings and major refurbishments;

ii. Existing Buildings [3] – the operation, maintenance and management of existing premises; and

iii. Interiors [4] – the planning, design, construction and commissioning of interiors projects (fit-out, renovation and refurbishment).

A More Sustainable Building Stock

BEAM contributes to the development and use of the building stock that is more sustainable with reduced impacts on the environment by:

i. enhancing safety, hygiene and the quality of indoor environments, and hence the health, comfort and well-being of occupants;

ii. minimising pollution loadings on external environments;

iii. promoting and encouraging energy efficient buildings, systems and equipment, including the use of renewable energy;

iv. reducing the unsustainable consumption and depletion of increasingly scarce resources such as water and tropical timber;

v. improving waste management and encouraging recycling and reuse of materials, and

vi. influence the marketplace in the supply of environmentally friendly materials, fittings, furnishings, products and equipment.

Specifications for Sustainable Buildings

The BEAM Plus Manuals provide a comprehensive and fair assessment of the overall performance of a building, or premises therein, in a range of key areas, at either the completion stage or during its life. BEAM Plus:

i. embraces many areas of sustainability, including social and economic dimensions;

ii. recognises best practices;

iii. provides for a comprehensive method of quantifying overall performance;

iv. demonstrates performance qualities to end users; and

v. provides economic benefits to stakeholders.

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2 BEAM Society Ltd. BEAM Plus New Buildings. 2012.
3 BEAM Society Ltd. BEAM Plus Existing Buildings. 2012.
4 BEAM Society Ltd. BEAM Plus Interiors. 2012.

1.6.2 BEAM PLUS BENEFITS

BEAM Plus defines criteria for exemplary buildings performance that is independently verified and recognised through a third-party certificate. Voluntary BEAM Plus assessment provides independently certified building performance rating in clearly defined terms.

Commitment to Sustainable Development

Increasingly investors, corporations and public sector organisations are demonstrating their commitment and contribution to sustainable development, through:

i. the maintenance of sustainable levels of economic growth;

ii. development progress that recognises the needs of the community;

iii. efficient use of non-renewable natural resources; and

iv. enhanced protection of the global, regional and local environments.

BEAM Plus provides a means for investors, developers, owners, tenants, occupiers and other stakeholders to demonstrate commitment through investment, ownership, and tenancies in certified 'green buildings'.

Market Recognition

The BEAM Plus rating systems:

i. set targets and standards which are independently assessed and so help to minimise false claims or distortions;

ii. provide recognition for buildings and premises where the quality has been enhanced and environmental impacts have been reduced; and

iii. enables developers, building owners and occupiers to respond to user demands for better quality buildings and interiors that have less impact on the environment.

Applicants Decide

The BEAM Plus label signifies levels of quality in respect of safety, health and comfort, which are important considerations for building users, and levels of performance in respect of environmental and social dimensions, which are of importance to society as a whole. The Applicant ultimately decides whether obtaining a BEAM Plus certificate is a worthwhile endeavour, but completion of a BEAM Plus assessment provides assurances as to the qualities of a building, not as a subjective promise, but as a measured reality.

1.6.3 BEAM PLUS ACHIEVEMENTS

Since its introduction in 1996, BEAM Plus (formerly HK-BEAM) has undertaken a leading role in raising awareness in Hong Kong on the contribution of buildings to sustainable development. BEAM has also helped encourage the integration of environmental measures into the design, construction and management of buildings of all types, both in Hong Kong and mainland China. On per capita basis, BEAM is one of the most widely used voluntary green building labelling schemes of its kind in the world.

Building Types Certified

The take up of assessments under BEAM has historically comprised the planning, design, construction, operation, maintenance and management of high-rise developments, including:

i. commercial office towers, corporate HQ buildings, data centres, technology complexes, transport and logistics facilities;

ii. private and public residential estates, university hostels and Government quarters;

iii. shopping malls, hotel and tourism, sports, leisure and recreational facilities;

iv. municipal buildings, Government offices, uniformed services, hospital, health and rehabilitation facilities; and

v. secondary school, international school, university and community college buildings.

Adoption by Government and Industry

Different versions of the BEAM Plus rating system and its predecessors have long been used as a reference for Applicants, both in the private and public sectors, during the design, construction and management of their buildings. Most notably, BEAM requirements have been incorporated into Applicant briefs, specifications and design requirements, in addition to procedures for building operation, maintenance and management. Numerous large-scale Applicants commit to obtaining certification of their new buildings and progressively introducing certification to their existing property portfolios.

More recently, BEAM Plus was endorsed by the HKGBC as Hong Kong's green building rating system and, since April 2011, has been adopted as a pre-requisite by Hong Kong Government for the granting of gross floor area concessions for green and amenity features in new building developments.

1.6.4 BASIS OF CREDITS AND CRITERIA

The terms sustainable and green when applied to buildings are often used interchangeably, although sustainability suggests a much broader concept [5]. ASTM [6] defines a green building as, "a building that provides the specified building performance requirements while minimizing disturbance to and improving the functioning of local, regional, and global ecosystems both during and after its construction and specified service life". Furthermore "a green building optimises efficiencies in resource management and operational performance; and, minimises risks to human health and the environment". To this can be added considerations of social equity and economic viability [7].

In the context of Hong Kong's sub-tropical climate and dense high-rise development BEAM regards a sustainable building as one that is safe, healthy, comfortable, functional, and efficient in the use of resources.

Environmental Aspects

An environmental aspect is defined in ISO 14004 [8] as an element of an organisations activity, products or services than can interact with the environment. ISO defines 'environment' as the surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.

Surroundings in this context extend from within an organisation to the global system. An environmental impact is any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services. A significant environmental aspect is one that has a significant environmental impact.

Social Aspects

BEAM Plus is concerned about the interactions between the assessed

5 International Organization for Standardization. ISO/TS 21929-1 Sustainability in building construction - Sustainability indicators - Part 1: Framework for the development of indicators for buildings. 2006.

6 ASTM International E 2114–01. Standard Terminology for Sustainability Relative to the Performance of Buildings. 2001.

7 International Organization for Standardization. ISO/TS 21931-1 Sustainability in building construction - Framework for methods of assessment for environmental performance of constructed works - Part 1: Buildings. 2006.

8 International Organization for Standardization. ISO14004: Environmental management systems – General guidelines on principles, systems and supporting techniques.

building, or premises within, and their neighbours, neighbouring properties, and the neighbourhood in general. The Assessment seeks to reduce negative impacts and rewards efforts that are aimed to improve the quality of the immediate surroundings to the benefit of the neighbourhood.

Post-SARs, hygiene has become a major issue in both design and management of buildings. Indoor air quality as long been a matter of concern, and together with thermal conditions, lighting quality and noise, is also a comfort issue.

Maintaining good indoor environmental quality (IEQ) depends on design, management, operation and user understanding of the many factors involved. Poor IEQ impacts productivity in the workplace. The quality of other services, such as vertical transportation, can also impact on user satisfaction and workplace efficiency. However, the needs of users and the efficiency of buildings need to be balanced against the consumption of non-renewable natural resources and environmental loadings to our air, land and water.

Credit Criteria and Weightings

The weighting system, i.e. the relative number of credits given for compliance with a particular aspect, is a critical part of an assessment method. Credits are allocated by taking into account practices elsewhere, particularly in overseas assessment methods, in addition to surveys and informed opinions of those who have contributed to the development of BEAM.

It is logical that BEAM Plus should seek to assign credits or weightings to assessment criteria somewhat in accordance with the significance of the impact. However, it is not practical at present to assess all the issues covered on a common scale. There is insufficient information available to provide an objective weighting for all issues, because of the difficulty in assigning an economic cost to environmental effects as diverse as, for example, the health of individuals, global warming and resource depletion. For a voluntary scheme there is also a need to consider the credits achieved to a particular assessment issue with due regard to technical difficulty and cost.

Performance Benchmarks

BEAM Plus uses local performance standards, codes and guides where these are available. Where these are not available international or national standards, codes and guides are referenced. Where there are differences in the performance criteria set by the various authorities BEAM Plus will generally avoid specifying the performance criteria, allowing the Applicant to specify what they consider to be appropriate for their building.

The BEAM Plus Assessment seeks to establish that the specified levels of performance have been achieved. Where performance standards are not well defined BEAM establishes its own performance benchmarks based on available data and stakeholder consensus. Credits are achieved for achieving higher levels of performance.

Raising Building Performance Standards

Responding to environmental priorities and to social and economic issues, BEAM strives to improve the overall performance of buildings. BEAM encourages progressively higher standards of performance and innovations that contribute to such performance.

Absolute versus Relative Performance

Through opinion surveys of BEAM Society members it is apparent that there should be a balance between assessment of performance issues over which the Applicant may have little or no control and performance

issues that can be influenced by the Applicant.

In addition, BEAM position is that assessment of some aspects of performance should not be penalised because of externalities that are not under the control of the Applicant, e.g. the efficiency of the utility supplying electricity to a building. In this case only consumption is quantified (e.g. kWh) and rated, and not the consequent environmental loadings (e.g. CO_2) unless the mix of energy sources (gas, oil, electricity) is significant. The rationale is that in the case of an inefficient supply, demand side management can make a significant contribution to reducing environmental loadings.

Regionally Responsive Criteria

Assessment criteria need to be relevant to the building and interior types and setting, and environmental, social and economic priorities. Consequently, some of the performance criteria in BEAM Plus reflect Hong Kong's humid sub-tropical climate and dense urban living environment.

Scientific Rigour

Whilst BEAM Plus endeavours to provide for a comprehensive and fair assessment it recognises that assessment criteria, assessment methods and allocation of credits are not complete and comprehensive.

BEAM Plus addresses items only where the associated environmental impacts have been proven, and for which reasonably objective performance criteria can be defined. Certain performance aspects attributable to buildings and their use have yet to be included, either because the environmental impacts are not well defined, or because performance criteria have not been established. They may be included in future updates, when information becomes available to permit a reasonably objective assessment.

In the meantime, it is argued that the real value of BEAM Plus lies not in scientific rigour but in the actual improvements to building quality and the levels of awareness amongst stakeholders resulting from its application.

Market Acceptance

For a voluntary scheme the extent to which performance can be enhanced is determined by market acceptance of the assessment criteria, the cost of undertaking assessments, the relative weighting of the credits counting towards the overall grade achieved. The performance criteria included in the various versions of BEAM are realistic and attainable in practice.

1.6.5 ASSESSMENT PRINCIPLES

According to international consensus [4,6] building assessments should be performance based as far as possible. Assessment needs to take a holistic view of performance with emphasis on life-cycle impacts. Assessment purely on prescriptive features would preclude buildings without those features from obtaining a good assessment result regardless of their actual performance. Furthermore, assessment based on features may encourage feature-based design, construction and operating practices.

Transparency

BEAM Plus recognises that assessment criteria and methods to achieve compliance need to be transparent, providing details of the benchmarks (baselines), data, assumptions and issues taken into account in the assessments and the credit ratings.

Flexible and Objective

BEAM Plus embraces a wide range of projects, variable in terms of scale, location and mix of uses (types of premises). The assessment criteria and methods of assessment need to be flexible and allow for

alternative means of compliance yet be reasonably objective to enable the Assessor to arrive at decisions without undue controversy.

Where issues are rather subjective, i.e. performance criteria cannot be quantified or determined through a compliance specification, BEAM Plus uses 'check-lists' to facilitate equitable and consistent assessments.

Updates to Assessment Criteria

The BEAM Plus rating schemes are revised and updated from time to time to reflect changes in industry standards and practices, findings from Credit Interpretation Request, circular letters and other related developments. Updates are issued as addenda to the rating system in circulation at the time and incorporated into future revisions.

Where credits are revised or modified after an interiors project has been registered for assessment, the credits that were current at the time of registration shall prevail unless the Applicant wishes to embrace the revisions and updates.

Special Cases

It is possible that some projects may not be fully embraced by the criteria currently presented in a BEAM Plus, due to their unusual nature or variety of forms and system designs, etc. In such circumstances certain assessment criteria or the method of demonstrating compliance may need to be modified. This would require agreement between the Applicant and the BSL TRC.

Certification Upon Completion

A key principle of BEAM Plus has always been that certification is issued only upon completion of the project, including its associated testing and commissioning. This helps to ensure that the committed design features are actually installed, that construction practices have met the required standards, and that testing and commissioning has verified the performance of the space after its completion.

Assessment Timing

Whilst buildings and interior spaces can be assessed at any time during sourcing, planning design, construction or commissioning process, the greatest benefit is derived if the assessment process begins at the sourcing stage, allowing credits from the selection of a suitable building to be included, for designers to optimise and integrate measures that will enhance the overall performance of the completed premises.

1.6.6 DEVELOPMENT HISTORY

BEAM was initiated in 1996 with initial funding provided by The Real Estate Developers Association of Hong Kong (REDA), research by Hong Kong Polytechnic University, and assessments conducted by the Centre for Environmental Technology Limited (CET) [9].

After more than a decade of implementation, the continued development of BEAM is now funded from certification, training and accreditation fees and industry sponsorship, with the voluntary efforts of BSL members and associates.

1996 Editions: Established in 1996 as "HK-BEAM" with the launch of two assessment methods, one for 'new office buildings' [10] and one for 'existing office premises' [11]. Environmental issues in the first versions of BEAM were categorised as 'global', 'local' and 'indoor' impacts.

1999 Editions: In 1999 the 'office' versions were re-issued with minor

9 An independent and non-profit environmental information and services centre established by the private sector, later to become the Business Environment Council, BEC

10 CET. BEAM 1/96. An Environmental Assessment Method for New Air-conditioned Office Premises. 1996.

11 CET. BEAM 2/96. An Environmental Assessment Method for Existing Air-conditioned Office Premises. 1996.

revisions and updated references [12,13], together with an entirely new assessment method for high-rise residential buildings [14]. BEAM for New Residential Buildings was the first such method for high-rise, high-density residential developments in a sub-tropical environment.

2004 Editions: Version 4/04 'New Buildings' and Version 5/04 'Existing Buildings' were significant upgrades, developed from pilot versions 4/03 and 5/03 published in June 2003. Besides expanding the range of building developments that can be assessed, these versions widened the coverage to include additional issues that are regarded as further defining quality and sustainability of buildings.

BEAM Plus (2010): BEAM Plus for New Buildings and for Existing Buildings were introduced in 2010 with research by the Chinese University of Hong Kong to coincide with the establishment of the Hong Kong Green Building Council (HKGBC). BEAM Plus is endorsed by HKGBC as Hong Kong green building rating system and since April 2010 has been adopted as a pre-requisite by Hong Kong Government for the granting of gross floor area concessions for green and amenity features in new building developments.

BEAM Plus V1.2 (2012): BEAM Plus Version 1.2 for New Buildings and Existing Buildings were released after further stakeholder engagement to integrate a holistic component of Passive Design for residential developments as an alternative method of assessment. BEAM Plus version 1.2 also contains minor amendments from the original guidelines in order to add clarity to the assessment.

BEAM Plus Interiors (2013): BEAM Plus Interiors has been introduced in response to calls from the marketplace for a localised benchmark for the fit-out, renovation and refurbishment of occupied interior spaces. This latest version continues the evolution of BEAM Plus through more comprehensive coverage and higher performance expectations.

1.6.7 CONTINUAL IMPROVEMENT

Since the collective knowledge as to what constitutes a sustainable building will continue to develop BEAM will need to respond, requiring a dynamic system able to incorporate periodic changes and updates. With wider implementation it is also expected that the scheme will be subject to further scrutiny by, and feedback from, an increasing number of stakeholders. Stakeholders are welcome to share their opinions and expertise via the BEAM Plus Interiors Feedback Form in this Manual.

12 CET. BEAM 1/96R. An Environmental Assessment Method for New Air-conditioned Office Premises. 1999.
13 CET. BEAM 2/96R. An Environmental Assessment Method for Existing Air-conditioned Office Premises. 1999.
14 CET. BEAM 3/99. An Environmental Assessment Method for New Residential Buildings.1999.

1.7 SUMMARY OF CREDITS

	Section	Credit Requirement	Credit
2	**GREEN BUILDING ATTRIBUTES (GBA)**		**8**
GBA 1	**GREEN BUILDING ATTRIBUTES**	5 credits where the building has been certified with Platinum grade; 4 credits where the building has been certified with Gold grade; 3 credits where the building has been certified with Silver grade; or 2 credits for Bronze grade. Alternative: Up to 4 credits for an uncertified building that meets the listed performance characteristics Exclusion: None	**5**
GBA 2	**LONG-TERM LEASES**	2 credits where the lease contract period between the landlord and the tenant is at least 4 years. 3 credits where the lease contract period between the landlord and the tenant is at least 6 years. Exclusion: None	**3**

	Section	Credit Requirement	Credit
3	**MANAGEMENT (MAN)**		**10**
MAN P1	**CONSTRUCTION SAFETY**	A Safety Management Plan has been implemented and updated during construction and fit-out activities. Exclusion: None	**Required**
MAN 1	**BEAM PROFESSIONAL**	1 credit for at least one (1) key member of the Project Team being a certified BEAM Professional. Exclusion: None	**1**
MAN 2	**CONSTRUCTION IAQ MANAGEMENT**	1 credit for implementing of adequate mitigation measures to reduce potential IAQ problems arising from deconstruction and fit-out activities in accordance with Construction Indoor Air Quality (IAQ) Management Plan. Exclusion: None	**1**
MAN 3	**CONSTRUCTION NOISE**	1 credit for implementing measures to reduce noise from construction and fit-out activities. Exclusion: None	**1**
MAN 4	**GREEN CLEANING**	2 credits for implementing a green cleaning plan. Exclusion: None	**2**
MAN 5	**CORPORATE SOCIAL RESPONSIBILITY FACILITIES**	2 credits for providing one of the listed provisions: i. Nursery provision (e.g. child care corner); ii. Baby-care room; iii. Supervised play area; iv. Recreation facility within space for staff (e.g. sleeping/rest room, fitness room); v. At least 2 enhanced provisions as stipulated in the "Recommended Design Requirements" of Barrier Free Access 2008 within tenant areas; vi. Bicycle parking, showering and locker facilities, etc. Exclusion: None	**2**

	Section	Credit Requirement	Credit
3	**MANAGEMENT (MAN)**		**10**
MAN 6	**USER GUIDANCE**	1 credit for providing a space user's guide for office space or a notice board for public or retail area to encourage and promote environmentally friendly space use, including but not limited to the following: local transport, hygiene and environmental issues, material, energy, indoor environmental quality, water conservation, waste sorting, etc. Exclusion: None	**1**
MAN 7	**OCCUPATIONAL HEALTH AND SAFETY**	1 credit for scoring at least 50% of the applicable occupational health and safety measures and facilities for the project space. 2 credits for scoring at least 70% of the applicable occupational health and safety measures and facilities for the project space. Exclusion: None	**2**

	Section	Credit Requirement	Credit
4	**MATERIALS ASPECTS (MA)**		**26**
MA P1	**USE OF NON-CFC BASED REFRIGERANTS**	Using no chlorofluorocarbon (CFC)-based refrigerants in HVAC&R or other equipment which is installed by the Applicant. Exclusion: None	**Required**
MA P2	**MINIMUM WASTE RECYCLING FACILITIES**	Provide storage facilities at prominent location for the collection of paper, plastic and metal waste. Exclusion: None	**Required**
MA P3	**TIMBER USED FOR TEMPORARY WORKS**	Prevent the use of virgin timber resources for temporary, enabling and hoarding works. Exclusion: None	**Required**
MA 1	**WASTE RECYCLING FACILITIES**	1 credit for providing storage for anyone of the following items. 2 credits for providing storages for any two of the following items. i. Recycling of glass; ii. Recycling of used small electrical appliance; and iii. Recycling of food waste for retails or restaurants. Exclusion: None	**2**
MA 2	**INTERIOR COMPONENTS REUSE**	1 credit for reusing at least 30% of prior condition's interiors walls, glazing, doors, ceilings and flooring. 2 credits for reusing at least 50% of prior condition's interiors walls, glazing, doors, ceilings and flooring. 3 credits for reusing at least 70% of prior condition's interiors walls, glazing, doors, ceilings and flooring. Exclusion: None	**3**
MA 3	**FURNITURE AND PARTITIONS**	1 credit for at least 30% of the total furniture and partitions is reused from salvaged furniture and partitions. 2 credits for at least 50% of the total furniture and partitions is reused from salvaged furniture and partitions. 3 credits for at least 70% of the total furniture and partitions is reused from salvaged furniture and partitions. Exclusion: None	**3**
MA 4	**MODULAR DESIGN MATERIALS**	1 credit for designing with modular elements which contribute to at least 50% of the newly installed elements in the project. Exclusion: None	**1**

	Section	Credit Requirement	Credit
4	**MATERIALS ASPECTS (MA)**		**26**
MA 5	**DESIGNED FOR DISASSEMBLY**	1 credit for installing easy to disassemble elements which contribute to at least 50% of the newly installed elements. Exclusion: None	**1**
MA 6	**SUSTAINABLE FLOORING PRODUCTS**	a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber 1 credit for demonstrating at least 50% of all newly installed flooring materials are made from either (or a combination) of rapidly renewable materials, recycled materials and sustainable timber. 2 credits for demonstrating the achievement of 100%. b) Regionally Manufactured Materials 1 credit for the use of flooring materials manufactured locally within 800km radius from the project space, which contribute to at least 50% of the newly installed flooring materials used in the project. c) Environmentally Manufactured Materials 1 credit for the use of flooring materials from manufacture factory which implemented an EMS and contribute to at least 50% of the newly installed flooring materials used in the project. Exclusion: None	**4**
MA 7	**SUSTAINABLE CEILING PRODUCTS**	a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber 1 credit for demonstrating at least 50% of all newly installed ceiling materials are made from either (or a combination) of rapidly renewable materials, recycled materials and sustainable timber. 2 credits for demonstrating the achievement of 100%. b) Regionally Manufactured Materials 1 credit for the use of ceiling materials manufactured locally within 800km radius from the project space, which contribute to at least 50% of the newly installed ceiling materials used in the project. c) Environmentally Manufactured Materials 1 credit for the use of ceiling materials from manufacture factory which implemented an EMS and contribute to at least 50% of the newly installed ceiling materials used in the project. Exclusion: None	**4**
MA 8	**SUSTAINABLE INTERNAL WALL AND DOOR PRODUCTS**	a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber 1 credit for demonstrating at least 50% of all newly installed internal wall and door materials are made from either (or a combination) of rapidly renewable materials, recycled materials and sustainable timber. 2 credits for demonstrating the achievement of 100%. b) Regionally Manufactured Materials 1 credit for the use of internal wall and door materials manufactured locally within 800km radius from the project space, which contribute to at least 50% of the newly installed internal wall and door materials used in the project. c) Environmentally Manufactured Materials 1 credit for the use of internal wall and door materials from manufacture factory which implemented an EMS and contribute to at least 50% of the newly installed internal wall and door materials used in the project. Exclusion: None	**4**

	Section	Credit Requirement	Credit
4	**MATERIALS ASPECTS (MA)**		**26**
MA 9	**ZERO PVC**	1 credit for using alternative products and materials with zero PVC content for the project. Exclusion: None	**1**
MA 10	**OZONE DEPLETING SUBSTANCES**	1 credit for the use of products in the project space that avoids using ozone depleting substances (CFC & HCFC) in their manufacture process or composition. Exclusion: None	**1**
MA 11	**DEMOLITION AND CONSTRUCTION WASTE REDUCTION**	1 credit for demonstrating that at least 30% of demolition and construction waste is recycled. 2 credits for demonstrating that at least 60% of demolition and construction waste is recycled. Exclusion: None	**2**

	Section	Credit Requirement	Credit
5	**ENERGY USE (EU)**		**26**
EU 1	**ENERGY PERFORMANCE**	**Performance-based Approach** Credit(s): 1 2 3 4 5 6 7 8 HVAC&R: 3% 5% 10% 15% 20% 25% Plus Credit(s): 1 2 3 4 5 6 7 8 Lighting: 10% 15% 20% 25% 30% 35% 40% 45% **Prescriptive-based Approach** Up to a maximum of 14 credits for using energy efficient systems and controls that will reduce the energy consumption of the project space. Building systems include HVAC&R and lighting. Exclusion: None	**14**
EU 2	**ENERGY EFFICIENT APPLIANCES**	1 credit when 70% of total quantities of each type of electrical appliances are certified energy efficient products. 2 credits when 90% of total quantities of each type of electrical appliances are certified energy efficient products. 3 credits when 100% of total quantities of each type of electrical appliances are certified energy efficient products. Exclusion: None	**3**
EU 3	**COMMISSIONING**	a) Commissioning plans 2 credits for provision of: i. Commissioning plan detailing all specified commissioning work for HVAC&R and lighting systems that impact on energy use and indoor environmental quality; and ii. The commissioning plan shall be endorsed by a Commissioning Authority (CxA). b) Commissioning reports 2 credits for provision of: i. Commissioning reports for HVAC&R and lighting systems that impact on energy use and indoor environmental quality; and ii. The commissioning reports shall be endorsed by a CxA. Exclusion: None	**4**
EU 4	**OPERATIONS & MAINTENANCE**	1 credit for provision of digital operations and maintenance (O&M) manual and energy management manual or an energy management section in O&M manual which encourage effective communication. Exclusion: None	**1**

	Section	Credit Requirement	Credit
5	**ENERGY USE (EU)**		**26**
EU 5	**METERING AND MONITORING**	3 credits for installation of metering that allows separate monitoring of electricity use by the following equipment installed by the Applicant and serving the project space (at the minimum): i. HVAC&R systems (including supplementary air conditioning, if any); ii. Lighting systems; iii. Small power (plug loads); iv. Lifts and escalators (if any); v. Hot water systems (if any); vi. Spa whirlpools (if any); vii. Loads associated with server room (if any); and viii. High electrical power equipment (>25kVA, if any). 1 credit for installation of thermal energy meters for monitoring the chilled water consumption. Exclusion: None	**4**

	Section	Credit Requirement	Credit
6	**WATER USE (WU)**		**6**
WU 1	**WATER QUALITY SURVEY**	1 credit for demonstrating that the quality of potable water meets the referenced drinking water quality standards at all points of use. Exclusion: None	**1**
WU 2	**ANNUAL WATER USE**	1 credit for demonstrating that the use of water efficient devices leads to an estimated aggregate annual water saving of 30% when compared with BEAM Plus baseline. 2 credits for demonstrating an estimated annual water saving of 40% when compared with BEAM Plus baseline. Exclusion: None	**2**
WU 3	**EFFLUENT DISCHARGE TO FOUL SEWERS**	1 credit for demonstrating the application of water efficient technology in the flushing system. Exclusion: None	**1**
WU 4	**NO BOTTLED WATER**	2 credits for demonstrating that provision to replace bottled water services has been provided, such as drinking water fountains, etc. Exclusion: None	**2**

	Section	Credit Requirement	Credit
7	**INDOOR ENVIRONMENTAL QUALITY (IEQ)**		**24**
IEQ 1	**INDOOR AIR QUALITY**	A. Specifications For each of the materials categories (A1 to A5), one credit is achieved when compliance is demonstrated through submission of the requisite documentation. Alternative: B. Measurement For each of the categories of contaminants (B1 to B5) one credit is achieved if measured concentrations obtained through appropriate measurements comply with the GOOD class requirement in the IAQ Certification Scheme. Exclusion: None	**5**

	Section	Credit Requirement	Credit
7	**INDOOR ENVIRONMENTAL QUALITY (IEQ)**		**24**
IEQ 2	**INDOOR PLANTING**	1 credit for fulfilling at least 2 items as shown below. 2 credits for fulfilling at least 4 items as shown below. i. The minimum density is one large plant (300mm pot) or two small plants (200mm pot) per two workstations; ii. Green wall of at least $5m^2$ is provided; iii. The plant species are carefully selected and suitable to be planted in indoor environment; iv. A "Horticultural Maintenance Plan" shall be in place to ensure the health of the plants is maintained; and v. No electricity is required to maintain and for the growth of the plants. Exclusion: None	**2**
IEQ 3	**MINIMUM VENTILATION PERFORMANCE**	1 credit for demonstrating that the project is in compliance with the minimum requirements of ANSI/ASHRAE 62.1-2010 in respect of Outdoor Air Quality; and Minimum Ventilation Rate. Alternative: 1 credit for demonstrating that carbon dioxide level within the project space can comply with Good Class requirement as stipulated in IAQ Certification Scheme. Exclusion: None	**1**
IEQ 4	**PRE-OCCUPANCY FLUSH OUT**	1 credit for undertaking flush-out of normally occupied project spaces prior to occupancy. Exclusion: None	**1**
IEQ 5	**TENANT EXHAUST**	1 credit for the provision of independent exhaust system for all photocopy / printing rooms and locations where significant indoor pollution sources are generated. Exclusion: None	**1**
IEQ 6	**UNCONTROLLED VENTILATION**	1 credit for undertaking tests in the premises using a non-balanced test method to demonstrate that the air tightness is within recognised limits. Exclusion: None	**1**
IEQ 7	**THERMAL COMFORT**	a) Temperature 1 credit for demonstrating the air temperature within the project space is ±1.5 C of the set temperature when the air side system is operating at steady state under normal occupied periods. b) Relative humidity 1 credit for demonstrating the relatively humidity within the project space is less than 70%. c) Air movement 1 credit for demonstrating the air movement within the project space is less than 0.3m/s. Exclusion: None	**3**
IEQ 8	**INTERIOR LIGHTING QUALITY**	3 credits where the uniformity, glare index and colour rendering index (1 credit for each parameter) at all workstations can comply with CIBSE requirements. Exclusion: None	**3**

	Section	Credit Requirement	Credit
7	**INDOOR ENVIRONMENTAL QUALITY (IEQ)**		**24**
IEQ 9	**NATURAL LIGHTING**	1 credit where 75% of workstations or seating are located in an area of floor plate that has a natural light illuminance level of 100 lux. 2 credits where 85% of workstations or seating are located in an area of floor plate that has a natural light illuminance level of 100 lux. Exclusion: None	**2**
IEQ 10	**VIEWS TO OUTSIDE**	1 credit for at least 60% of all workstations or seating have a direct line of sight to external vision glazing or naturally lit internal courtyard or atrium. 2 credits for at least 80% of all workstations or seating have a direct line of sight to external vision glazing or naturally lit internal courtyard or atrium. Exclusion: None	**2**
IEQ 11	**ACOUSTICS**	1 credit for demonstrating background noise levels are within the prescribed criteria. 1 credit for demonstrating that the reverberation time in applicable areas meets the prescribed criteria for given types of premises. 1 credit for demonstrating airborne noise isolation between rooms, spaces and premises meets the prescribed criteria. Exclusion: None	**3**

	Section	Credit Requirement	Credit
8	**INNOVATIONS (IV)**		**10**
IV 1	**INNOVATIVE TECHNIQUES**	Maximum 10 BONUS credits	**10**
IV 2	**PERFORMANCE ENHANCEMENTS**		

2 GREEN BUILDING ATTRIBUTES

GBA 1 GREEN BUILDING ATTRIBUTES

EXCLUSION

None.

OBJECTIVE

Encourage selection of host building that employs best practices in design and/or operation.

CREDIT ATTAINABLE

Up to 5 credits

CREDIT REQUIREMENT

5 credits where the building has been certified with Platinum grade;

4 credits where the building has been certified with Gold grade;

3 credits where the building has been certified with Silver grade; or

2 credits for Bronze grade.

Alternative:

Up to 4 credits for an uncertified building that meets the listed performance characteristics.

ASSESSMENT

Criteria

The selected building is within validity of BEAM certification or other internationally recognised green building labelling systems. The prescribed number of credits shall be achieved in accordance with the equivalence to BEAM grades. Grades such as 'Excellent' shall be deemed equivalent to 'Platinum', and so on, for lower grades.

A green building certificate older than five (5) calendar years, irrespective of published validity date, does not meet the requirement of this credit.

Documentation

For BEAM certified buildings, the credits shall be achieved automatically based on the records held by BSL.

Where the host building holds more than one independently assessed Green Building certification, points are awarded for one certificate, no double counting is permitted.

Where the certificates have different ratings, this credit shall be based only on the BEAM certificate.

For other rating systems, the Applicant shall provide evidence confirming the host building has a valid certificate.

ALTERNATIVE APPROACH

Criteria

For an uncertified building, one (1) credit is achieved for each of the following listed characteristics of the building, up to a maximum of 4 credits (The first 6 listed characteristics or features are referenced from Site Aspects of the latest version of BEAM Plus for New Buildings).

i. No car parking provision: No car parking is provided other than provisions intended for use by disabled persons and/or any shuttle service vehicles.

ii. Local transport: The mass transit station or other public transport facilities must be within 500m walking distance of the occupied building, and the scheduled operating frequency between 07.00 to 19.00 hours shall be 10 minutes or less.

iii. Neighbourhood basic services: At least 10 different basic services are located within 500m walking distance from the main entrance of the host building and pedestrian access to the services is available for the Site. Basic services shall include: (1) Restaurants; (2) Banks (including Automated Teller Machine); (3) Medical Facility; (4) Dental Clinic; (5) Pharmacy; (6) Supermarket; (7) Convenience Stores; (8) School; (9) Kindergarten or Day Care Centre; (10) Library; (11) Post Box; (12) Laundry or Dry Cleaner; (13) Hairdresser; (14) Retail shops; (15) Place of Worship; and (16) Community Centre. Among these 16 items, only one of them can be counted twice in calculating the total number of neighbourhood basic services.

iv. Neighbourhood recreational facilities: At least 2 different recreational facilities are located within 500m walking distance from the main entrance of the host building and pedestrian access to the facilities is available for the site. Recreational facilities shall include: (1) Shaded/covered sitting out areas/garden/park with seating facilities; (2) Waterfront Promenade; (3) Public Swimming pool; (4) Public Indoor Sports Hall; (5) Public Outdoor Sports Facility such as football field, basketball court, tennis court, etc.; and (6) Bicycle Tracks. Among these 6 items, only one of them can be counted twice in calculating the total number of neighbourhood recreational facilities.

v. Light pollution: The obtrusive light from exterior lighting (installed / owned by the Applicant) meets the specified performance for the environmental zone in which the building is located.

vi. Water efficient design: The host building employs rainwater harvest or greywater reclamation system.

vii. On-site renewable energy: The host building has installed monitored renewable applications that supply energy for building usage (no specific percentage is required for achieving this approach).

viii. Corporate Social Responsibility (CSR) Facilities: The host building has provided at least 2 CSR facilities. These include: (1) Nursery provisions; (2) Baby-care rooms; (3) Recreational facilities; (4) Bicycle parking; (5) Electrical vehicle charging facilities; (6) Barrier free access facilities; and (7) Carpool.

The list is not meant to be exhaustive. The Applicant is encouraged to submit alternative green features for Approval subject to the sole discretion of BSL TRC.

Documentation

For each listed characteristics or features above, credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. No car parking provision: Photographs showing no private carparking space is provided within the host building.

ii. Local transport: A scaled map showing the transport facilities and the walking distances from the main entrance of the host building, and extracts of timetable for each route showing the service frequency during the prescribed hours.

iii. Neighbourhood basic services: A scaled map showing the neighbourhood basic services and the walking distances from

the main entrance of the host building.

iv. Neighbourhood recreational facilities: A scaled map showing the neighbourhood recreational facilities and the walking distances from the main entrance of the host building.

v. Light pollution: A lighting simulation report including methodology justification and result analysis to confirm the compliance of the prescribed light pollution criteria.

vi. Water efficient design: Photographs showing the operating system for greywater reclamation or rainwater harvesting.

vii. On-site renewable energy: Photographs showing the renewable energy system and screenshot of the energy monitoring system.

viii. Corporate Social Responsibility facilities: Floor plans or photographs showing the provisions of these facilities within the host building.

BACKGROUND

The Applicant's representatives responsible for sourcing and selecting premises have the opportunity to demonstrate commitment to sustainability by selecting a host building that has been certified as 'green' or employed green strategies.

GBA 2 LONG-TERM LEASES

EXCLUSION None.

OBJECTIVE Conserve the natural resources, reduce the waste and associated environmental impacts by remaining in the same location.

CREDIT ATTAINABLE Up to 3 credits

CREDIT REQUIREMENT 2 credits where the lease contract period between the landlord and the tenant is at least 4 years.

3 credits where the lease contract period between the landlord and the tenant is at least 6 years.

ASSESSMENT

Criteria

The Applicant shall provide a certified true copy of the Contract (lease agreement) for the prescribed duration.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. The certified true copy of the Contract (lease agreement) for the prescribed duration.

ii. Where the Applicant is also the building owner, the landlord or a related company [1], an undertaking letter signed by a director shall be submitted stating the occupation commitment for the prescribed duration.

BACKGROUND A long-term lease can minimise the frequency of relocation and associated deconstruction and renovation activities. It can help to reduce the waste generated and energy consumption during transportation and renovation activities, save the virgin resources and minimise the disturbance to adjacent tenants etc.

Another benefit for longer occupancy periods is that tenants have a greater incentive to make longer-payback upgrades for energy and water upgrading works. Longer occupancy periods can also help tenants reduce moving expenses over time; reduce construction expenses for building out new spaces; prevent the disruption of employee productivity that is often associated with relocation; and shelter the tenant from rent increases and inflation.

1 In this context "Related Company" shall mean any organisation, firm or company where the Applicant has beneficial control, or holds more than 10% of its shares.

3 MANAGEMENT

MAN P1 CONSTRUCTION SAFETY

EXCLUSION None.

OBJECTIVE Encourage development of systematic safety management plan that embraces the safety and health of the workers and neighbours.

REQUIREMENT A Safety Management Plan has been implemented and updated where necessary during construction and fit-out activities.

ASSESSMENT

Criteria

The Applicant shall submit confirmation in the form of a letter signed-off by the project manager or the space owner that the works were carried out:

i. in accordance with any requirements specified in the applicable building fit-out guide; and

ii. without violation of the Construction Sites (Safety) Regulations.

A Safety Management Plan detailing the following at a minimum shall be provided:

i. Person-in-charge and emergency contact;

ii. Hazard / risk identification;

iii. Public protection controls (e.g. prevent unauthorised access, falling debris);

iv. Control methods;

v. Site inspection frequency;

vi. Common plant and equipment used;

vii. Promotion & training; and

viii. Personal protection equipment used, etc.

Documentation

Pre-requisite shall be fulfilled when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A declaration letter signed-off by the project manager or the space owner;

ii. A Safety Management Plan; and

iii. Records showing that the Safety Management Plan is properly implemented.

BACKGROUND

In many instances interior fit-out is carried out by small and medium-sized renovation firms which might not have sufficient resources to develop a comprehensive Safety Management Plan for every specific project. BEAM seeks to reduce the injuries from construction activities associated with fit-out by encouraging renovation firms to develop and implement a Safety Management Plan using the resources available from the public domain. Various resources quoted from the Authorities are extracted [1,2,3,4,5,6].

1 Occupational Safety and Health Management in Renovation and Maintenance Works for the Property Management Industry – Labour Department
http://www.oshc.org.hk/others/bookshelf/BB110069E.pdf

2 Safety Hints for Renovation Workers – Occupational Safety & Health Council (Chinese version only)
http://www.oshc.org.hk/others/bookshelf/CB945C.pdf

3 Guidance Notes to Renovation Safety – Labour Department
http://www.oshc.org.hk/others/bookshelf/BB258E.pdf

4 Guidance Notes to Renovation Safety – Labour Department
http://www.oshc.org.hk/others/bookshelf/BB258E.pdf

5 Safety Hints for Renovation Workers in Using Chemicals – Occupational Safety & Health Council (Chinese version only)
http://www.oshc.org.hk/others/bookshelf/CB148C.pdf

6 OSH for Building Services Work – Occupational Safety & Health Council (Chinese version only)
http://www.oshc.org.hk/others/bookshelf/CB098C.pdf

MAN 1 BEAM PROFESSIONAL

EXCLUSION

None.

OBJECTIVE

To facilitate the application for the BEAM certification process and to ensure the design of the project following the requirement of the BEAM Plus Manual.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for at least one (1) key member of the Project Team being a certified BEAM Professional.

ASSESSMENT

Criteria

The Applicant shall provide evidence of engagement of the BEAM Pro as the key project team member.

The BEAM Pro shall meet all of the following requirements:

i. The BEAM Pro was accredited before the beginning of construction;

ii. An employee of the design firm, or an employee or consultant of the project space owner;

iii. Conduct one design charrette meeting at concept stage;

iv. Participation in meetings;

v. Provide guidance to the project team regarding BEAM Plus principles, structure, timing and certification process from design through to practical completion of the project; and

vi. Review and prepare all submission for compliance with BEAM Plus.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A copy of the nominated BEAM Pro's accreditation certificate; or a printout of the relevant page of the online BEAM Pro Directory, found on the HKGBC website, signed and dated by the project's BEAM Pro, with his/her name underlined; and

ii. A copy of the BEAM Pro's letter of appointment endorsed/signed by the project manager or the space owner, identifying the scope of work.

MAN 2 CONSTRUCTION IAQ MANAGEMENT

EXCLUSION None.

OBJECTIVE Reduce the potential for indoor air quality problems resulting from construction and where applicable deconstruction, to the benefit of workers and adjacent neighbours.

CREDIT ATTAINABLE 1

CREDIT REQUIREMENT 1 credit for implementing of adequate mitigation measures to reduce potential IAQ problems arising from deconstruction and fit-out activities in accordance with Construction Indoor Air Quality (IAQ) Management Plan.

ASSESSMENT Criteria

A Construction IAQ Management plan which includes procedures meeting the minimum requirements, as follows:-

i. measures to protect the ventilation system components and air pathways against contamination during construction;

ii. cleaning procedures to be employed prior to the building being occupied, in the event that ventilation system components and air pathways are not adequately protected;

iii. control measures for HVAC system and component protection;

iv. contaminant source control; and

v. interruption of moisture/pollutant pathways;

Events shall be scheduled to protect indoor air quality by:

i. permitting adequate airing-out of new materials;

ii. sequencing the installation of finish materials; and

iii. proper curing of concrete before covering.

The Plan should specify the location, type, amount, sequence and timing of the various control measures, including emergency procedures, and the labour, materials and time required to implement them. The project construction documents should address the following:

i. an overview of tasks to be executed;

ii. a list of reference documents, including specifications, drawing list, and submittal drawings;

iii. a list of participants in the process and their responsibilities;

iv. a plan for management, communication and documentation;

v. an outline of the scope of the IAQ Management Plan, including submittal review, inspection, and enforcement;

vi. the expected written work products, including checklists and worksheets; and

vii. a schedule of activities.

The project construction documents should require the contractor to:

i. designate a representative with daily responsibility for IAQ issues;

ii. include procedures related to the IAQ Management Plan on the agenda during regularly scheduled meetings;

iii. store building materials in a weather tight, clean area protected from dust, debris and moisture damage;

iv. keep the premises free from accumulating of waste materials, rubbish and other debris resulting from the work. Identify the storage, disposal and housekeeping practices to be applied to building supplies and waste materials to protect HVAC systems from contamination;

v. submit a construction schedule to prevent materials from acting as sinks for storage and subsequent release of contaminants emitted from finishes which have the potential for short-term off-gassing. In the schedule, the contractor should include appropriate allowances for drying or curing times before installation of materials that have a fibrous or porous nature that tend to adsorb contaminants;

vi. provide adequate outside air continuously during installation of materials and finishes;

vii. replace all construction-related filtration media used on permanent HVAC equipment at substantial completion of the work;

viii. confirm that all air handling equipment including but not limited to filters, casing, coils, fans and ducts are clean, before air quality testing; and

ix. ensure air ducts clean by coordinating duct testing and cleaning procedures with the commissioning requirements.

A Construction IAQ Management report detailing how fit-out construction activities, and where applicable deconstruction activities, were executed for the project. The report shall detail:

i. design approaches, specifications and contract requirements on actions to be taken by contractors to control dust, odour and other emissions, moisture damage, etc. generated during work activities;

ii. roles and responsibilities for monitoring and reporting on the execution of the control instructions;

iii. measures taken to schedule delivery, store, protect and install absorptive materials in order to minimise exposure to moisture and airborne contaminants;

iv. protection measures for fixed HVAC systems and equipment;

v. protection for all Building Services equipment, including but not limited to plumbing, tanks, vessels, drainage, piping, FSI, hose reels, electrical and FSI conduits, etc should be sealed with temporary plugs during construction;

vi. source control of pollutants from materials such as sealants and paints;

vii. isolation of areas of work to prevent contamination of adjacent clean or occupied spaces;

viii. exhausting of contaminants to outside air where appropriate;

ix. negative pressurisation where appropriate;

x. cleaning activities during construction;

xi. replacement of appropriate filter media upon completion;

xii. details of any monitoring or measurement of pollutants during construction; and

xiii. planning and implementation of pre-occupancy flush-out.

This section applies irrespective of whether the project is located in a new or refurbished building where adjacent tenant areas remain unoccupied, or where the project is a renovation of space in an occupied building. Where deconstruction required, it shall be included in the Assessment.

Where there is minimal construction activity associated with a project the credit remains applicable, but the submitted report shall detail the project's interior (design and layout of spaces) prior to acquisition, and when completed for the new occupancy.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Construction IAQ Management Plan; and

ii. Construction IAQ Management Report.

GUIDANCE

Dust and odours generated by various deconstruction and construction activities cause significant air pollution. High levels of dust, combined with other pollutants, can cause respiratory problems. Inhaled particles may aggravate asthma, bronchitis, and very small particles may cause cancer. Dust also reduces visibility, dirties clothing and buildings, and increases the rate of corrosion.

Good site practices are the major mitigation measures for prevention or minimisation of air pollution from construction activities. A management plan, covering IAQ related construction procedures should be developed before construction begins with contractors and be a regular agenda item for progress meetings.

An important part of the management plan is the sequence in which materials, fixtures and fittings are installed during the phases of construction. For example, products that emit VOC's over a relatively short timeframe should be installed before installing absorbent materials.

Practical guidance on the control of air pollution during construction is available from SMACNA [1], US EPA [2] and Hong Kong EPD website [3]. Though the guidance focuses on activities in occupied buildings, they are also appropriate to manage construction activities in new buildings.

The guide recommends measures in respect of scheduling activities, source control, pathway interruption, protecting installed HVAC systems and equipment, and good housekeeping.

SCHEDULING ACTIVITIES

Construction work in occupied buildings that will generate emissions and nuisance should be undertaken outside normal working hours.

SOURCE CONTROL MEASURES

Source control means specifying finish materials, composite wood products, sealants, etc. with low toxicity and off-gassing, as covered in the IEQ section. Contractors will require instructions and close monitoring to ensure that inferior products are not used in place of specified materials.

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1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA). IAQ Guidelines for Occupied Buildings Under Construction. 2nd. Ed., 2007.

2 The United States Government. Environmental Protection Agency. IAQ Design Tools for Schools during Construction. http://www.epa.gov/iaq/schooldesign/construction.html#Construction%20Practices

3 Hong Kong Environmental Protection Department – Indoor Air Quality Information Centre. Improve the Indoor Air Quality in Your Building. http://www.iaq.gov.hk/pamphlets/200911/booklet_building.pdf

PATHWAY INTERRUPTION

All occupied areas, or areas that will become occupied, particularly those adjacent to the project, should be isolated as far as practicable. Measures such as erecting temporary doors and screens to inhibit dust and air movement, sealing of construction areas, depressurising work areas to provide a pressure differential to adjacent areas, and exhausting directly to the outside are recommended.

HVAC EQUIPMENT AND OTHER BS INSTALLATIONS PROTECTION

Installed HVAC equipment should be protected from dust and other contaminants. Ducts should be sealed and subsequently cleaned. Where HVAC systems are required to operate during project work activities it is important to protect the return air side of the ventilation system. Temporary filters, to MERV 8 or better, should be installed over openings. Care should be taken not to allow storage of materials and other products in ductwork or air-handler plant rooms. Upon completion of the work, but in co-ordination with pre-occupancy flush out activities, all filtration media should be replaced.

HOUSEKEEPING MEASURES

Cleaning activities should be arranged to control contaminants in spaces under construction and prior to occupancy, possibly using strategies such as high-efficiency filters, or using suitable wetting agents to manage fine dust. Cleaning materials used should not be a source of toxic chemicals, or should be applied under appropriate guidelines.

MERV RATING

Filtration efficiency defines how well the filter cleans indoor air by removing airborne particles. Low-efficiency filters, around 25% efficiency for 3-10 micron particles, are typically used to keep lint and dust from clogging HVAC system components. Medium- and high-efficiency filters, up to 95% efficiency for 3-10 micron particles, are typically used to remove mould, pollen, and fine particulate. High Efficiency Particulate Air (HEPA) filters are used when 99.97% efficiency and above (for 0.3 micron particles) is required.

ANSI/ASHRAE Standard 52.2 [4] measures the particle size efficiency (PSE) of an HVAC filter. This indicates the ability to remove particles of differing sizes between 0.3 and 10 micrometres in diameter. A Minimum Efficiency Reporting Value (MERV), is assigned to a filter based on a minimum PSE. A MERV 1 is least efficient, while a MERV 16 is most efficient. HEPA and Ultra Low Penetration Air (ULPA) filters have filtration efficiency that is higher than MERV 16 and are not measured by the ANSI/ASHRAE 52.2 test standard.

4 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE). ANSI/ASHRAE 52.2-1999. Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

MAN 3 CONSTRUCTION NOISE

EXCLUSION

None.

OBJECTIVE

Minimise nuisance to the immediate neighbourhood caused by noise during construction and fit-out activities.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for implementing measures to reduce noise from construction and fit-out activities.

ASSESSMENT

Criteria

The Applicant shall submit confirmation in the form of a letter signed-off by the project manager or the space owner that the works were carried out:

i. in accordance with any requirements specified in the applicable building fit-out guide provided by the building management or building owner;

ii. without violation of the any noise control regulations; and

iii. that no formal complaints were lodged with the Authorities;

The letter shall detail how noise from the work activities was minimised and/or rescheduled to avoid nuisance to neighbouring tenants.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Measures to minimise the noise nuisance to the immediate neighbourhood during construction and fit-out activities; and

ii. A declaration letter signed-off by the project manager or the space owner stating no formal complaints were lodged with the Authorities.

BACKGROUND

In many instances interior fit-out will take place when other areas of the building, or the premises themselves, are occupied. BEAM seeks to reduce the nuisance from construction activities associated with fit-out, particularly noise and vibration that can affect neighbours.

Where the work takes place in circumstances where other parts of the building are occupied, it is expected that noise and vibration that is transmitted via the building structure will be avoided during the hours of 09.00 to 18.00. Where noise is generated within spaces which does not involve drilling, chasing, channelling, etc. structural and solid walls but is transmitted as mainly airborne noise then steps should be taken to mitigate the impact.

MAN 4 GREEN CLEANING

EXCLUSION

None.

OBJECTIVE

Ensure an environmentally friendly cleaning procedure after fit-out works.

CREDIT ATTAINABLE

2

CREDIT REQUIREMENT

2 credits for implementing a green cleaning plan.

ASSESSMENT

Criteria

The Applicant shall provide a copy of the plan detailing how in-house or appointed cleaning service providers adopt and maintain a defined set of written guidelines or standard operating procedures that govern cleaning of interior spaces.

This shall include procedures, chemical handling, consumption of pesticide, equipment maintenance and operation procedures, communication requirements, training and inspection, reporting and record keeping procedures.

Documentation

Credits shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A copy of the green cleaning plan;
ii. The method statement of cleaning;
iii. Catalogue / photo showing the cleaning products used; and
iv. Photos showing cleaning procedure conducted.

BACKGROUND

Green cleaning can improve the health and the safety of both human beings and the environment. Green cleaning can also be more efficient and can offer cost savings as the quantities of chemicals required in the cleaning process are generally reduced.

Green Seal [1] establishes requirements for cleaning service providers, including in-house and external cleaning services, to create a green cleaning program that protects human health and the environment. For the purposes of this Manual, green cleaning encompasses all indoor activities typically required to clean commercial, public, and industrial buildings.

EPD [2] also publishes green specifications of cleansing products.

There are many resources providing environmentally friendly cleaning products. They include: Green Seal, Kadoorie Farm and Botanic Garden (KFBG) Corporation [3], Consumer Specialty Products Association [4], US EPA [5], etc.

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1 Green Seal. http://www.greenseal.org/
2 EPD. List of products with recommended green specifications http://www.epd.gov.hk/epd/english/how_help/green_procure/files/Green_Specifications.pdf
3 Kadoorie Farm and Botanic Garden (KFBG) Corporation. Green Cleaning Products http://www.climatechange.hk/cht/green-cleanse-product-highlights.aspx
4 Consumer Specialty Products Association. Household Cleaning Products and Green Cleaning Products. http://www.aboutcleaningproducts.com/
5 The United States Government. Environmental Protection Agency. Environmentally Preferable Purchasing (EPP). http://www.epa.gov/epp/index.htm

MAN 5 CORPORATE SOCIAL RESPONSIBILITY FACILITIES

EXCLUSION

None.

OBJECTIVE

Encourage space development that is an asset to the society and promotes the organisation's Corporate Social Responsibility (CSR).

CREDIT ATTAINABLE

2

CREDIT REQUIREMENT

2 credits for providing one of the listed provisions:

i. Nursery provision (e.g. child care corner);
ii. Baby-care room;
iii. Supervised play area;
iv. Recreation facility within space for staff (e.g. sleeping/rest room, fitness room);
v. At least 2 enhanced provisions as stipulated in the "Recommended Design Requirements" of Barrier Free Access 2008 within tenant areas; and
vi. Bicycle parking, showering and locker facilities, etc.

ASSESSMENT

Criteria

The Applicant shall submit a floor plan showing the provision and the facilities built in the proposed area (e.g. the type of furniture provided within the baby-care room).

In case the project space is insufficient to provide such facilities, the provisions can also be located in other parts of the host building under the same management of the Applicant and they shall be accessed by other occupants.

Every provision must be supported with a management plan. The management plan can be one-page in-length listing how and when the public or the staff can access the facilities, person-in-charge, usage rules for the space, etc. and it is signed-off by the space owner or the property manager of the space as supporting to the commitment.

The listed provisions as shown above are not meant to be exhaustive. The Applicant is encouraged to submit alternative CSR facilities for approval subject to the sole discretion of BSL TRC.

Documentation

Credits shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A floor plan showing the provision(s) and the facilities built-in; and
ii. A management plan of the provision signed-off by the space owner or the property manager of the space.

BACKGROUND

The provision of CSR facilities such as, child care corner, baby-care room, recreation facilities for staff, etc., within the project space does not only provide convenience to the society but it can also promote the organisation's commitment toward CSR.

Provisions of CSR facilities are essential to the mental and physical well-being of the individual and the community as a whole. It contributes to the quality of life of space users, and is more sustainable. The design and layout of these facilities should be of a high quality which meets the needs of the users.

MAN 6 USER GUIDANCE

EXCLUSION

None.

OBJECTIVE

Inform tenants/owners on the environmental, comfort and health impacts of their activities, and to encourage actions that reduce adverse impacts.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for providing a space user's guide for office space or a notice board for public or retail area to encourage and promote environmentally friendly space use, including but not limited to the following: local transport, hygiene and environmental issues, material, energy, indoor environmental quality, water conservation, waste sorting, etc.

ASSESSMENT

Criteria

The Applicant shall submit a user guide for office space or an illustration on the notice board (it can also be poster, electronic board, etc.) for retail area that is designed specifically for the project space. The user guide or the notice board, etc. shall use easy-to-understand language and addresses at least 5 aspects as stipulated below:

i. Local public transport and cycling provision (e.g. information, maps and timetables);

ii. Information on alternative methods of transport (e.g. car sharing schemes; shuttle bus services; electric car rental and charging location, if available);

iii. Hygiene and environmental issues (e.g. green cleaning);

iv. Materials selection for fit-out (e.g. low VOC products, sustainable timber, reuse of materials);

v. Energy issues (e.g. energy efficient operation of air conditioning, lighting and/or hot water system(s), selection of energy efficient appliances);

vi. Water conservation (e.g. adoption of low flow tap);

vii. Waste sorting facilities or practices (e.g. details of recyclable waste, location of recycling bins) and

viii. Indoor environmental quality (e.g. IAQ certification), etc.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A user guide or illustration (e.g. in the form of photograph) with explanation on the notice board / poster / electronic board.

BACKGROUND

Overall performance can be improved and environmental impacts reduced with the co-operation of the space user or tenants of premises within a building. Very often users are not aware of the safety, hygiene, energy, water, comfort and environmental issues. It is good practice to provide guidance on the design and use of premises as they interface with the overall building performance. It shall contain guidance and information on applicable regulations, advice on partitioning to maintain adequate ventilation, etc.

MAN 7 OCCUPATIONAL HEALTH AND SAFETY

EXCLUSION None.

OBJECTIVE Encourage provisions of interior layout that embrace health and safety performance.

CREDIT ATTAINABLE 2

CREDIT REQUIREMENT 1 credit for scoring at least 50% of the applicable occupational health and safety measures and facilities for the project space.

2 credits for scoring at least 70% of the applicable occupational health and safety measures and facilities for the project space.

ASSESSMENT

Criteria

The Applicant shall submit documentation which can illustrate the provisions of health and safety measures and facilities in accordance with the checklist provided below.

Where 50% or 70% compliance of applicable items are demonstrated, the credit(s) shall be achieved.

Assessment Grid

Ergonomics	Pt	Indoor Environmental Quality	Pt	Storage	Pt
Provided adjustable & movable office chairs.	1	Wall / sound barrier between occupant and noisy equipment or locations (e.g. photocopiers, kitchen etc).	1	Closed lid bins for organic waste (e.g. food waste).	1
Armrests on office chair (if provided) shall be adjustable in height.	1	Draught: Air from air diffuser is not directly blown to seating occupant.	1	1.2 metres of space in front of storage to allow sufficient space for safe movement.	1
Standing-height-benches can be adjustable in height (if provided).	1	Glare: No monitors (computer, TV) are facing window.	1	Safe means of climbing up to storage that is more than 2 metres.	1
Desks or tables are rounded corners with no sharp edges.	1	Sound absorbing panel between walkway and workstation.	1	**Interior layout**	**Pt**
Knee clearance dimensions for desk is from 610mm to 760mm for height and >800 mm for width.	1	Others (by Applicant)	1	Walkways / aisles are at least 1 metre clear width.	1
Anti-fatigue matting for standing workers (e.g. retail staff behind counter, laboratory staff)	1	Others (by Applicant)	1	No electrical extension cords lying on walkway or in shopping centres.	1
Others (by Applicant)	1	Others (by Applicant)	1	Others (by Applicant)	1
Total Applicable Points		Points Achieved:		Percentage Achieved:	

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Justification for each checked item,

ii. Photographs showing the layout / setup, and

iii. Manufacturer manuals / catalogues showing the provision and how it operates.

BACKGROUND

Workplaces can be hazardous; there are potential risks that can cause injury or ill. Protecting the health and safety of people in the workplace is an important aspect in sustainable workplaces. Incidents can have a dramatic impact on people's lives and significant financial impacts on organisations through loss of skilled staff and lost production of goods or services.

A safe and healthy workplace requires interior designer's thoughtful planning. Eliminating and controlling hazards and risks during design stage will have a positive impact to future operation.

This section only includes some of the common measures that should be used to control OHS hazards and risks. There are many resources that can provide further information and design guidelines in OHS, such as the Occupational Safety & Health Council [1], the United States Department of Labour, Occupational Safety & Health Administration [2], Australia WorkSafe Victoria [3], etc.

1 Occupational Safety & Health Council. http://www.oshc.org.hk/
2 The United States Department of Labour. Occupational Safety & Health Administration. Ergonomics http://www.osha.gov/SLTC/ergonomics/
3 Australia WorkSafe Victoria. http://www.worksafe.vic.gov.au/

4 MATERIALS ASPECTS

MA P1 USE OF NON-CFC BASED REFRIGERANTS

EXCLUSION

None.

OBJECTIVE

Reduce the release of chlorofluorocarbon into the atmosphere.

REQUIREMENT

Using no chlorofluorocarbon (CFC)-based refrigerants in HVAC&R or other equipment which is installed by the Applicant.

ASSESSMENT

Criteria

The Applicant shall use no chlorofluorocarbon (CFC)-based refrigerants in HVAC&R or other equipment.

Documentation

The pre-requisite shall be fulfilled when the Applicant provides the following documentation to demonstrate the compliance:

i. Equipment schedules of HVAC&R or other equipment;

ii. Catalogues to show the equipment types, model number and used refrigerant type. Important information shall be highlighted for easy identification; and

iii. On-site photos to show the installed HVAC&R or other equipment.

In case the HVAC&R or other equipment is not installed by the Applicant, the following documents are required in the submission.

i. A clarification letter signed by both Applicant and building property management company in-charge to confirm that no supplementary HVAC&R or other equipment is installed by the Applicant.

BACKGROUND

In Hong Kong, Ozone Layer Protection Ordinance (Cap. 403) 1989 gives effect to Hong Kong's international obligations to control the manufacture, import and export of ozone depleting substances [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.

More information on ozone layer protection can be found in EPD website [3].

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1 Environmental Protection Department. A Concise Guide to the Ozone Layer Protection Ozone Layer Protection Ordinance. 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. http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/files/cgt_olp_cr_eng.pdf

3 Environmental Protection Department. Ozone Layer Protection. http://www.epd.gov.hk/epd/english/environmentinhk/air/ozone_layer_protection/wn6_info.html

MA P2 MINIMUM WASTE RECYCLING FACILITIES

EXCLUSION

None.

OBJECTIVE

Reduce pressure on landfill sites and help to preserve non-renewable resources by promoting the recycling of waste materials.

REQUIREMENT

Provide storage facilities at prominent location for the collection of paper, plastic and metal waste.

ASSESSMENT

Criteria

The Applicant shall provide at least 1 set of storage facility for the recycle of paper, plastic and metal materials. The facilities provided shall be placed at prominent location (i.e. cannot be located at car park and other non-occupied areas), but not necessary within the project space. The size of the facility and frequency of collection are not regulated.

The waste collector / recycler shall be employed by either Applicant or property management company to collect the recycled materials.

In case the host building already provides these recycling facilities at prominent location (i.e. cannot be located at car park and other non-occupied areas), Applicant is not required to provide such facilities. The property management company of the host building shall provide the details of these recycling facilities for assessment purpose.

Documentation

The pre-requisite shall be fulfilled when the Applicant provides the following documentation to demonstrate the compliance:

i. Floor plan to show the location of the recycling facilities;
ii. On-site photos to show the provided recycling facilities;
iii. Description of
    a.) Recycler's company name, contact and address;
    b.) Who signed the contact with the recycler;
    c.) A list of targeted recycle materials;
    d.) Collection frequency; and
iv. Signed recycle material collection contract between the Applicant / building's property management company and waste collector / recycler. When the contract is signed by property management company which cannot be disclosed due to the privacy, a compliance letter signed (the content shall fully cover the abovementioned description) by both Applicant and property management company is required as alternative supplement.

BACKGROUND

Well managed facilities of solid waste encourage recycling and results in reductions in the disposal at landfill sites. Projects shall be designed with the provision of facilities at prominent locations to encourage occupants to conduct waste separation and sorting.

MA P3 TIMBER USED FOR TEMPORARY WORKS

EXCLUSION

None.

OBJECTIVE

Encourage the use of well-managed timber.

REQUIREMENT

Prevent the use of virgin timber resources for temporary, enabling and hoarding works.

ASSESSMENT

Criteria

The Applicant shall provide documentation and photographic evidence demonstrating the timber used for temporary, enabling and hoarding works is originated from sustainable sources or re-used from other sites.

Where other recycled materials are used for temporary, enabling, and hoarding works, this pre-requisite is fulfilled.

Documentation

The pre-requisite shall be fulfilled when the Applicant provides the following documentation to demonstrate the compliance:

i. A summary table to show the manufacturers, countries of origin and quantities for the timber used for temporary, enabling and hoarding works;

ii. Certification of sustainable timber from the forest management, manufacturer and vendor; and

iii. All purchase orders from vendors and delivery notes from manufactures to the project space (both sustainable and normal timber and composite timber products are required).

A list of acceptable forest certification system include the following:

i. Forest Stewardship Council (FSC);

ii. Programme for the Endorsement of Forest Certifications Scheme (PEFC) – General, United Kingdom, Germany and Sweden;

iii. Canadian Standards Association (CSA);

iv. Cerflor (Brazil); and

v. Malaysian Timber Certification Council (MTCC).

BACKGROUND

Timber is the most ecologically benign of construction materials. However, there are hardwoods which are being extracted from virgin forests in an unsustainable manner, destroying valuable forests and ecosystems. Similarly, some softwoods such as redwood and cedar are being depleted. Where forests are being harvested in an unsustainable manner, the result is the extinction of indigenous species and the clearance of vegetation that would otherwise help regulating the amount of CO_2 in the atmosphere. Improved forestry practices can be encouraged by seeking timber from sources where the forests are well-managed.

Hong Kong uses only imported timber and is one of the largest importers of tropical hardwoods. The construction sector in Hong Kong is a major consumer of hardwoods from tropical rainforests, with a large proportion used wastefully, and ending up at landfill sites. Timber should originate only from well-managed sources and should be reused whenever possible.

MA 1 WASTE RECYCLING FACILITIES

EXCLUSION None.

OBJECTIVE Reduce pressure on landfill sites and help to preserve non-renewable resources by promoting the recycling of waste materials.

CREDIT ATTAINABLE 2

CREDIT REQUIREMENT 1 credit for providing storage for anyone of the following items.

2 credits for providing storages for any two of the following items.

i. Recycling of glass;
ii. Recycling of used small electrical appliance; and
iii. Recycling of food waste for retails or restaurants.

ASSESSMENT

Criteria

The Applicant shall provide at least 1 set of storage facility for the recycling of glass / small electrical appliance / food waste. The facilities provided are not necessary within the project space. The location, size of the facility and frequency of collection are not regulated.

The waste collector / recycler shall be employed by either Applicant or property management company to collect the recycled materials.

In case the host building already provides these recycling facilities, Applicant is not required to provide such facilities. The property management company of the host building shall provide the details of these recycling facilities for assessment purpose.

The recycling of small electrical appliances means computers, monitors, rechargeable batteries, printers or lamps.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Floor plan to show the location of the recycling facilities;
ii. On-site photos to show the provided recycling facilities;
iii. Description of
    a.) Recycler's company name, contact and address;
    b.) Who signed the contact with the recycler;
    c.) A list of targeted recycle materials;
    d.) Collection frequency; and
iv. Signed recycle material collection contract between the Applicant / building's property management company and waste collector / recycler. When the contract is signed by property management company which cannot be disclosed due to the privacy, a compliance letter signed (the content shall fully cover the abovementioned description) by both Applicant and property management company is required as alternative supplement.

BACKGROUND

Glass:

Close to 100,000 tonnes of glass containers are disposed of in our landfills every year. Glass is a kind of inert material and will not release harmful material to the environment on disposal. However, as glass can hardly decompose, disposal of glass containers by landfilling will exhaust our dwindling landfill space and is also a waste of valuable natural resource.

The Government has been encouraging the community to participate in source separation of waste to minimise waste disposal and promote resources recovery. To promote local glass recycling, the Environmental Protection Department (EPD) has liaised with the sectors concerned (e.g. hotels, catering and property management sectors, etc.) and non-profit making organisations and provided support to them in implementing various voluntary glass bottle recycling programmes in specific trade and at local districts.

Small Electrical Appliance:

Each year, Hong Kong households and corporates dispose of more than 70,000 tonnes of computers and electrical and electronic equipment. Some of these items are still in good working condition and could be put to second-hand use. All of them contain components and materials that could be recovered for reuse and recycling, such as metals and plastics.

To reduce the quantity of waste computers and waste electrical and electronic equipment disposed of at landfills, the Environmental Protection Department launched a Territory-Wide Trial Recovery Programme in January 2003. The programme has been well received by the public and more than 40,000 waste computers and electrical and electronic units are being recovered and processed each year.

Food Waste:

There is approximately 3,584 tonnes food waste produced in Hong Kong everyday. One third originates from commercial and industry (C&I) sector, and the remaining comes from households, representing 12% and 28% respectively of the municipal solid waste generated in Hong Kong. In recent years, the amount of disposal food waste from C&I sectors has been increasing, from 400 tonnes in 2002 to 1,056 tonnes in 2011

The disposal of food waste, an organic waste which decomposes easily, to landfills is not sustainable as it leads to rapid depletion of the limited landfill space and formation of greenhouse gases such as methane, and wastewater at landfills, imposing severe burden on our environment. The EPD plans to develop the Organic Waste Treatment Facilities (OWTF) in phase. The OWTF will adopt biological technologies – composting and anaerobic digestion to stabilise the organic waste and turn it into compost and biogas for recovery. The first phase of the OWTF will be constructed at Siu Ho Wan with a daily treatment capacity of 200 tonnes of source separated organic waste.

MA 2 INTERIOR COMPONENTS REUSE

EXCLUSION

None.

OBJECTIVE

Extend the life cycle of existing building elements to conserve resources, reduce waste and environmental impacts.

CREDIT ATTAINABLE

3

CREDIT REQUIREMENT

1 credit for reusing at least 30% of prior condition's internal walls, glazing, doors, ceilings and flooring.

2 credits for reusing at least 50% of prior condition's internal walls, glazing, doors, ceilings and flooring.

3 credits for reusing at least 70% of prior condition's internal walls, glazing, doors, ceilings and flooring.

ASSESSMENT

Criteria

The Applicant shall quantify the reused elements based on total surface area.

To determine the total reused elements, divide the total area of reused elements by the total area of elements at prior condition.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A summary table to show the prior condition's elements (items and area), reused elements (items and area) and calculation of reused percentage;

ii. Drawings to quantity the reused portion;

iii. Descriptions of the methodologies and steps adopted to retain and maintain the reused items; and

iv. Post-construction photos to demonstrate the interior elements are retained.

CHECK-LIST AND EQUATION

The following items shall be included for assessment:

a.) Internal walls
b.) Internal glazing
c.) Ceilings
d.) Internal doors
e.) Flooring
f.) Structural wall's coverings

** Only single side area shall be counted.*

Structural elements, fenestration, partition system, furniture, mechanical and electrical installations and any other elements which are not listed above are excluded from the assessment.

Total quantity of reused interior elements can be determined by equation (1).

$$\text{Interior Elements Reuse (\%)} = \frac{\sum \text{Reused Elements } (m^2)}{\sum \text{Elements in Prior Condition } (m^2)} \times 100\%$$

BACKGROUND

Re-using fixed furniture and partitions will reduce the impact on the environment because the demand for virgin material and resources creating new furniture, and waste that maybe landfilled are averted.

MA 3 FURNITURE AND PARTITIONS

EXCLUSION

None.

OBJECTIVE

Extend the life cycle of existing furniture and partitions to conserve resources, reduce waste and environmental impacts.

CREDIT ATTAINABLE

3

CREDIT REQUIREMENT

1 credit for at least 30% of the total furniture and partitions is reused from salvaged furniture and partitions.

2 credits for at least 50% of the total furniture and partitions is reused from salvaged furniture and partitions.

3 credits for at least 70% of the total furniture and partitions is reused from salvaged furniture and partitions.

ASSESSMENT

Criteria

The Applicant shall quantify the value of reused / salvaged furniture and partitions, based on mass.

To determine the total reused percentage, divide the total mass of the reused / salvaged furniture and/or partitions by the total mass of the furniture and partitions used in the project space (both reused and newly installed). Desks and chairs are also included in the assessment and qualified as 100% recyclable when 1) they are purchased from second-hand shop, and/or 2) reused from either prior condition or other existing offices.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A summary table to show the prior condition's elements (items and volume), reused elements (items and volume) and calculation of reused percentage;

ii. Drawings to quantify the reused items;

iii. Post-construction photos to demonstrate the furniture / partitions are retained; and

iv. Desks and chairs only: Purchase orders, deliver notes and on-site photos to demonstrate that purchased from second-hand market and/or reuse.

CHECK-LIST AND EQUATION

The following items shall be included for assessment:

a.) Fixed Furniture
b.) Cabinets
c.) Chairs
d.) Partitions
e.) Desks

Structural elements, fenestration, mechanical and electrical installations and any other elements which are not listed above are excluded from the assessment.

Total quantity of reused furniture and finishes can be determined by equation (1).

$$\textit{Reuse Furniture and Partitions (\%)} = \frac{\sum \textit{Reused Furniture and Partitions (kg)}}{\sum \textit{All Furniture and Partitions used in Project Space (kg)}} \times 100\%$$

BACKGROUND

There is a great potential to lower project costs and significantly reduce the total environmental impacts by re-using some of the fixed furniture and partitions. By doing so, it is anticipated that the environmental impacts associated with the extraction and processing of virgin materials can be reduced. Materials otherwise destined for landfill are used productivity.

MA 4 MODULAR DESIGN MATERIALS

EXCLUSION

None.

OBJECTIVE

Encourage to increase the use of modular design elements in project design in order to enhance buildability and reduce waste.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for designing with modular elements which contribute to at least 50% of the newly installed elements in the project.

ASSESSMENT

Criteria

The Applicant shall quantify the value of modular element, based on total surface area. Only the newly installed elements are included in this assessment. Each single item (see below checklist and equation section) shall be designed with modular element and it shall be assessed individually.

Elements shall be manufactured with standardise dimensions which can be arranged or fitted together in various scenarios of design.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A summary table to show the product types, manufacturers, quantities, percentage of modular component and reference sources;

ii. Drawings with supporting product catalogues / technical sheets to quantify the modular component; and

iii. Post-construction photos to show the modular component has adopted.

CHECK-LIST AND EQUATION

The following items shall be included for assessment:

a.) Partition walls
b.) Ceilings
c.) Doors
d.) Raised floor

Structural elements, fenestration, furniture, mechanical and electrical installations and any other elements which are not listed above are excluded from the assessment.

Total quantity of modular design (%) for each item as shown above can be determined by below equation (1).

$$\textit{Modular Design}^{*}\ (\%) = \frac{\sum \textit{Modular Elements } (m^2)}{\sum \textit{Newly Installed Items } (m^2)} \times 100\%$$

** Only single side area shall be counted.*

BACKGROUND

This refers to use of modular systems of design allowing standard size factory built. Standardisation of details goes hand in hand with optimisation of material quantity. It also generally has benefits for both quality and environmental cost. It simplifies the design and site operations. Building elements produced in standard ranges of sizes can also be interchanged. Materials should be dimensioned carefully to use standard-sized modules to the greatest extent to minimise construction off-cutting waste.

MA 5 DESIGNED FOR DISASSEMBLY

EXCLUSION

None.

OBJECTIVE

Encourage to increase the use of disassemble elements in project design in order to reduce waste.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for installing easy to disassemble elements which contribute to at least 50% of the newly installed elements.

ASSESSMENT

Criteria

The Applicant shall quantify the value of elements which are designed for disassembly and easy waste separation, based on total surface area. Only the newly installed elements are included in this assessment. Each single item (see below checklist and equation section) shall be designed for easy to disassemble and it shall be assessed individually.

The elements shall be designed for disassembly at the end lifetime, which can be readily disassembled by using non-specialist tools and for reuse, recycling or reprocessing.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A summary table to show the product types, manufacturers, quantities, percentage of disassembly design and reference sources;
ii. Description with supporting product catalogues / technical sheets to show the design for disassembly and easy waste separation; and
iii. Post-construction photos to show the design for disassembly has adopted.

CHECK-LIST AND EQUATION

The following items shall be included for assessment:

a.) Partition walls
b.) Ceilings
c.) Doors
d.) Raised floor

Structural elements, fenestration, furniture, mechanical and electrical installations and any other elements which are not listed above are excluded from the assessment.

The percentage of disassemble design for each item as shown above can be determined by below equation (1).

$$\text{Disassemble Design (\%)} = \frac{\sum \text{Disassembly Designed Elements } (m^2)}{\sum \text{Newly Installed Items*} \ (m^2)} \times 100\%$$

** Only single side area shall be counted.*

BACKGROUND

There is a great potential to lower project costs and significantly reduce the total environmental impacts by re-using the ceiling, partition walls, doors and raised floor. By doing so, it is anticipated that the environmental impacts associated with the extraction and processing of virgin materials can be reduced. Besides, design for disassembly can minimise the noise and vibration during demolition / relocation works in future.

MA 6 SUSTAINABLE FLOORING PRODUCTS

EXCLUSION

None.

OBJECTIVE

Promote the use of sustainable materials and reduce the consumption of virgin resources.

CREDIT ATTAINABLE

4

CREDIT REQUIREMENT

a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber

1 credit for demonstrating at least 50% of all newly installed flooring materials are made from either (or a combination) of rapidly renewable materials, recycled materials and sustainable timber.

2 credits for demonstrating the achievement of 100%.

b) Regionally Manufactured Materials

1 credit for the use of flooring materials manufactured locally within 800km radius from the project space, which contribute to at least 50% of the newly installed flooring materials used in the project.

c) Environmentally Manufactured Materials

1 credit for the use of flooring materials from manufacture factory which implemented an EMS and contribute to at least 50% of the newly installed flooring materials used in the project.

ASSESSMENT

Criteria

a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber

The Applicant shall quantify the flooring products with the content of either (or a combination) rapidly renewable materials, recycled materials and sustainable timber based on the total surface area of floor. When the product contains multiple elements, it can be qualified when the accumulate portion of rapidly renewable materials / recycled materials / sustainable timber is greater than 50%.

Use equation 1 to determine the total value.

b) Regionally Manufactured Materials

The Applicant shall quantify the flooring products which are regionally manufactured within 800km radius, based on the total surface area of floor. For salvaged materials, the factory location from where they were salvaged shall be classified as the point of manufacture.

For products which contain multiple elements and originated from different locations, only the portion of elements which are regionally manufactured within 800km can be qualified as regionally manufactured materials.

Use the equation 2 to determine the total value.

c) Environmentally Manufactured Materials

The Applicant shall quantify the flooring products manufactured from factory having implemented an Environmental Management System (EMS) based on the total surface area of floor.

The EMS shall fully cover the following:

a.) Environmental policy
b.) Impact identification
c.) System of EMS review
d.) Environmental audit system
e.) Objective & Target
f.) Environmental training
g.) Assigned responsible staff for environmental aspect

For products which are manufactured in different factories, and assembled in a factory at last, only the factory for assembly at last is required in the assessment.

Use the equation 3 to determine the total value.

For All Sections

Only the new construction works are assessed. Alternatively, 3 credits shall be achieved where the Applicant obviates the material requirement, through design, such that no new construction materials are installed.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber

i. A summary table to show the product items, manufacturers, quantities, percentage of rapidly renewable / recycled / sustainable timber content and reference sources;

ii. Layout to quantify the flooring materials;

iii. Product catalogues or technical sheets with description to substantiate the content; and

iv. On-site photos to demonstrate the presence of the flooring products.

b) Regionally Manufactured Materials

i. A summary table showing the product types, manufacturers, manufacture locations, quantities, percentage of regionally manufactured products and reference sources; and

ii. Delivery notes to show the manufacture location and quantity of all installed materials.

c) Environmentally Manufactured Materials

i. A summary table to show the product types, manufacturers, quantities; and

ii. EMS Manual or certificate of the manufacturer.

CHECK-LIST AND EQUATION

Check-List

The following items shall be included in the assessment :

a.) Flooring
b.) Fixing
c.) Framing
d.) Trimming
e.) Skirting
f.) Levelling

Structural elements, fenestration, furniture, mechanical and electrical installations and any other elements which are not listed above are excluded from the assessment.

Equation 1 – Determining the total quantity of renewable materials / recycled materials / sustainable timber.

$$\text{Qualified Content (\%)*} = \frac{\sum \text{(Rapidly Renewable Materials + Recycled Materials + Sustainable Timber) } (m^2)}{\sum \text{Newly Installed Flooring Materials } (m^2)} \times 100\%$$

Equation 2 – Determining the total quantity of regionally manufactured materials.

$$\text{Total Regionally Manufactured Materials (\%)*} = \frac{\sum \text{Regionally Manufactured Materials } (m^2)}{\sum \text{Newly Installed Flooring Materials } (m^2)} \times 100\%$$

Equation 3 – Determining the total quantity of environmentally manufactured materials.

$$\text{Total Environmentally Manufactured Materials (\%)*} = \frac{\sum \text{Environmentally Manufactured Materials } (m^2)}{\sum \text{Newly Installed Flooring Materials } (m^2)} \times 100\%$$

** Only single side area shall be counted.*

BACKGROUND

Rapidly Renewable Materials

Most building materials necessitate the consumption of large amounts of natural resources. Rapidly renewable materials [1] are represent a materials alternative to mainstream buildings materials that are composed from either finite raw materials or long-cycle renewable materials (i.e., natural resources which are planted and harvested in less than a 10-year cycle are defined as rapidly renewable materials) and do not result in significant biodiversity loss, increased erosion, or air quality impacts. Rapidly renewable materials include, but are not limited to, bamboo, linoleum, cork, fast-growing poplar, pine and products such as wheat straw cabinetry. Materials such a bamboo, wool, natural linoleum, etc. require fewer inputs, have reduced environmental impacts, and can provide economic benefits.

Designers should establish objectives for the use of rapidly renewable materials and identify where such materials can be applied as substitutes for more commonly used resource intensive materials. The use of materials such as bamboo flooring, strawboard, cotton insulation, natural linoleum flooring, etc. should be considered as a minimum. Installation method shall be carefully considered, and detailed in the submission.

1 Preshani Maistry. Rapidly Renewable Materials. http://greenalberta.ca/downloads/Rapidly_Renewable_Materials.pdf

Recycled Materials

Waste materials and industrial by-products can be used in building construction in an unprocessed form. This reduces the extraction of virgin materials. The basic properties required for technical acceptance are that they can perform their intended functions throughout the design life without being deleterious on the environment.

Sustainable Timber

Timber is the most ecologically benign of construction materials. However, there are hardwoods which are being extracted from virgin forests in an unsustainable manner, destroying valuable forests and ecosystems. Similarly, some softwoods, such as redwood and cedar are being depleted. Where forests are being harvested in an unsustainable manner, the result is the extinction of indigenous species and the clearance of vegetation that would otherwise help regulate the amount of CO_2 in the atmosphere. Improved forestry practices can be encouraged by seeking timber from sources where the forests are well managed.

Hong Kong uses only imported timber, and is one of the largest importers of tropical hardwoods. The construction sector in Hong Kong is a major consumer of hardwoods from tropical rainforests, with a large proportion used wastefully, and ending up at landfill sites. Timber should originate only from well-managed sources and should be reused whenever possible. Guidelines, templates and implementation measures to help organisations develop purchasing policies and practices that help conserve forest resources are available [2]. PNAP No. ADV-5 [3] gives guidance for alternatives to the use of hardwoods in order to reduce the amount of tropical hardwood timber used in projects.

Sustainable timer is defined as a wood-based material originally sourced from forestlands participating in an acceptable system or program which certifies sustainable forest management. Acceptable systems or programs must include adherence to management practices which conserve biological diversity and maintain productive capacity of forest ecosystems, and be independently audited and monitored.

Forest Stewardship Council (FSC) [4] and Programme for the Endorsement of Forest Certification (PEFC) [5] are independent, non-profit organisation established to promote the responsible management of the world's forest.

Regionally Manufactured Materials

By using regional materials, environmental impacts and material costs are reduced, and the local economy is supported. Pollution associated with transportation, including air and noise, has become a serious obstruction to the quality of life, and even the health of citizen. Further, energy consumption by transportation, as well as the demand of

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2 World Wildlife Fund. http://assets.wwf.org.uk/downloads/responsible_purchasing.pdf

3 Buildings Department, Practice Note for Authorized Persons and Registered Structural Engineers PNAP No. ADV-5, Tropical Hardwood Timber. http://www.bd.gov.hk/english/documents/pnap/ADV/ADV005.pdf

4 Forest Stewardship Council. http://www.fsc.org/

5 Programme for the Endorsement of Forest Certification. http://www.pefc.org/

petroleum, has dramatically increased. The use of regional materials reduces the transportation activities and the accompanying pollution associated. It can relieve air pollution generated by trucks, trains and other vehicle deplete non-renewable fossil fuels in the long transportation. By purchasing the regional materials, transportation problems are further reduced.

Due to the reduced transportation costs, the regional materials are more cost effective. Also, the support of local manufacturers and labour forces contributes to a healthier local economy.

Environmentally Manufactured Materials

For an organisation to be successful in addressing environmental issues, it must set clear objectives at the highest level with an appropriate programme for their management, checking and review. An environmental policy, endorsed by directorate level management, is a key element of such a programme. ISO 14004 [6] sets out guidelines for establishing an environmental management system (EMS) and specifies the key features of an effective environmental policy as:

i. Being appropriate to the nature, scale and environmental impacts of the organisation's activities, products and services;

ii. A commitment to comply with relevant environmental legislation;

iii. A commitment to continual improvement and pollution prevention;

iv. Providing a framework for setting and reviewing environmental objectives and targets; and

v. Being documented and communicated to all employees, suppliers, and customers.

6 International Organization for Standardization. ISO 14004 Environmental management systems – General guidelines on principles, systems and supporting techniques. http://www.iso.org/iso/iso14000

MA 7 SUSTAINABLE CEILING PRODUCTS

EXCLUSION

None.

OBJECTIVE

Promote the use of sustainable materials and reduce the consumption of virgin resources.

CREDIT ATTAINABLE

4

CREDIT REQUIREMENT

a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber

1 credit for demonstrating at least 50% of all newly installed ceiling materials are made from either (or a combination) of rapidly renewable materials, recycled materials and sustainable timber.

2 credits for demonstrating the achievement of 100%.

b) Regionally Manufactured Materials

1 credit for the use of ceiling materials manufactured locally within 800km radius from the project space, which contribute to at least 50% of the newly installed ceiling materials used in the project.

c) Environmentally Manufactured Materials

1 credit for the use of ceiling materials from manufacture factory which implemented an EMS and contribute to at least 50% of the newly installed ceiling materials used in the project.

ASSESSMENT

Criteria

a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber

The Applicant shall quantify the ceiling products with the content of either (or a combination) rapidly renewable materials, recycled materials and sustainable timber based on the total surface area of ceilings. When the product contains multiple elements, it can be qualified when the accumulate portion of rapidly renewable materials / recycled materials / sustainable timber is greater than 50%.

Use the equation 1 to determine the total value.

b) Regionally Manufactured Materials

The Applicant shall quantify the ceiling products which are regionally manufactured within 800km radius, based on the total surface area of ceilings. For salvaged materials, the factory location from where they were salvaged shall be classified as the point of manufacture.

For products which contain multiple elements and originated from different locations, only the portion of elements which are regionally manufactured within 800km can be qualified as regionally manufactured materials.

Use the equation 2 to determine the total value.

c) Environmentally Manufactured Materials

The Applicant shall quantify the ceiling products manufactured from factory having implemented an Environmental Management System (EMS) based on the total surface area of ceilings.

The EMS shall fully cover the following:

a.) Environmental policy
b.) Impact identification
c.) System of EMS review
d.) Environmental audit system
e.) Objective & Target
f.) Environmental training
g.) Assigned responsible staff for environmental aspect

For products which are manufactured in different factories, and assembled in a factory at last, only the factory for assembly at last is required in the assessment.

Use the equation 3 to determine the total value.

For All Sections

Only the new construction works are assessed. Alternatively, 3 credits shall be achieved where the Applicant obviates the material requirement, through design, such that no new construction materials are installed.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber

i. A summary table to show the product items, manufacturers, quantities, percentage of rapidly renewable / recycled / sustainable timber content and reference sources;

ii. Layout to quantify the ceiling materials;

iii. Product catalogues or technical sheets with description to substantiate the content; and

iv. Submit on-site photos to demonstrate the presence of the ceiling products.

b) Regionally Manufactured Materials

i. A summary table showing the product types, manufacturers, manufacture locations, quantities, percentage of locally manufactured products and reference sources; and

ii. Delivery notes to show the manufacture location and quantity of all installed materials.

c) Environmentally Manufactured Materials

i. A summary table to show the product types, manufacturers, quantities; and

ii. EMS Manual or certificate of the manufacturer.

CHECK-LIST AND EQUATION

Check-List

The following items shall be included in the assessment :

a.) Ceiling Tiles
b.) Hangers
c.) Trimming
d.) Levelling
e.) Framing
f.) Ceiling Support
g.) Secondary Grid
h.) Bulkhead
i.) Shadow Gap Infill

Structural elements, fenestration, furniture, mechanical and electrical installations and any other elements which are not listed above are excluded from the assessment.

Equation 1 – Determining the total quantity of renewable materials / recycled materials / sustainable timber.

$$\textit{Qualified Content (\%)*} = \frac{\sum \textit{(Rapidly Renewable Materials + Recycled Materials + Sustainable Timber)} \ (m^2)}{\sum \textit{Newly Installed Ceiling Materials} \ (m^2)} \times 100\%$$

Equation 2 – Determining the total quantity of regionally manufactured materials.

$$\textit{Total Regionally Manufactured Materials (\%)*} = \frac{\sum \textit{Regionally Manufactured Materials} \ (m^2)}{\sum \textit{Newly Installed Ceiling Materials} \ (m^2)} \times 100\%$$

Equation 3 – Determining the total quantity of environmentally manufactured materials.

$$\textit{Total Environmentally Manufactured Materials (\%)*} = \frac{\sum \textit{Environmentally Manufactured Materials} \ (m^2)}{\sum \textit{Newly Installed Ceiling Materials} \ (m^2)} \times 100\%$$

** Only single side area shall be counted.*

BACKGROUND

See MA 6.

MA 8 SUSTAINABLE INTERNAL WALL AND DOOR PRODUCTS

EXCLUSION

None.

OBJECTIVE

Promote the use of sustainable materials and reduce the consumption of virgin resources.

CREDIT ATTAINABLE

4

CREDIT REQUIREMENT

a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber

1 credit for demonstrating at least 50% of all newly installed internal wall and door materials are made from either (or a combination) of rapidly renewable materials, recycled materials and sustainable timber.

2 credits for demonstrating the achievement of 100%.

b) Regionally Manufactured Materials

1 credit for the use of internal wall and door materials manufactured locally within 800km radius from the project space, which contribute to at least 50% of the newly installed internal wall and door materials used in the project.

c) Environmentally Manufactured Materials

1 credit for the use of internal wall and door materials from manufacture factory which implemented an EMS and contribute to at least 50% of the newly installed internal wall and door materials used in the project.

ASSESSMENT

Criteria

a) Rapidly Renewable Materials / Recycled Materials / Sustainable Timber

The Applicant shall quantify the internal walls and doors with the content of either (or a combination) rapidly renewable materials, recycled materials and sustainable timber based on the total surface area of walls and doors. When the product contains multiple elements, it can be qualified when the accumulate portion of rapidly renewable materials, recycled materials and/or sustainable timber is greater than 50%.

Use the equation 1 to determine the total value.

b) Regionally Manufactured Materials

The Applicant shall quantify the internal walls and doors which are regionally manufactured within 800km radius, based on the total surface area of walls and doors. For salvaged materials, the factory location from where they were salvaged shall be classified as the point of manufacture.

For products which contain multiple elements and originated from different locations, only the portion of elements which are regionally manufactured within 800km can be qualified as regionally manufactured materials.

Use the equation 2 to determine the total value.

c) Environmentally Manufactured Materials

The Applicant shall quantify the internal walls and doors, where the manufacture factory and process has implemented an Environmental Management System (EMS) based on the total surface area of walls and doors.

The EMS shall fully cover the following:

a.) Environmental policy
b.) Impact identification
c.) System of EMS review
d.) Environmental audit system
e.) Objective & Target
f.) Environmental training
g.) Assigned responsible staff for environmental aspect

For products which are manufactured in different factories, and assembled in a factory at last, only the factory for assembly at last is required in the assessment.

Use the equation 3 to determine the total value.

For All Sections

Only the new construction works are assessed. Alternatively, 3 credits shall be achieved where the Applicant obviates the material requirement, through design, such that no new construction materials are installed.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

a) Rapidly Renewable Materials/ Recycled Materials / Sustainable Timber

i. A summary table to show the product items, manufacturers, quantities, percentage of rapidly renewable / recycled / sustainable timber content and reference sources;

ii. Layout to quantify the internal wall and door;

iii. Product catalogues or technical sheets with description to substantiate the content; and

iv. Submit on-site photos to demonstrate the presence of the internal wall and door.

b) Regionally Manufactured Materials

i. A summary table showing the product types, manufacturers, manufacture locations, quantities, percentage of locally manufactured products and reference sources; and

ii. Delivery notes to show the manufacture location and quantity of all installed internal wall and door.

c) Environmentally Manufactured Materials

i. A summary table to show the product types, manufacturers, quantities; and

ii. EMS Manual or certificate of the manufacturer.

CHECK-LIST AND EQUATION

Check-List

The following items shall be included in the assessment :

a.) Internal Wall and It's Covering
b.) External / Structural Wall's Covering Only
c.) Hangers
d.) Trimming
e.) Levelling
f.) Framing

** Only single side area shall be counted.*

Structural elements, fenestration, furniture, mechanical and electrical installations and any other elements which are not listed above are excluded from the assessment.

Equation 1 – Determining the total quantity of renewable materials / recycled materials / sustainable timber.

$$\textit{Qualified Content (\%)} = \frac{\sum \textit{(Rapidly Renewable Materials + Recycled Materials + Sustainable Timber) } (m^2)}{\sum \textit{ Newly Installed Internal Wall and Door Materials } (m^2)} \times 100\%$$

Equation 2 – Determining the total quantity of regionally manufactured materials.

$$\textit{Total Regionally Manufactured Materials (\%)} = \frac{\sum \textit{ Regionally Manufactured Materials } (m^2)}{\sum \textit{ Newly Installed Internal Wall and Door Materials } (m^2)} \times 100\%$$

Equation 3 – Determining the total quantity of environmentally manufactured materials.

$$\textit{Total Environmentally Manufactured Materials (\%)} = \frac{\sum \textit{ Environmentally Manufactured Materials } (m^2)}{\sum \textit{ Newly Installed Internal Wall and Door Materials } (m^2)} \times 100\%$$

BACKGROUND See MA 6.

MA 9 ZERO PVC

EXCLUSION None.

OBJECTIVE Avoid the use of Poly Vinyl Chloride (PVC) products.

CREDIT ATTAINABLE 1

CREDIT REQUIREMENT 1 credit for using alternative products and materials with zero PVC content for the project.

ASSESSMENT

Criteria

The Applicant shall use alternative products and materials with zero PVC.

Note: PVC materials within the project space that are provided by the host building and are not installed by the Applicant shall be excluded from the calculation.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A summary table showing the product types, quantities, determination of PVC content and reference sources;

ii. A list of alternative materials used to replace the PVC items; and

iii. Product catalogues (to show the materials) or technical sheets to confirm that the installed products are non-PVC type material.

CHECK-LIST The following items shall be included for assessment:

a.) Edge Protection Strip
b.) Cable Conduit
c.) Electrical Cables
d.) Furniture
e.) Phone Cables
f.) Pipework
g.) Data Cables

Items which are not listed in the above checklist are excluded from the assessment.

BACKGROUND PVC is a persistent bioaccumulative toxic chemical (PBT). This is toxic, persist in the environment and accumulate in food chains and therefore pose risks to human health and ecosystems. Remediation is difficult and often very expensive, preventing it's entering the environment in the first place is the obvious and preferred strategy. To avoid the release of PBT chemicals into the environment, the specification, installation of PBT's in building materials and choose materials that are manufactured without added PVC is required.

Greenpeace [1] has provided the evaluation for PVC. The PVC products may usually be found in building furnishings including electrical cable, furniture elements, floor covering, blinds, finishes etc. However the production of PVC may release a toxic chemical, dioxin, to air, water and land. Meanwhile, additional chemicals such as

1 Greenpeace, PVC Free Solution. http://www.greenpeace.org/international/en/campaigns/toxics/polyvinyl-chloride/pvc-free-solutions/?accept=8c09563de2f21958e588a899afb444b0

phthalates are added to make it more soft and flexible. When PVC reaches its end of useful life and is disposed at landfill, it again leaks dioxin and heavy metal. The Australia Green Star rating tools [2] has provided the reference of alternative materials for reducing the use of PVC.

2 Green Building Council of Australia, Green Star rating tools for Office Interior v1, Technical Manual, section Mat-10 PVC Minimisation.

MA 10 OZONE DEPLETING SUBSTANCES

EXCLUSION

None.

OBJECTIVE

Reduce the release of chlorofluorocarbons and hydrochlorofluorocarbons into the atmosphere.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for the use of products in the project space that avoids using ozone depleting substances (CFC & HCFC) in their manufacture process or composition.

ASSESSMENT

Criteria

The Applicant shall not use products that use ozone depleting substances in the manufacture process or composition of thermal insulation and fire retardant materials specified in partition walls, chilled water pipes, refrigerant pipes and ductwork.

Note: Ozone depleting substances within the project space that are provided by the host building and are not installed or replaced by the Applicant shall be excluded from the assessment.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A summary table to show the installed materials and products, manufacturers, reference sources (e.g. catalogue or manufacturer compliance letter; vendor's letter is not accepted); and

ii. Product catalogue and/or compliance letter signed by the manufacturer to show the avoidance of using ozone depleting substances in all newly installed materials and products.

BACKGROUND

The US Environmental Protection Agency provides information on suitable substitutes for ozone depleting substances [1], including fire suppression [2], blowing agents [3], solvents, etc. CIBSE GN01 [4] provides design guidance for refrigeration systems, thermal insulation and fire protection systems.

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1 US Environmental Protection Agency. http://www.epa.gov/docs/ozone/snap/lists/index.html
2 US Environmental Protection Agency. http://www.epa.gov/ozone/snap/fire/index.html
3 US Environmental Protection Agency. http://www.epa.gov/docs/ozone/snap/foams/lists/index.html
4 Chartered Institution of Building Services Engineers. CFC's, HCFC's, HFC's and halons. 2000. ISBN 0900953993.

MA 11 DEMOLITION AND CONSTRUCTION WASTE REDUCTION

EXCLUSION

None.

OBJECTIVE

Encourage best practice in the management of waste, including sorting, recycling and disposal of demolition and construction waste.

CREDIT ATTAINABLE

2

CREDIT REQUIREMENT

1 credit for demonstrating that at least 30% of demolition and construction waste is recycled.

2 credits for demonstrating that at least 60% of demolition and construction waste is recycled.

ASSESSMENT

Criteria

The Applicant shall quantify the overall demolition and construction waste and list the disposal / recycle method, based on mass. The disposal of inert material to public fill will not be considered as an acceptable strategy for fulfilling this requirement.

Note: Waste from demolition is excluded from the calculation when the demolition work is not required or not under the Applicant's control.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A waste flow table summary to show the type of wastes, disposal methods, quantities and reference sources;

ii. All trip tickets, waste records and recycler receipts to substantiate the waste reduction calculation;

iii. Waste monitoring records to show the execution of waste recycling and sorting in monthly bases; and

iv. On-site photos to show the waste sorting and storage by contractors, and collection by recyclers.

CHECK-LIST AND EQUATION

The following items shall be included in the assessment:

a.) Demolished materials (if any)
b.) Plastics
c.) Paper and cardboard packaging
d.) Metals
e.) Timber
f.) General refuse

Items which are not listed in the above checklist are excluded from the assessment.

Total quantity of recycled waste can be determined by equation (1).

$$\textit{Total C\&D Waste Recycle (\%)} = \frac{\sum \textit{Quantity of Recycled C\&D Waste (kg)}}{\sum \textit{Quantity of C\&D Waste (kg)}} \times 100\%$$

BACKGROUND

Buildings Department [1] and ETWB TWC 19/2005 [2] provide guidance on waste management during construction.

1 Buildings Department. Practice Note for Authorized Persons and Registered Structural Engineers PNAP ADV-19. Construction and Demolition Waste. http://www.bd.gov.hk/english/documents/pnap/ADV/ADV019.pdf

2 Environment, Transport and Works Bureau. Technical Circular (Works) No. 19/2005. Environmental Management on Construction Sites. http://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/19/1/C-2005-19-0-1.pdf

5 ENERGY USE

EU 1 ENERGY PERFORMANCE – PERFORMANCE-BASED APPROACH

EXCLUSION

None.

OBJECTIVE

Reduce the consumption of energy resources and the consequent harmful emissions of carbon dioxide (CO_2) to the atmosphere.

CREDIT ATTAINABLE

14

CREDIT REQUIREMENT

Credit(s) shall be achieved based on the reduction of annual HVAC&R and lighting energy consumption by:

Credit(s)	1	2	3	4	5	6
HVAC&R	3%	5%	10%	15%	20%	25%

Plus

Credit(s)	1	2	3	4	5	6	7	8
Lighting	10%	15%	20%	25%	30%	35%	40%	45%

Applicants may choose either, the Performance-based or the Prescriptive-based approach to avoid double counting environmental impacts.

ASSESSMENT

Criteria

The number of credits to be achieved shall be determined by reference to the percentage reduction in the annual energy use of the project space relative to the respective benchmark (zero-credit) criteria evaluated from the Baseline model.

The methodology of the energy simulation shall make reference to the latest Building Energy Code (BEC) or Appendix G of ANSI/ASHRAE/IES 90.1-2010 or equivalent. (Note: For interim measure before Hong Kong equivalent of Appendix G of ANSI/ASHRAE/IES 90.1-2010 is available, lighting power density (LPD) in ANSI/ASHRAE/IES calculation shall use those parameters in Code of Practice for Energy Efficiency of Building Services Installation – 2012 Edition). Appendix 9.1 includes the default values or assumptions for design parameters for Performance-based approach when conducting energy simulation.

The submission for compliance and the computer software to be used shall make reference to the latest Building Energy Code (BEC) or ANSI/ASHRAE/IES Standard 90.1-2010.

When the selected simulation program cannot adequately model a design (Note: For example: passive design with significant contribution on the reduction of CO_2 emissions), material, or device, the rating authority may approve an exceptional calculation method to demonstrate above-standard performance. The exceptional calculation shall make reference to Section A3.4 of Code of Practice for Energy Efficiency of Building Services Installation - 2012 Edition [1] and/or Appendix G2.5 of ANSI/ASHRAE/IES 90.1–2010[2] and/or Appendix D of the Advanced Energy Modelling for LEED – Technical Manual v1.0 (September 2011 Edition)[3].

1 EMSD - Code of Practice for Energy Efficiency of Building Services Installation - Section A3.4 2012
2 ANSI/ASHRAE/IES Standard 90.1-2010 – Energy Standard for Buildings Expect Low Rise Residential Buildings
3 USGBC - Advanced Energy Modeling for LEED – Technical Manual v1.0 (August 2010 Edition).

Estimated annual energy consumption:

HVAC&R system:

Where a significant portion (>80%) of a project space in a new or an existing commercial building (an office, retails shop, restaurant etc.), is served by an independent central plant equipment (e.g. chiller plant controlled by the landlord and not by the Applicant), the simulation model will need to cover only the air-side air-conditioning system serving the project space, and the building envelop characteristics will be as described in Appendix 9.1.

If the project space is served by a unitary air-conditioning system (e.g. VRF system or split type air conditioning unit controlled by the Applicant), the simulation model will need to cover the entire air-conditioning installation, and the building envelop characteristics will be as described in Appendix 9.1.

Lighting system:

The lighting power densities and lighting controls will be ascertained from the lighting installation designs.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Energy simulation report clearly indicates the savings associated with HVAC&R and lighting systems;
ii. All input and output files used for the energy simulation;
iii. Specification describing HVAC&R and lighting systems;
iv. As-built drawings for all systems installed;
v. Manufacturer specification or catalogue showing the technical data used in the energy simulation;
vi. Other calculations or supporting that are used as substantiation to the energy simulation; and
vii. All submissions shall be signed by HKSAR Registered Energy Assessor.

EU 1 ENERGY PERFORMANCE – PRESCRIPTIVE-BASED APPROACH

EXCLUSION

None.

OBJECTIVE

Reduce the consumption of energy resources and the consequent harmful emissions of carbon dioxide (CO_2) to the atmosphere.

CREDIT ATTAINABLE

14

CREDIT REQUIREMENT

Up to a maximum of 14 credits for using energy efficient systems and controls that will reduce the energy consumption of the project space. Building systems include HVAC&R and lighting.

Applicants may choose either, the Performance-based or the Prescriptive-based approach to avoid double counting environmental impacts.

ASSESSMENT

Criteria

Completed documentation shall be submitted for each feature installed for the project space. The documentation shall detail the essential information of the installed system.

Credit(s) may not be achieved if the installed feature is not going to operate as intent. For example, occupancy sensor is unlikely to turn off lighting in shopping area of a 24/7 convenience store.

Credit(s) shall be achieved where one or more of the following features are installed, providing the energy efficient features meet all of the following conditions:

i. Installed by the Applicant;

ii. Serve the project space; and

iii. Meet the minimum system requirements outlined in Section 9.1 for respective features.

HVAC&R System:

1 credit for provision of appropriate zoning and thermostat distribution.

1 credit for provision of occupancy sensors and/or programmable timers controlling HVAC operation.

1 credit for provision of automatic blinds controlled by daylight sensor reducing air conditioning demand.

1 credit for provision of ceiling or wall mounted fans increasing air circulation hence reducing air conditioning demand.

1 credit for provision of variable speed drive fan coil units or high efficiency motors.

1 credit for provision of high efficiency air conditioning units.

1 credit for provision of heat recovery system.

1 credit for provision of CO_2 sensors controlling fresh air rate.

1 credit for complying with the installation positions for air-conditioning units.

1 credit for provision of openable windows to enhance natural ventilation.

Lighting System:

1 to 6 credits for a reduction of Lighting Power Density (LPD) by: 10%, 15%, 20%, 25%, 30% and 35% respectively.

1 credit for provision of appropriate zoning and manual control distribution.

1 credit for provision of daylight dimming controls.

1 credit for provision of occupancy sensor controls.

1 credit for provision of task light for every workstation.

1 credit for provision of main switch at the entrance of the premises so that the last staff can switch off all the lighting systems when leaving the premises.

1 credit for compliance with voluntary code to switch of signboards and non-essential lighting after operating hours, or no later than 11pm (for retails or restaurants).

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Specification describing the installation requirements for the features;

ii. As-built drawings showing the features installed;

iii. Manufacturer specification or catalogue;

iv. Testing and commissioning records demonstrating the relevant criteria above are met; and

v. Completely filled EMSD Technical Form for Lighting Installation showing the percentage of reduction in lowering the Lighting Power Density (if adopted).

OTHER ENERGY EFFICIENT FEATURES

For energy efficient features not listed above, the Applicant can submit the proposed features for BAS and BSL TRC consideration. The Applicant shall also submit calculation showing the estimated energy saving achieved by the adoption of each or all the proposed features. Number of credit(s) to be achieved is subject to BSL TRC's final approval based on the estimated energy reduction and/or the innovation of the proposed features.

Note: Energy saving measures that rely on occupant'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 as valid energy saving features in this section.

EU 2 ENERGY EFFICIENT APPLIANCES

EXCLUSION

None.

OBJECTIVE

Encourage the wider use of energy efficient equipment and appliances.

CREDIT ATTAINABLE

3

CREDIT REQUIREMENT

1 credit when 70% of total quantities of each type of electrical appliances are certified energy efficient products.

2 credits when 90% of total quantities of each type of electrical appliances are certified energy efficient products.

3 credits when 100% of total quantities of each type of electrical appliances are certified energy efficient products.

ASSESSMENT

Criteria

Only eligible equipment and appliances meeting the following criteria shall be included in this assessment:

i. installed by the Applicant at the time of occupancy and serving the project space; and

ii. the type of equipment and appliance governed by the EMSD's Energy Efficiency Labelling Scheme for both mandatory and voluntary schemes [1,2] and the US EPA's ENERGY STAR Program [3].

iii. HVAC, lighting (including ballast), fixed task lighting, hot water system and building envelope products are excluded in this section to prevent double counting, as energy performance of these building services systems are assessed in BEAM Plus EU 1 section.

Certified energy efficient products are qualified by the EMSD Energy Efficiency Labelling Scheme with Grade 1 labels, EMSD's Voluntary Energy Efficiency Labelling Scheme with Recognition type label, or US's EPA ENERGY STAR Program with ENERGY STAR label in this assessment.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A summary table showing at the minimum, appliance type, model number, reference catalogue or manufacturer specification, efficiency ratings, efficiency labelling types, quantity of the installed appliances and equipment; and

ii. Catalogues or manufacturer specification showing appliance type, model number, efficiency ratings and efficiency labelling types as substantiation to the summary table, where important information shall be highlighted or circled for easy

1 Electrical and Mechanical Services Department. Voluntary Energy Efficiency Labelling Scheme. http://www.emsd.gov.hk/emsd/eng/pee/eels_pub.shtml

2 Electrical and Mechanical Services Department. Mandatory Energy Efficiency Labelling Scheme. http://www.emsd.gov.hk/emsd/eng/pee/eels_mpub.shtml

3 US Environmental Protection Agency. Energy Star Qualified Products. http://www.energystar.gov/index.cfm?fuseaction=find_a_product.

identification.

BACKGROUND

To make it easier for the public to choose energy efficient products, EMSD operates Mandatory and Voluntary Energy Efficiency Labelling Schemes for appliances and equipment used both in the home and office. The scheme aims to save energy by informing potential customers of the product's level of energy consumption and efficiency rating, so that buyers can take these factors into consideration when making their purchasing decision.

EU 3 COMMISSIONING

EXCLUSION None.

OBJECTIVE Commissioning the HVAC&R and lighting systems to ensure the impact on energy use of the systems is adequate, the systems performance is as specified and the systems operation is as intended.

CREDIT ATTAINABLE 4

CREDIT REQUIREMENT a) Commissioning plans

2 credits for provision of:

i. Commissioning plan detailing all specified commissioning work for HVAC&R, lighting and other Building Services systems that impact on energy use and indoor environmental quality; and

ii. The commissioning plan shall be endorsed by an independent Commissioning Authority (CxA).

b) Commissioning reports

2 credits for provision of:

i. Commissioning reports for HVAC&R, lighting and other Building Services systems that impact on energy use and indoor environmental quality; and

ii. The commissioning reports shall be endorsed by an independent CxA.

ASSESSMENT Where no alterations to building services* in the host building are undertaken and no supplementary building services are installed, 4 credits in EU 3a) and 3b) are deemed to be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A statement from the space owner / project manager that confirms that no alternations to the building services provided by the host building were undertaken and no supplementary building services were installed.

For project where alterations to host building services* are undertaken or supplementary building services are installed, the following criteria apply.

a) Commissioning plan

Criteria

The commissioning plan shall fulfil the requirements detailed in Section 9.2.1 as a minimum and it shall be endorsed by the CxA.

The CxA shall meet all of the following requirements based on the project area:

i. For project area less than 1,000m^2, the CxA shall be an independent person who is not involved in the design and general installation works and with commissioning experience in at least 2 buildings or fit out projects.

ii. For project area larger than 1,000m^2, the CxA shall be an independent person who is not involved in the design and general installation works and meet the following

requirements:

a.) Registered Professional Engineer (R.P.E.) registered with the Engineers Registration Board (ERB) in Building Services, Electrical, Mechanical or Environmental discipline; and/or Member of the Hong Kong Institution of Engineers (MHKIE) in Building Services, Electrical, Mechanical or Environmental discipline;

b.) Relevant commissioning experience in at least 2 buildings or fit out projects; and

c.) Must not be an employee of, or contracted through, a contractor or construction manager dealing with construction contracts.

The commissioning plans shall cover the following energy and IEQ related systems:

i. Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems and associated controls;

ii. Lighting systems and associated controls;

iii. Energy monitoring systems (if any);

iv. Renewable energy systems (if any); and

v. Domestic hot water systems (if any).

Only systems installed by the Applicant and serving the project space are assessed.

In brief, the criteria can be summarised in the matrix as shown:

Alter the base BS* or install supplementary BS?	**Area (m^2)**	**Requirements in brief**
No	All size	Credits are deemed to be achieved.
Yes	All size	Independent CxA

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Copy of the commissioning plan endorsed and signed-off by the CxA;

ii. Resume of the CxA (for project area less than 1,000m^2) detailing:

a.) Academic and industrial qualification; and

b.) The relevant commissioning experience in at least 2 buildings or fit out projects; and

iii. Resume of the CxA (for project area larger than 1,000m^2) detailing:

a.) The qualification of R.P.E. with R.P.E. Number and/or MHKIE in Building Services, Electrical, Mechanical or Environmental discipline with Membership Number; and

b.) The relevant commissioning experience in at least 2 buildings or fit out projects.

iv. A declaration letter signed-off by the space owner / project

manager stating that:

a.) The CxA is responsible for reporting of all conditions and findings directly to the space owner; review and development of a commissioning plan; and determining and documenting whether systems, equipment and components are functioning in accordance with the design intent and in accordance with the construction documents.

b) Commissioning reports

Criteria

The functional testing of systems and equipment shall be performed as documented by the CxA. The commissioning report shall cover as a minimum the items given in Appendix 9.2.2, after all commissioning tasks, except seasonally deferred testing, have been completed.

Commissioning reports shall be verified and signed-off by the CxA. The CxA requirements shall follow the criteria stated in part a).

The commissioning reports shall cover the following energy and IEQ related systems:

i. Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems and associated controls;

ii. Lighting systems and associated controls;

iii. Energy monitoring systems (if any);

vi. Renewable energy systems (if any); and

vii. Domestics hot water systems (if any).

Only systems installed by the Applicant and serving the project space are assessed.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Copy of the commissioning reports endorsed and signed-off by the CxA.

Remarks:

* Minor relocation of air conditioning and lighting systems provided by the host building are considered as “no alternation to host building services” in this assessment.

BACKGROUND

Commissioning is a quality assurance process for buildings from predesign through design, construction, and operations. 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 should be fully functional systems that can be properly operated and maintained throughout the life of the building.

CIBSE [1,2,3], BSRIA [4] and ASHRAE [5] publications provide

1 The Chartered Institution of Building Services Engineers. Air distribution systems. CIBSE. Commissioning Code A. http://www.cibse.org/index.cfm

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. Architectural Services Department publishes commissioning procedures for Government buildings [6].

Effective 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 T&C requirements should cover all HVAC&R and lighting systems including the renewable systems (if any), energy monitoring system (if any) and all hot water systems (if any).

The CxA need to prepare a Commissioning Plan with details on how the review and testing should be carried out. His/her work should compliment and not cross over the responsibility of the building services/BMS designers who also have commissioning responsibility.

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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.
http://www.bsria.co.uk/
5 ASHRAE. New Building Commissioning.
http://www.ashrae.org/
6 Architectural Services Department, Building Services Branch. Testing and Commissioning Procedure No.1 for Air-conditioning, Refrigeration, Ventilation and Control System in Government Buildings.
http://www.archsd.gov.hk/en/publications.aspx

EU 4 OPERATIONS & MAINTENANCE

EXCLUSION None.

OBJECTIVE Enable building operators to operate the HVAC&R and lighting systems in an energy efficient manner according to the design intent, be able to monitor the performance of the building, and maintain the performance.

CREDIT ATTAINABLE 1

CREDIT REQUIREMENT 1 credit for provision of digital or online operations and maintenance (O&M) manual and energy management manual or an energy management section in O&M manual which encourage effective communication.

ASSESSMENT Where the host building operator provides maintenance service for the Building Services under the existing installation, the Applicant shall submit the scope of work, the programme/schedule, and maintenance method statement to achieve this credit.

For project where alterations to host building services are undertaken or supplementary building services are installed, the following criteria applies.

Criteria

The digital operations and maintenance manual(s) and the energy management manual(s) shall include the details given in Appendices 9.2.3 and 9.2.4 respectively as a minimum and cover the following systems at a minimum:

i. Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems and associated controls;
ii. Lighting systems and associated controls;
iii. Energy monitoring systems (if any);
iv. Renewable energy systems (if any); and
v. Domestic hot water systems (if any).

Only systems installed by the Applicant and serving the project space are assessed.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Copies of digital O&M manual and energy management manual for all systems and equipment. It can be in PDF format with table of content linked to respective section for easy navigation.

BACKGROUND

Facilities to carry out basic maintenance and equipment for monitoring consumption can help improve operating efficiency and environmental performance of a building. ASHRAE [1] and BSRIA [2] provide advice on the preparations for operation and maintenance to ensure the safe and efficient operation of each system and major item of plant, including a description of the operating modes, a recommended strategy for operation and control, control data and set points, interlocks between plant items, etc.

1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Preparation of Operating and Maintenance Documentation for Building Systems. ASHRAE Guideline 4. Atlanta.

2 J H Armstrong. Building Services Research and Information Association. Operating and Maintenance Manuals for Building Services Installations. Application Guide 1/87. Dec. 1990.

EU 5 METERING AND MONITORING

EXCLUSION

None.

OBJECTIVE

Enable measurement for real time monitoring, and historical record keeping to improve the performance of the project space's engineering systems, particularly concerning energy use.

CREDIT ATTAINABLE

4

CREDIT REQUIREMENT

a) Electrical meters

3 credits for monitoring system and appliance electricity consumption, the Applicant shall install electricity metering and sub-metering to record electricity consumption of the following equipment serving the project space irrespective of ownership (at the minimum)

i. HVAC&R systems (including supplementary air conditioning, if any);
ii. Lighting systems;
iii. Small power (plug loads);
iv. Lifts and escalators (if any);
v. Hot water systems (if any);
vi. Spa whirlpools (if any);
vii. Loads associated with server room (if any); and
viii. High electrical power equipment (>25kVA, if any).

b) Thermal energy meters for chilled water

1 credit for installation of thermal energy meters for monitoring the chilled water consumption.

ASSESSMENT

a) Electrical meters

Criteria

The assessment focuses on the largest categories of energy consumption, which for interiors would be HVAC&R systems (including supplementary air conditioning, if any); lighting systems; small power (plug loads); hot water systems (if any); loads associated with server room (if any); and high electrical power equipment (>25kVA, if any) installed by the Applicant and serving the project space.

Metering shall provide hourly, daily and weekly records to supplement monthly billing data and shall be either:

i. 'Smart' meters or meter with data-recording ability; or
ii. A building automation/energy management system.

Electricity metering (for input power, energy and maximum demand), together with associated measuring transducers/transformers for indicating power and energy, shall comply with an appropriate standard such as BS EN [1] and to at least accuracy class 1.

1 British Standard BS EN 62053-11:2003.Electricity metering equipment (a.c.). Particular requirements. Electromechanical meters for active energy (classes 0,5, 1 and 2)

Documentation

Credits shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. As-built electrical schematic of the measuring and monitoring equipment installed, to demonstrate that all systems and equipment as stated in the credit requirement section can be monitored separately;

ii. Manufacturer technical specification, to demonstrate that the accuracy of metering and/or monitoring equipment comply with the prescribed standards stated above;

iii. Testing and commissioning records of start-up consumption for all systems and equipment as stated in the credit requirement section, to demonstrate that electricity use can be measured as stipulated; and

iv. Photographs showing the installed metering systems.

b) Thermal energy meters for chilled water sub-metering

Criteria

Thermal energy meters for chilled water sub-metering shall provide hourly, daily, weekly and monthly records of chilled water energy consumption for the project area.

The metering and associated measuring transducers/transformers for indicating flow rate, supply and return temperature of chilled water and energy, shall comply with an appropriate standard such as EN [2] and to at least accuracy class 2.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. As-built schematic of the measuring and monitoring equipment installed, to demonstrate that chilled water energy consumption for the project area can be monitored as a whole;

ii. Manufacturer technical specification, to demonstrate that the accuracy of metering and/or monitoring equipment comply with the prescribed standards stated above;

iii. Testing and commissioning records of start-up consumption to demonstrate that energy use can be measured as stipulated; and

iv. Photographs showing the installed metering systems.

BACKGROUND

Surveys of a large number of premises in Hong Kong [3] revealed that buildings are in general insufficiently equipped with measuring devices for measurement of energy performance. Furthermore, other than basic metering for billing purposes, interiors projects rarely provide sub-metering so occupiers generally remain ignorant of where energy is consumed. Whilst sub-metering in itself does not save energy,

2 British Standard BS EN 1434-5:2007. Heat meters. Initial verification tests

3 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.

meters that are installed correctly encourage and provide the information for the monitoring and targeting process.

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, but which can be identified from analysis of performance trend data. Control problems can be detected and control strategies improved to match the building demand.

Opportunities for reducing energy consumption can be identified only if it is possible to monitor performance of the installed systems and equipment. Equipment use and control can be altered and the results monitored to show how energy consumption changes.

The cost of instrumentation is not significant when compared to overall construction costs and the accuracy should be such as to provide meaningful readings. The payback from improved energy performance can be high taking into account the reduction in electricity consumption and demand charges resulting from more efficient equipment operation.

For most projects monitoring should include separate meters for lighting and small power (plug loads and fixed equipment such as an instantaneous water heater), with additional provisions to monitor air-conditioning energy use. Where the project includes HVAC plant additional to the core and shell provisions, metering can be more extensive. For example, a monitoring system should allow the overall performance of the plant to be determined for all operating modes and range of operating conditions [4].

Given the interest in carbon foot printing and carbon trading, energy monitoring and targeting is receiving greater attention than hitherto [5].

4 K Calder. The Building Services Research and Information Association. Practical Chiller System Monitoring. Technical Note TN 7/94. 1994.

5 Carbon Trust. In-depth management guide CTG008. Monitoring and targeting.

6 WATER USE

WU1 WATER QUALITY SURVEY

EXCLUSION None

OBJECTIVE Ensure that the quality of potable water is satisfactory.

CREDIT ATTAINABLE 1

CREDIT REQUIREMENT 1 credit for demonstrating that the quality of potable water meets the referenced drinking water quality standards at all points of use.

ASSESSMENT

Criteria

Potable water sampling should be systematic, such as described in ISO 5667 [1], but as a minimum, sample(s) shall be taken at the farthest point(s) of use in the distribution system within the project space from the storage tank of the host building. If water sample(s) can comply with the seven (7) parameters including pH, colour, turbidity, conductivity, iron, E.Coli and total coliform as stipulated in the Quality Water Recognition Scheme for Buildings [2] administered by the Water Supplies Department, the credit can be attained.

Alternative:

In case water supply is not connected to the project space, the credit can still be attained provided that the Applicant can demonstrate:-

i. The host building is already awarded with at least Blue Certificate under the Quality Water Recognition Scheme issued by Water Supplies Department; or

ii. Twin-tank system is installed in the host building.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A laboratory test report including details of the analysis of sample(s) taken from a selection of potable water outlets used to supply for human consumption.

Alternative:

i. The Blue Certificate (or higher grade certificate) of the host building; or

ii. Photos showing that twin-tank system is installed in the host building.

BACKGROUND According to WSD [3] Hong Kong's water is of the safest quality and among the best in the world. However, it is affected in some instances by the inadequate maintenance of internal plumbing systems before it reaches customers' taps and this can cause discolouration of the

1 ISO 5667-5:2006 Water quality -- Sampling -- Part 5: Guidance on sampling of drinking water from treatment works and piped distribution systems

2 Water Supplies Department. Quality Water Recognition Scheme for Buildings http://www.wsd.gov.hk/en/customer_services_and_water_bills/application_for_licence_certificate/quality_water_recognition_scheme_for_buildings/index.html

3 Water Supplies Department. Annual Report. http://www.wsd.gov.hk/filemanager/en/share/annual_reports/rpt0203/pdf/08_water_quality.pdf

water.

To encourage the building owners to maintain their plumbing systems properly and with the endorsement of the Advisory Committee on the Quality of Water Supplies (ACQWS), the Water Supplies Department launched the Fresh Water Plumbing Quality Maintenance Recognition Scheme [4] in 2002. Since 1 January 2008, the Scheme has been renamed as Quality Water Recognition Scheme for Buildings. The successful applicants will be awarded a Certificate 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.

The twin-tank system can bring few benefits. These include:-

i. Un-interrupted water supply to consumers;

ii. Water saving; and

iii. Facilitating cleansing operation.

More details can be found in WSD website. [5]

SAMPLING

ISO 5667 establishes detailed principles to be applied to the design of sampling programmes, to sampling techniques and to the handling and preservation of samples of drinking water and water used for food and beverage processing (drinking water). It is important that the sampling purpose be defined as accurately as possible and that the measurements provide the required information in the most efficient and statistically representative manner.

4 Water Supplies Department. Fresh Water Plumbing Maintenance Guide. http://www.wsd.gov.hk/filemanager/en/share/pdf/FWPMGe.pdf

5 Water Supplies Department. Twin-tank System http://www.wsd.gov.hk/en/plumbing_and_engineering/tts/index.html

WU 2 ANNUAL WATER USE

EXCLUSION

None.

OBJECTIVE

Reduce the consumption of fresh (potable) water through the application of water saving devices that have proven performance and reliability.

CREDIT ATTAINABLE

2

CREDIT REQUIREMENT

1 credit for demonstrating that the use of water efficient devices leads to an estimated aggregate annual water saving of 30% when compared with BEAM Plus baseline.

2 credits for demonstrating an estimated annual water saving of 40% when compared with BEAM Plus baseline.

ASSESSMENT

Criteria

Calculation shall be provided to determine the reduction of water consumption in the project space compared with a similarly occupied space whose water fittings and appliances conform to a baseline performance. The calculation should take into account the number of employees, and the number of operational days per annum. This information must be supplied by the Applicant and may be stated in the design brief or OPR.

Water use is based either on a 'per operation' basis or as the product of flow rate and operation time. The default assumptions are given in Appendix 9.3. Number of water devices installed and frequency of use must be the same for both the baseline and project case.

Alternative:

If sanitary (water taps and shower heads) is not available within the project space but available in common area (e.g. toilets/bathroom shared with other tenants or space users, retail premises within shopping centres etc) within the host building that is available to the user of the project space:-

1 credit can be achieved if sensor type water taps are installed in the common area.

1 additional credit can be achieved if the Applicant can demonstrate that the water taps and shower heads (if available) installed in the host building are Voluntary Water Efficiency Labelling Scheme (WELS) [1] Grade 1 labelled or having the equivalent or less flow rate.

This alternative approach encourages tenant or space user to become conscious the sanitary they are using, hence it ultimately motivates building owner to select or retrofit with water efficient sanitary.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Water saving calculation supported with manufacturers' specifications of all installed devices including flow rate information; and

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

ii. The format of water saving calculation shall align with example given in Appendix 9.3.

Alternative:

i. Documentation, include record photographs showing the sensor type water taps installed in the common area within the host building; and

ii. Manufacturer's specification/catalogue and WSD documentation (e.g. information available from WSD website, or official letter from WSD) for water tap and shower head (if available) showing the WELS Grade 1 for one addition credit.

BACKGROUND

Hong Kong differs from most other places in the world in that the majority of offices have a saltwater flushing supply rather than using potable water. Therefore the scope for water reductions may be more limited here than elsewhere. Neither the quantification of water use nor the potential for savings has been addressed in the 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.

For the majority of interiors, a limited amount of hand washing and perhaps some manual dish washing will take place in the pantry. It is not the intention to include water used for washing food or produce (required for hygiene), nor water used for coffee making machines, etc.

There is an increasing availability of devices and plumbing fixtures which have demonstrated an ability to save water over the lifetime of the system if installed and maintained properly. Flow rates can be controlled to reduce excessive discharge at taps, faucets and showers without detriment to the quality of water delivery. Substantial evidence shows that the use of water-efficient plumbing fixtures conserves water[1]. A number of studies in the US have measured the impact of installing water-efficient plumbing fixtures through sophisticated sensors, before and after comparisons of water bills, or other means. Although the results varied, the studies generally concluded that low-flow fixtures are effective in saving water.

High efficiency devices include low flow rate faucets or faucets with aerated flows. The provision of automatic shut-off devices, particular in public use areas, can save significant quantities of water. Examples of automatic shut-off devices are spring-loaded (or push-once) taps, electronic proximity sensors, etc., but excluding timed shut-off devices.

1 United States General Accounting Office. Report to Congressional Requesters. Water Infrastructure. Water-Efficient Plumbing Fixtures Reduce Water Consumption and Wastewater Flows. GA RCED-00-23. August 2000.

WU 3 EFFLUENT DISCHARGE TO FOUL SEWERS

EXCLUSION

None.

OBJECTIVE

Reduce the volumes of sewage discharge thereby reducing burdens on municipal sewage supply and treatment facilities.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for demonstrating the application of water efficient technology in the flushing system.

ASSESSMENT

Criteria

The Applicant shall demonstrate that the flushing systems installed within the project space are water efficient. Water efficient flushing systems include but not limited to: sensor type urinal, waterless urinal, dual flush water closet, flushing system certified by Water Efficiency Labelling Scheme Grade 2 or above.

Alternative:

If sanitary (urinal and water closet) is not installed within the project space but available in common area (e.g. toilets shared with other tenants or space users) within the host building that is available to the user of the project space:-

1 credit can be achieved if at least one of the abovementioned water efficient flushing systems is installed in the host building.

This alternative approach encourages tenant or space user to become conscious the sanitary they are using, hence it ultimately motivates building owner to select or retrofit with water efficient sanitary.

Note: If the space users of the project space have access to flushing systems in both common area and project space, only the flushing systems within the project space should be assessed.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Manufacturer specifications/catalogues and photos showing the abovementioned water efficient flushing systems.

Alternative:

i. Photos showing the abovementioned water efficient flushing systems installed in the common area within the host building.

BACKGROUND

Demand for flushing and potable water should be assessed with regard to Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulation 10A(4). “Potable water” refers to a supply of water for the purposes of Regulation 10A(2)[1]. The quantity of flushing water required is given in PNAP 17 [2].

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1 Department of Justice, CAP 123I building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations http://www.legislation.gov.hk/blis_pdf.nsf/6799165D2FEE3FA94825755E0033E532/182338FA79710018482575EE003F2DBE/$FILE/CAP_123I_e_b5.pdf

2 Buildings Department. Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers. PNAP No. APP-4 Water Supplyand Wells. http://www.bd.gov.hk/english/documents/pnap/APP/APP004.pdf

Regulation 19 of the Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations (Drainage Regulations) requires flushing cisterns of water closet fitments to have a discharge between 9 and 14 litres. Under the current Waterworks Regulations, flushing cisterns shall be of the valveless syphonic type and the flushing volume shall be within the range of 7.5 and 15 litres [3].

With the application of modern technology in the design of water closet flushing system, the effectiveness of flushing can be maintained with a reduced discharge. Therefore, to conserve our valuable water resources, both the Building Authority (BA) and Water Authority would have no objection to relaxing the use of syphonic flushing cisterns with discharge less than that required by the current regulations provided that the associated toilet bowls are compatible with the cisterns and the syphonic action is sufficient for the wastes in the toilet bowls to be cleared effectively by a single flush. WSD has relaxed the requirements in respect of the flushing mechanism and minimum flushing volume as follows:

i. the use of valve type flushing devices (mechanical or sensor type with single flush or dual flush) in addition to valveless syphonic type flushing apparatuses; and

ii. the use of flushing devices which are capable to give a single flushing volume of less than 7.5 litres.

The capacity of the flushing cistern in the case of trough water-closets and urinals shall be approved by the Water Authority subject to the discharge in the case of trough water-closets being not less than 9 litres of water for every metre of the channel and the discharge in the case of urinals being not less than 4.5 litres of water for every basin or stall, or in the case of a trough urinal, every metre thereof.

3 Buildings Department. Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers. PNAP No. APP-99Flushing Volume for Flushing Cisterns. http://www.bd.gov.hk/english/documents/pnap/APP/APP099.pdf

WU 4 NO BOTTLED WATER

EXCLUSION

None.

OBJECTIVE

Reduce the environmental impact during the production and transportation of plastic water bottles.

CREDIT ATTAINABLE

2

CREDIT REQUIREMENT

2 credits for demonstrating that provision to replace bottled water services has been provided, such as drinking water fountains, etc.

ASSESSMENT

Criteria

Plastic bottled water type dispenser shall not be provided for project space.

Documentation

Credits shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Photos showing bottle-less drinking facility is provided in the project space.

BACKGROUND

A study commissioned by the World Wildlife Fund (WWF) [1] found that bottled water was the largest growing drinks industry driven by peoples' perception of deteriorating drinking water quality. The study said that in some cases, bottled waters only differed from tap water in their method of delivery. The environmental consequences of drinking bottled water are immense. The study found that 1.5 million tons per annum of plastic are used to bottle water. Toxic chemicals can be released into the environment during the manufacture and in the ultimate disposal of the bottles, a significant proportion of which end up in landfills. A quarter of the 89 billion litres of water bottled worldwide annually are consumed outside their country of origin resulting in additional carbon dioxide emissions.

1 Ferrier, C, Bottled water: Understanding a social phenomenon, April, 2001, http://assets.panda.org/downloads/bottled_water.pdf

7 INDOOR ENVIRONMENTAL QUALITY

IEQ 1 INDOOR AIR QUALITY

EXCLUSION

None.

OBJECTIVE

Demonstrate that airborne contaminants do not give rise to unacceptable levels of indoor air pollution in normally occupied spaces.

CREDIT ATTAINABLE

5

CREDIT REQUIREMENT

A. Specifications

For each of the materials categories (A1 to A5), one credit is achieved when compliance is demonstrated through submission of the requisite documentation.

Alternative:

B. Measurement

For each of the categories of contaminants (B1 to B5) one credit is achieved if measured concentrations obtained through appropriate measurements comply with the GOOD class requirement in the IAQ Certification Scheme [1].

ASSESSMENT

Criteria

Two alternative methods are available to demonstrate compliance: A. by design, whereby indoor contaminant sources are reduced through selection of materials, or B. through measurement of contaminants upon completion of the project.

A. Design Approach

A1. Adhesives and Sealants

Where adhesives, sealants and sealant primers are used in the project interiors, the VOC content limits should less than the maximum limit given in Annex 6 of “A Guide to the Air Pollution Control (Volatile Organic Compounds) Regulation” issued by Environmental Protection Department [2].

A2. Paints, Coatings and Finishes

Where paints, coatings and finishes are used in the project interiors, the VOC content limits should less than 50g per litre.

A3. Wood and Laminates

i. Composite wood and fibre products shall not contain any added urea - formaldehyde resins; and

ii. Adhesives used to fabricate assemblies shall not contain any added urea - formaldehyde.

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1 Indoor Air Quality Management Group. A Guide on Indoor Air Quality Certification Scheme for Offices and Public Places. http://www.iaq.gov.hk/cert/doc/CertGuide-eng.pdf

2 A Guide to the Air Pollution Control (Volatile Organic Compounds) Regulation http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/files/voc_reg_guide.pdf

The list of all products and laminate adhesives used shall be accompanied by a statement that they contain no added urea - formaldehyde.

A4. Flooring materials and Carpets

For flooring materials:

i. The total emission and emission rate of VOC should not exceed 2g/m^2 and 500µg/m^2/hr;

ii. The emission of formaldehyde should not exceed 0.13mg/m^3 air for wood-based flooring;

iii. The product should not contain chlorinated / brominated paraffins, organic tin compounds, phthalates or PBDEs content; and

iv. The product should not contain any heavy metals or their compounds as list below:

a.) Cadmium;

b.) Mercury;

c.) Hexavalent chromium;

d.) Lead;

e.) Arsenic; and

f.) Antimony.

For carpets:

i. The emissions of Total Volatile Organic Compounds (TVOCs) should not exceed 0.5 mg/m^2 per hour.

Water-based adhesive or adhesive free should be used.

A5. Furniture

For metal furniture:

i. The colour coating of the furniture should not contain:

a.) Formaldehyde or halogen solvent; and

b.) Any heavy metallic substances such as lead, cadmium, chromium and their compounds.

ii. If the product contains plastic parts, the plastic parts should not contain the following substances:

a.) Lead;

b.) Chromium;

c.) Cadmium;

d.) Mercury;

e.) Phthalates; and

f.) Halogenated organic substances.

For non-metal furniture:

i. All wooden board used shall be of Class E1 in respect of formaldehyde emission requirements as follows:

a.) MDF Board: $\leqq$ 8mg/100g as per EN120 test requirement; and

b.) Plywood: release $\leqq$ 0.124mg/m^3 air as per EN717-1

requirement.

Salvaged and used furniture shall be excluded from the assessment.

A list of all furniture and fittings shall be provided identifying either age (reused) or product details (description, manufacturer, product range/model) and copies of test reports.

Alternative:

B. Measurement Approach

The objective of sampling is to ensure that the interior spaces will not suffer undue contamination from indoor sources or infiltration from outdoor sources. Where it can be demonstrated that identified pollutants (B1 to B5 as stated below) are complied with the Good Class requirement prescribed in the IAQ Certification Scheme, credit(s) shall be achieved.

B1. Total Volatile Organic Compounds (TVOCs)

B2. Formaldehyde (HCHO)

B3. Products of Combustion:

i) Carbon Monoxide (CO)

ii) Nitrogen Dioxide (NO_2)

B4. Respirable Suspended Particulate (RSP, PM_{10})

B5. Ozone

Measurements shall take place during normally occupied period.

<u>Documentation</u>

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

A. Design Approach

i. Specifications for the materials/components as they appear in construction documents;

ii. A table listing the materials used, identifying the emissions rates for materials in classes A2 and A4, the permitted emissions limit for each of the materials as specified in referenced documents, and details of the source data (e.g. manufacturer's data sheets); and

iii. Confirmation of compliance with the relevant standard/emissions criteria.

B. Measurement Approach

i. The method statement of IAQ measurement;

ii. Measurement report issued by an HKAS accredited IAQ Certificate Issuing Body 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; or

iii. Alternatively, IAQ Certificate issued by Environmental Protection Department for demonstrating compliance.

COMMON IAQ POLLUTANTS

All materials that emit contaminants that can enter the indoor air in interior spaces are considered as indoor contaminants. Surfaces and materials that can emit contaminants into the indoor air include flooring, ceilings and ceiling systems, walls, fittings, finishes,

ventilation system surfaces and components, and materials in cavities and chases, including caulking materials for insulation and sealing purposes.

The Indoor Air Quality Information Centre website indicates the major emission sources, health effect and the mitigation measures of different IAQ pollutants [3].

IAQ CERTIFICATION SCHEME

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 owners of premises / buildings or property management companies to pursue the best level of IAQ.

More details can be found in EPD website [4].

3 Indoor Air Quality Information Centre Website http://www.iaq.gov.hk/second.asp?page=iaq&sub=pollutant

4 Indoor Air Quality Information Centre Website http://www.iaq.gov.hk/second.asp?page=scheme&sub=background

IEQ 2 INDOOR PLANTING

EXCLUSION None.

OBJECTIVE Improve the indoor air quality and enhance the productivity.

CREDIT ATTAINABLE 2

CREDIT REQUIREMENT 1 credit for fulfilling at least 2 items as shown below.

2 credits for fulfilling at least 4 items as shown below.

ASSESSMENT

Criteria

i. The minimum density is one large plant (300mm pot) or two small plants (200mm pot) per two workstations;

ii. Green wall of at least $5m^2$ is provided;

iii. The plant species are carefully selected and suitable to be planted in indoor environment;

iv. A "Horticultural Maintenance Plan" shall be in place for effective communication and ensure the health of the plants is maintained;

v. No herbicides and pesticides are applied to the plants;

vi. No electricity, from fossil fuelled generation, is used to maintain and for the growth of the plants.

Documentation:

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. A layout plan which illustrates the locations of the plants or green walls;

ii. A summary table that includes the total number of the plants and species;

iii. Calculation showing the density of the plant is adequate;

iv. A statement from plant supplier that the plants selected are suitable to be planted in indoor environment;

v. A Horticultural Maintenance Plan in one A-4 page which addresses, in minimum, the location of the plants, the watering and cleaning requirements, identification of plant disease and plant replacement regime etc.;

vii. A statement from the Applicant to substantiate that no herbicides and pesticides are applied to the plants;

vi. A statement from the Applicant or photos to substantiate that no electricity from fossil fuelled generation is used to maintain and for the growth of the plants.

BACKGROUND There are many benefits of indoor plantings. Plants are not only bringing a feeling of refreshment to the occupants, but also the most important benefit is their ability to absorb indoor pollutants such as carbon dioxide or VOC etc. In return they emit oxygen in the surroundings and help in cleansing the air.

According to some research studies, offices with indoor plantings can reduce the rate of absenteeism and enhance in the creativity and productive of the employees.

IEQ 3 MINIMUM VENTILATION PERFORMANCE

EXCLUSION

None.

OBJECTIVE

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 occupants.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for demonstrating that the project is in compliance with the minimum requirements of ANSI/ASHRAE 62.1-2010 [1] in respect of Outdoor Air Quality; and Minimum Ventilation Rate.

Alternative:

1 credit for demonstrating that carbon dioxide level within the project space can comply with Good Class requirement as stipulated in IAQ Certification Scheme.

ASSESSMENT

Criteria

The Applicant shall conduct the air measurement at the intake location to confirm that outdoor air pollutants including Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Ozone (O_3) and Respirable Suspended Particulates (RSP) conform to the IAQ Certification Scheme Good Air Quality level.

On the other hand, perform calculation to demonstrate the ventilation rate can comply with ANSI/ASHRAE 62.1-2010's requirement.

Documentation

i. Measurement report demonstrating CO, NO2, O3 and RSP can comply with Good Class requirement of IAQ Certification Scheme at intake location(s);

ii. Completion of Table H-3 of ANSI/ASHRAE 62.1-2010 demonstrating compliance with the minimum ventilation rate(s) provided; or

iii. Alternatively, IAQ Certificate issued by Environmental Protection Department for demonstrating compliance.

BACKGROUND

The purpose of this credit is to provide the minimum outdoor air ventilation to provide for the control of odours, that is, the supply, distribution and control of ventilation to maintain the carbon dioxide (CO_2) levels within design targets in normally occupied spaces, and the control of indoor pollutants such as TVOCs, formaldehyde, etc.

1 ANSI/ASHRAE 62.1-2010. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

IEQ 4 PRE-OCCUPANCY FLUSH OUT

EXCLUSION

None.

OBJECTIVE

Reduce the potential for indoor air quality problems resulting from the construction or renovation process.

CREDIT ATTAINABLE

1

CREDIT REQUIREMENT

1 credit for undertaking flush-out of normally occupied project spaces prior to occupancy.

ASSESSMENT

Criteria

Following completion of construction and all interior finishes and after the installation of all fixed furniture and furnishings, the occupied spaces should be flushed out to remove the contaminants.

The flushing duration can be determined by the Applicant and subject to calculation of fresh air required to achieve the IAQ Certification Good Class requirement. During the flushing period, there should be no construction or renovation activities in the vicinity of the space being flushed.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Details of the flush out procedures;

ii. Photos taken during flush-out period;

iii. The flush-out dates, outdoor delivery rates, flushing duration, internal temperature and humidity shall be indicated; and

iv. Calculation showing the fresh air required for flushing can comply with IAQ Good Class requirement.

BACKGROUND

This compliance path uses the building HVAC system to evacuate airborne contaminants. The flush-out may begin only after all construction works and finishes are completed; all cleaning finalised and all fixed furniture installed. Final test and balancing should be completed and HVAC control should be functional, particularly if the occupants will be moving in during the second phase of flush-out.

The flush-out procedure assumes the use of the building's HVAC system, but alternatives are acceptable providing they meet the air quantity, temperature and humidity requirements.

One approach uses temporary supply and exhaust systems placed into windows or window openings. EPA's indoor air quality for schools website [1] provides information on exhaust and spot ventilation during construction activities that can be helpful for design teams who are considering using this approach.

Care must be taken to ensure the airflow is not short circuited, potentially leaving remote corners within the project spaces with less than adequate circulation, or other parts of the building with unanticipated increases, such as a stack effect up elevator shafts.

1 EPA IAQ Design Tools for Schools, Controlling Pollutants and Sources Section 5 Ventilation Techniques. http://www.epa.gov/iaq/schooldesign/controlling.html#Ventilation Techniques

If the interior's HVAC system is used, any temporary filters and duct coverings installed shall be removed. The filtration media shall be replaced with new media unless the system is configured such that filters filter only the outside air. The new filters installed prior to the start of flush-out must be MERV 13 or better.

Depending upon the season, outside air can be cold or humid. Appropriate internal temperature and relative humidity shall be maintained during flush-out procedure.

IEQ 5 TENANT EXHAUST

EXCLUSION None.

OBJECTIVE Prevent exposure of occupants to concentrated indoor sources of pollutants.

CREDIT ATTAINABLE 1

CREDIT REQUIREMENT 1 credit for the provision of independent exhaust system for all photocopy / printing rooms and locations where significant indoor pollution sources are generated.

ASSESSMENT

Criteria

The Applicant shall provide independent exhaust to all photocopy / printing rooms and locations with significant indoor pollution sources with sufficient exhaust rate. On the other hand, the Applicant shall ensure the discharge of the exhaust louvres shall not face or at a minimum distance of 7m to other intake location points or louvres.

Documentation

Credit shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Drawings showing the location of all photocopy / printing rooms and locations with significant indoor pollution sources and associated ductwork layouts;

ii. The fan schedule serving the photocopy / printing rooms and locations with significant indoor pollution sources;

iii. Calculation indicating that the exhaust rate of 2.5l/s/m^2 is achieved; and

iv. Photos or drawings showing the location of the exhaust point.

BACKGROUND Concentrated airborne contaminants are best removed close to their sources. The provision of independent exhaust, segregated from general ventilation, is an appropriate strategy.

Photocopiers and printers emit contaminants such as ozone and particulates and should be housed in dedicated rooms that are not normally occupied. ANSI/ASHRAE 62.1-2010 [1] designates the air quality in copy and print rooms as air class 2 and it is therefore inappropriate to allow re-circulation to occupied areas of the building. ANSI/ASHRAE 62.1-2010 recommends an exhaust flow rate of 2.5 l/s/m^2.

1 ANSI/ASHRAE 62.1-2010. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

IEQ 6 UNCONTROLLED VENTILATION

EXCLUSION None.

OBJECTIVE Reduce uncontrolled air movement in or out of premises, thereby provide better control over background ventilation through purposely provided openings and reduce infiltration of contaminated air.

CREDIT ATTAINABLE 1

CREDIT REQUIREMENT 1 credit for undertaking tests in the premises using a non-balanced test method to demonstrate that the air tightness is within recognised limits.

ASSESSMENT

Criteria

The Applicant shall conduct on-site testing in accordance with ASTM E779 [1] and demonstrate the testing result can comply with air leakage rates as stipulated in CIBSE TM23:2000 [2].

For all test methods, the arithmetic mean of the air leakage rates measured under pressurisation and depressurisation at 50 Pa should be normalised to the external surface area of the whole building or unit to give the air leakage rate in $m^3 m^{-2} h^{-1}$ of external envelope.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Testing report;

ii. Details of the fan for testing; and

iii. Testing procedures and results.

BACKGROUND Air movement between indoors and outdoors occurs as a result of differentials between indoor and outdoor air pressure caused by winds and stack effect. Poor building detailing, services penetrations and gaps around windows in a building envelope will result in air leakage, either infiltration or ex-filtration. This results in a loss of conditioned air or an unwanted gain of unconditioned air, and resultant heat losses or heat gains in occupied rooms. These losses reduce the user's control over ventilation through purposely provided ventilators. Infiltration can increase the levels of outdoor pollutants that enter indoors. Infiltration can be reduced through good detail design, sealing of services penetrations and properly installed high-quality window systems with effective sealing of cracks and joints.

The air tightness of the building envelope can be investigated using a fan (or fans) mounted in a suitable aperture such as a door or window to create an induced pressure difference across the building envelope. The test should be carried out under low wind and stack conditions so that the induced pressure difference is uniformly distributed over the building envelope.

ASHRAE RP 935 details several methods for testing tall buildings. A modification to one test method (floor by floor method) is to simultaneously pressurise the floors above and below the test floor,

1 ASTM E779. Standard Test Method for Determining Air Leakage Rate by Fan Pressurization. 1999.
2 CIBSE TM23:2000. Testing Buildings for Air Leakage, London. 2000.

i.e. simultaneously pressurise 3 adjacent floors. If the flow rates are adjusted so that there is no differential pressure between the middle and the upper and lower floors there will be no cross leakage from the middle floor. The measured air leakage rate will therefore be the envelope leakage for that floor.

Some example good practice target values (at 50 Pa) are [3]:

Air-conditioned offices	5 $m^3 m^{-2} h^{-1}$
Naturally Ventilated offices	10 $m^3 m^{-2} h^{-1}$
Superstores	5 $m^3 m^{-2} h^{-1}$

The measured values quoted are the arithmetic mean of the air leakage rates measured for pressurisation and depressurisation tests. It follows that the air leakage rate measured under unbalanced conditions will be an over estimate of the air leakage through external envelope by an amount depending on the degree of leakage to neighbouring units.

3 Bahnfleth W P, Yuill G K, Lee B W. Protocol for Field Testing of Tall Buildings to Determine Air Leakage Rate. ASHRAE Transactions. 1999. pp27-38.

IEQ 7 THERMAL COMFORT

EXCLUSION

None.

OBJECTIVE

Ensure the thermal comfort of the occupants.

CREDIT ATTAINABLE

3

CREDIT REQUIREMENT

a) Temperature

1 credit for demonstrating the air temperature within the project space is ±1.5°C of the set temperature when the air side system is operating at steady state under normal occupied periods.

b) Relative humidity

1 credit for demonstrating the relatively humidity within the project space is less than 70%.

c) Air movement

1 credit for demonstrating the air movement within the project space is less than 0.3m/s.

ASSESSMENT

Criteria

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].

Alternative:

The Applicant can present a valid IAQ Certificate for the project space issued by EPD to demonstrate compliance

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Measurement report endorsed by a CIB; or

ii. IAQ Certificate issued by Environmental Protection Department for demonstrating compliance.

BACKGROUND

Physical parameters such as temperature, humidity, and air movement are important indoor air quality parameters as they could affect people's perception of the indoor air quality. Very often, the level of some of the indoor air pollutants could also be affected by temperature and humidity.

1 Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places, Indoor Air Quality Management Group, The Government of the Hong Kong Special Administrative Region. http://www.iaq.gov.hk/cert/doc/GN-eng.pdf

IEQ 8 INTERIOR LIGHTING QUALITY

EXCLUSION

None.

OBJECTIVE

Ensure the adequacy and maintenance of visual comfort conditions achieved by the electric lighting provisions in occupied spaces.

CREDIT ATTAINABLE

3

CREDIT REQUIREMENT

3 credits where the uniformity, glare index and colour rendering index (1 credit for each parameter) at all workstations / working zone can comply with CIBSE requirements [1].

ASSESSMENT

Criteria

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.

Documentation

The Applicant shall provide the following documentation to demonstrate compliance:

i. The layout plan showing all workstations / working zone;

ii. A summary table indicating the uniformity, glare index and colour rendering index (by measurements or simulations) at each workstation / working zone; and

iii. Catalogues or other supporting documents showing that the colour rendering index of the lighting system.

MEASURED PERFORMANCE

For lighting installations that are already installed, horizontal and vertical illuminance and luminance can be measured using a lux meter and a luminance 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

The illuminance variation consists of ‘uniformity’ which is concerned with illuminance conditions on the task and immediate surroundings, and ‘diversity’ which expresses changes in illuminance across a larger space.

The uniformity can be calculated according to that described in Section 4.5.4 of the Code. The calculated uniformity (minimum to average illuminance) over any task area and immediate surround should not be less than 0.8.

1 The Chartered Institution of Building Services Engineers. Code for Interior Lighting. London. CIBSE.

The glare index can be calculated according to either of the two methods described by CIE [2], or the CIBSE Technical Memoranda [3]. These methods are also summarised in Section 4.5.6 of the CIBSE Code.

The calculated glare index shall be checked for compliance with the recommendations given in Section 2.6.4 of the Code or Chapter 5 of the Lighting Guide.

For assessment using the IESNA Lighting Criteria, the calculation methods described in Chapter 9 of the IESNA Lighting Handbook can be used for the calculation of the following parameters:

i. horizontal and vertical illuminance;

ii. glare: VCP or UGR; and

iii. luminance.

A validated computer program such as Radiance, 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.

2 Commission Internationale de l'Eclairage (CIE). Maintenance of indoor electric lighting systems. CIE Technical Report - Publication No. 97. Vienna.he Chartered Institution of Building Services Engineers. Code for interior lighting. London.

3 The Chartered Institution of Building Services Engineers. Technical Memoranda TM10. Calculation of glare indices. London, CIBSE, 1985.

IEQ 9 NATURAL LIGHTING

EXCLUSION None.

OBJECTIVE Encourage a holistic examination of interior layout, building design, and fenestration design, such as to maximise access to daylight for the purposes of improved health and comfort.

CREDIT ATTAINABLE 2

CREDIT REQUIREMENT 1 credit where 75% of workstations or seating are located in an area of floor plate that has a natural light illuminance level of 100 lux.

2 credits where 85% of workstations or seating are located in an area of floor plate that has a natural light illuminance level of 100 lux.

ASSESSMENT

Criteria

The credit(s) can be achieved by either measurement or computer modelling.

The Applicant can simply use a lux meter to measure the illuminance levels at all workstations when all artificial lightings are switched off at noon time and under sunny day condition.

Alternative:

he Applicant can use computer software such as Radiance to simulate the illuminance level under overcast sky condition. The report submitted shall identify the key parameters used in the computations/modelling, especially with regard to glazing transmittance, and the reflectance's of external and internal surfaces. The values of the parameters shall reflect the nature and type of surfaces on the external vertical obstructions and horizontal surfaces, and likely internal finishes. In addition, to ensure a realistic result that reflects the urban density of Hong Kong, surrounding buildings shall be included in the model.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. The interior layout plan;
ii. On site measurement results by a calibrated device; and
iii. Summary table showing the measurement date, time, sky conditions and percentage of compliance.

Alternatively,

i. Computer modelling report;
ii. Information showing the transmittance of the glazing;
iii. Schedule of internal finishes used in the modelling; and
iv. Summary table showing the percentage of compliance.

BACKGROUND

Access to daylight is an important aspect of comfort and health. Critical to providing sufficient daylight is the provision of a view of the sky. The amount of daylight available for specific rooms is related to:

i. window and room geometry and room surface finishes;

ii. sky obstruction due to the form of the building and its overshadowing from neighbouring buildings; and

iii. glazing transmittance.

In Hong Kong's congested built form rooms on lower floors of buildings may be considerably overshadowed by the built form. This can result in significantly reductions in natural light, and will incur increased electricity consumption for artificial lighting, and degradation of internal comfort and health conditions. It is possible to take into account the overshadowing by adjacent buildings using appropriate design tools.

IEQ 10 VIEWS TO OUTSIDE

EXCLUSION

None.

OBJECTIVE

Provide occupants in normally occupied spaces with a connection to the outdoors.

CREDIT ATTAINABLE

2

CREDIT REQUIREMENT

1 credit for at least 60% of all workstations or seating have a direct line of sight to external vision glazing or naturally lit internal courtyard or atrium.

2 credits for at least 80% of all workstations or seating have a direct line of sight to external vision glazing or naturally lit internal courtyard or atrium.

ASSESSMENT

Criteria

The assessment applies to workplaces such as offices, schools, and retails etc., where connection to the outside is regarded as important for comfort and productivity. Interior spaces that need not be considered include public corridors, lift lobbies, conference rooms, storage areas, printing rooms, plant rooms and server rooms.

On the plan view sight lines shall be drawn from each workstation or seating location to the exterior vision glazing. In section view, direct sight lines shall be drawn for each workstation or seating from a point 1.2m above the floor (Fig. 1).

The project workstations or seating shall be within 8m of the nearest vision glazing and have a direct line of sight at seated eye level of 1.2m of the vision glazing. The view shall be either through an external window providing a view of landscape, streetscape or buildings, or to a naturally lit internal courtyard or atrium where the distance from the glazing to the back wall of the courtyard or atrium is not less than least 8m.

The view can be an internal view across a space providing the Applicant can provide photos or drawings that the interior layout shall be such that views will not be impaired once all partitions and furniture has been installed.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

i. Drawings detailing the layout of all normally occupied interior spaces in plan view showing all intended workstations or seating;

ii. Table showing the distance between the nearest glazing and all workstations for plan view and section view; and

iii. Photos to illustrate the view of external windows.

BACKGROUND

A very important psycho-emotional factor for building occupants who remain indoors for long periods is the visual contact with the exterior. The ability to focus the eyes on a distant view provides for relaxation.

An investigation [1] into the potential contributions of windows and daylight to improved performance by office workers found that having a better view out of a window was consistently associated with better worker performance. Office workers were found to perform 10% to 25% better on tests of mental function and memory recall when they had the best possible view versus those with no view. Furthermore, office worker self reports of better health conditions were strongly associated with better views. Reports of increased fatigue were most strongly associated with a lack of view.

For students, findings [2] clearly support the theory that interesting views to outside enhance, rather than detract, from student learning.

An appropriate approach to interior fit-out is to arrange high height panels and similar obstructions perpendicular to vision glazing, with low height or suitably glazed (clear) panels arranged parallel with the vision glazing in order to maintain views to the outside for workstations located away from exterior walls.

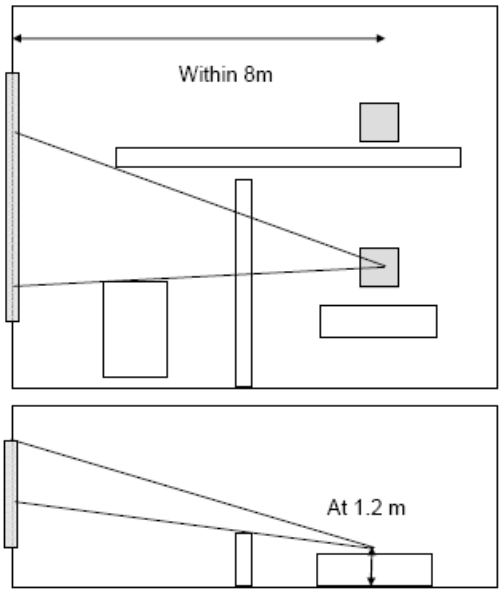

Fig. 1. Determination of viewable vision glazing for each workstation

1 California Energy Commission. Windows and Offices: a Study of Office Worker Performance and the Indoor Environment. 2003.

2 California Energy Commission. Windows and Classrooms: A Study of Student Performance and the Indoor Environment, 2003.

IEQ 11 ACOUSTICS

EXCLUSION None.

OBJECTIVE To provide an appropriate acoustical environment for occupants.

CREDIT ATTAINABLE 3

CREDIT REQUIREMENT 1 credit for demonstrating background noise levels are within the prescribed criteria to ensure the well-being of the occupant.

1 credit for demonstrating that the reverberation time in applicable areas meets the prescribed criteria for given types of premises to ensure the speech clarity.

1 credit for demonstrating airborne noise isolation between rooms, spaces and premises meets the prescribed criteria to ensure the speech privacy.

ASSESSMENT

Criteria

A. Internal noise level:

i. Classrooms, conference rooms – NC 35

ii. Offices – NC 40

iii. Retail shops and restaurants – NC 45

B. Reverberation time:

The average reverberation time for mid frequencies (500Hz, 1kHz and 2kHz), shall not exceed:

i. Offices, conference rooms, classrooms – 0.6s

ii. Retail shops – 1s

C. Air-borne noise isolation:

i. Between 2 offices, 2 conference rooms, office/conference room or 2 retail shops – STC 48

ii. Between 2 classrooms – STC 37

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, or both, depending on the Applicant's preference.

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 should include at least one sample of each type of occupied space

For the airborne isolation, the Applicant shall submit a schedule of the premises and spaces in the building, the noise isolation criteria adopted, relevant partition 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,

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.

and the results of tests or calculations/simulations demonstrating compliance with the criteria

Internal noise calculations or site measurements should 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 60804 to type 2 or better, or equal equivalent standard.

The assessment shall include the noise from building services equipment only.

Documentation

Credit(s) shall be achieved when the Applicant provides the documentation stated below, to demonstrate criteria compliance:

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

ii. Field test measurement report or computer simulation results with construction details of the partition walls; and

iii. Acoustic measurement report with valid calibration certificate of sound level meters or calculation to demonstrate compliance of NC 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.

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 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.

Another problem is 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 [3].

3 British Standards Institution BS8233 – Sound insulation and noise reduction for buildings – Code of Practice.

8 INNOVATIONS

8.1 Innovative Techniques

8.2 Performance Enhancements

8.3 Features Considered as Innovations

INTRODUCTION

The Applicant shall be solely responsible to present quantitative evidence for BSL TRC review detailing comprehensively the benefit, environmental impacts averted or performance gains compared to existing criteria.

CREDITS

Maximum 10 BONUS credits in this Section.

8.1 INNOVATIVE TECHNIQUES

This section applies to advanced practices and new technologies that have not hitherto found application in Hong Kong. Any credits gained under this heading shall be regarded as 'bonus' credits, counting towards the total credits obtained, but not towards the total credits available.

Credits may be achieved for innovative and/or unconventional designs, construction techniques or provisions for operation that will improve the environmental performance of a building development during any part of its life cycle.

Applicant submissions that do not provide detailed and comprehensive details and method statements of "quantified" emission reductions or avoided emissions or impacts within the submission papers, no matter how obvious, will be rejected.

OBJECTIVE

Encourage adoption of practices, new technologies and techniques that have yet to find application in Hong Kong.

ASSESSMENT

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 BSL TRC who will consider each aspect on its merits and award credits accordingly.

The Applicant shall make a submission for granting additional credits 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 Interiors, 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.

8.2 PERFORMANCE ENHANCEMENTS

An alternative approach to achieving bonus credits under BEAM Plus for Interiors is to demonstrate significant performance enhancements, i.e. strategies and techniques that greatly exceed the requirements of existing BEAM Plus. For example, features that result in significantly higher levels of service, energy, water or materials savings. Any credits gained under this heading shall be regarded as 'bonus' credits, counting towards the total credits obtained, but not towards the total credits obtainable.

OBJECTIVE

Encourage adoption of practices, technologies and techniques that provide for performance enhancements over and above stated performance criteria in BEAM Plus for Interiors.

ASSESSMENT

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 BSL TRC who will consider each aspect on its merits and award credits accordingly.

The Applicant shall make a submission for granting additional credits 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 credits to be achieved.

8.3 FEATURES CONSIDERED AS INNOVATIONS

Appendix 9.4 provides a list of features that will be favourably considered as innovations which bonus credit may be achieved at the sole discretion of BSL TRC based on the features implemented.

9 APPENDICES

9.1 ASSESSMENT FRAMEWORK OF ENERGY PERFORMANCE

9.1.1 Energy Assessment Framework

9.1.2 Energy Assessment Approaches

9.1.3 Performance-based Approach

9.1.4 Prescriptive-based Approach

9.1.1 ENERGY ASSESSMENT FRAMEWORK

The assessment framework described herein applies to all space types:

i. those that are air-conditioned throughout the year;

ii. premises that are air-conditioned, either by a central plant serving the entire project area or unitary equipment for individual spaces;

iii. premises that are air-conditioned by a central plant shared with other portions of the building; and

iv. premises that adopt passive design.

9.1.2 ENERGY ASSESSMENT APPROACHES

To accommodate various space types and to allow flexibility in achieving the energy performance target for a project, the Applicant can freely choose one of the given approaches (i.e. Performance-based or Prescriptive-based Approaches) based on their project situation and resources for the assessment of energy performance.

9.1.3 PERFORMANCE-BASED APPROACH

The Performance-based Approach is used for assessing the Annual Energy Use for HVACR and lighting systems. The Annual Energy Use is estimated by computer simulation and is based primarily on the 'Energy Budget' approach, supplemented by a range of basic requirements.

The Code of Practice for Energy Efficiency of Building Services Installations (BEC) [1] provides a framework for demonstrating compliance in which the proposed design has annual energy consumption no greater than that of a reference case that satisfies the prescriptive requirements.

The Performance-based Approach described in Section 9 of the Code of Practice for Energy Efficiency of Building Services Installations is primarily geared towards demonstrating compliance to performance requirements in section 5 to 8 of the BEC. A number of important modifications are listed here for extending the BEC's Performance-based Approach for the purpose of quantifying energy reduction as a result of efficient design.

Energy Reduction Measures Considered for this credit

The major modifications concerns clause 9.5.4.1 in BEC, which states: In fulfilling clause 9.5.3 (the requirement that the design energy should not exceed the energy budget), the increase in design energy as a result of not satisfying the trade-off allowable requirements in clause 9.4.2 (performance requirements for lighting, air-conditioning, lift and escalators, electrical installations) of BEC, can be off-set with reduction in design energy as a result of –

i. An improvement over the corresponding minimum allowable levels of performance in any one or more of the items listed with energy efficiency requirements in Sections 5 to 8 of the Code (lighting, A/C, vertical transport and electrical), [This

1 Electrical and Mechanical Services Department - Code of Practice for Energy Efficiency of Building Services Installation 2012

clause effectively limits the baseline A/C system to be the same as the proposed system with the same components (albeit with minimum performance requirements). For example: both baseline and designed building will have VAV, though the designed building can have better fan efficiencies] And/or,

ii. A better OTTV (Overall Thermal Transfer Value), on condition that the energy reduction (as a result of better OTTV) counted towards the reduction should be limited to not more than 5% of the energy budget, and/or

iii. Having recovered energy or renewable energy captured or generated on site.

For the purpose of quantifying energy reduction for air conditioning and lighting as a result of efficient design towards demonstration of compliance to this credit, the reduction due to OTTV (e.g. apply Low-E window film if allowed by the building management of the host building) need not be limited to 5% of the energy budget, and the acceptable reduction measures are extended to:

i. An improvement over the corresponding minimum allowable levels of performance in any one or more of the items listed with energy efficiency requirements in Sections 5 to 6 of BEC (lighting and A/C);

ii. Reduce facade heat gain through improved OTTV;

iii. Adoption of load reduction strategies, including but not limited to natural ventilation, free-cooling, natural daylight etc. When the selected simulation program cannot adequately model a design or a control strategy, exceptional calculation method can be used with reference to 8.1.6 - ASHRAE Approach (see below);

iv. Addition of energy reduction components, such as (but not limited to) variable speed drives, heat recovery, energy efficient lamps and ballasts, light pipes and light tubes, sensors (daylight, CO_2, occupancy), dimming devices etc.;

v. Reduction in energy use through the selection of a more efficient system, such as (but not limited to) A/C equipment with higher COP than BEC's minimum requirements, LED lighting reducing lighting power density etc.

Baseline Design

For the purpose of assessment of this credit, the base-case should also be developed based on designed-case but with the following important distinctions:

Modifications as described by clauses A3.3.2 and A3.3.4;

Energy saving devices and load reduction strategies need not be included in the base-case. These are defined as components or operation strategies that reduce energy use while delivering the same level of environmental comfort to the interior space. Classification of energy saving devices and load reduction strategies is subject to the acceptance of the BAS.

Baseline Air-Conditioning System

For the purpose of assessment of this credit, the baseline air-conditioning should have identical zoning to the designed-case, and should be modelled with a system and equipment identical to the designed-case as stated in A3.3.5 of BEC, concerning air-conditioning

system:

"The air-conditioning systems, zoning and equipment types of the base-case should be identical to the designed-case; and the system and equipment of the reference space should exactly meet the relevant requirements in Section 6 of the BEC."

Baseline Envelope Design

For the purpose of the assessment of this credit, in the case of difficulty in extracting the construction details of external walls, roofs and windows of the assessed space, the baseline building envelope should be modelled with the dimension of external walls, roofs and windows measured on site and the default construction characteristics as given below.

DEFAULT CONSTRUCTION CHARACTERISTICS FOR THE BUILDING ENVELOPE

External walls	**Thickness (m)**	**Material**	**k (W/mK)**	**(kg/m^3)**	**Cp (J/kgK)**	**(-)**
Layer 1	0.005	Mosaic Tiles	1.5	2500	840	0.58
Layer 2	0.01	Cement/Sand Plastering	0.72	1860	840	
Layer 3	0.1	Heavy Concrete	2.16	2400	840	
Layer 4	0.01	Gypsum Plastering	0.38	1120	840	0.65
Roofs						
Layer 1	0.025	Concrete Tiles	1.1	2100	920	0.65
Layer 2	0.02	Asphalt	1.15	2350	1200	
Layer 3	0.05	Cement/Sand Screed	0.72	1860	840	
Layer 4	0.05	Expanded Polystyrene	0.034	25	1380	
Layer 5	0.15	Heavy Concrete	2.16	2400	840	
Layer 6	0.01	Gypsum Plastering	0.38	1120	840	0.65
Windows						
Layer 1	0.006	Tinted Glass	1.05 SC = 0.65	2500	840	0.65
Window to wall area ratio		As measured on site				
Adjacent spaces not assessed but air conditioned			Assume no heat transfer			
Adjacent spaces not assessed and not air conditioned			Assume having the same construction characteristic as external wall			

Symbols:

k	Thermal conductivity
	Density
Cp	Specific heat
	Solar absorptivity of exposed surface
SC	Shading coefficient of glazing

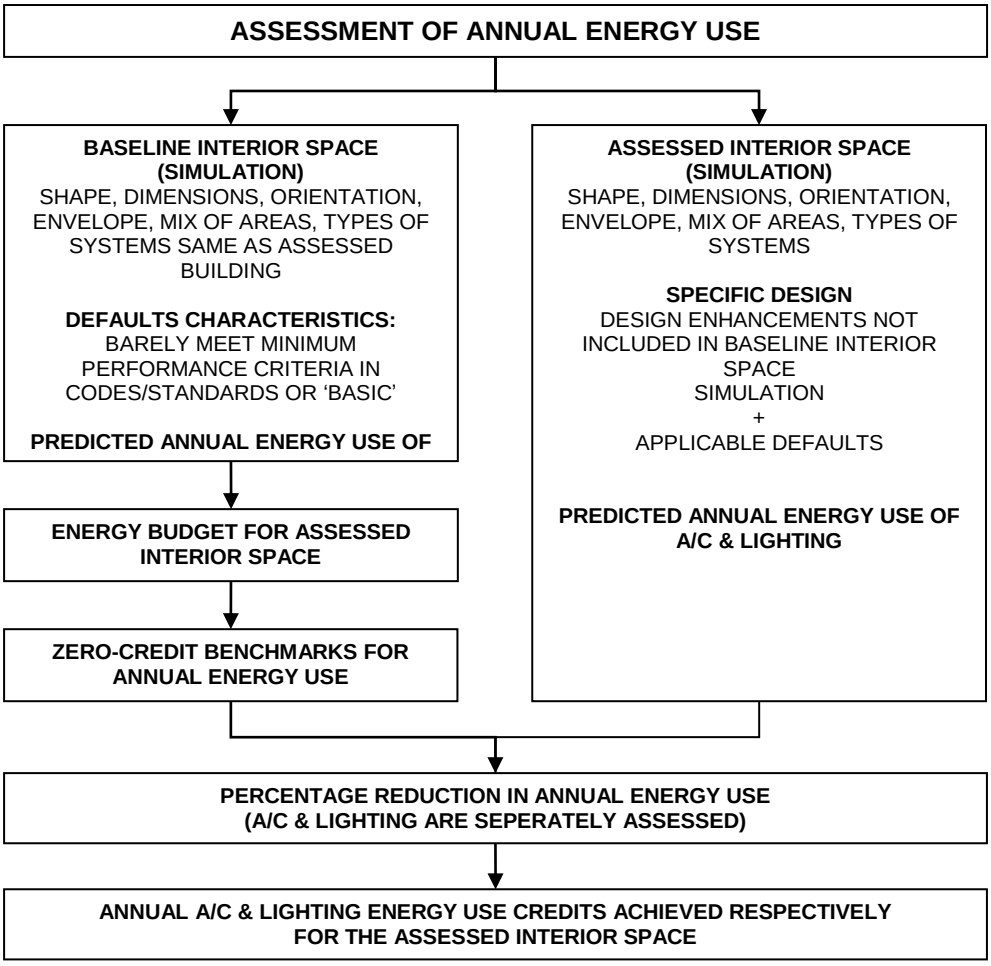

Figure 9.1 Energy performance assessment

KEY FEATURES

The key features of the Performance-based Approach are as follows.

i. the 'Energy Budget' for an ASSESSED INTERIOR SPACE is the predicted Annual Energy Use for a BASELINE INTERIOR SPACE (zero-credit benchmark);

ii. the BASELINE INTERIOR SPACE model has the same shape and dimensions, comprises the same mix of areas and types of premises as the ASSESSED INTERIOR SPACE;

iii. the BASELINE INTERIOR SPACE model will incorporate a range of standard (default) characteristics such that the model represents a building whose energy performance barely meets the relevant regulatory requirements or meets only 'basic' design quality;

iv. as far as possible the predicted Annual Energy Use of the ASSESSED INTERIOR SPACE will be based on its specific design characteristics; and

v. the number of credits achieved is determined by the percentage reduction in the predicted Annual Energy Use of the ASSESSED INTERIOR SPACE relative to the BASELINE INTERIOR SPACE where A/C and lighting are separately assessed.

APPLICABLE SOFTWARE

In principle, BEAM Plus Assessment would accept the use of most of the building energy analysis simulation software listed in the latest edition of EMSD Performance-based Building Energy Code. However, the BSL TRC might review the acceptance of any other software that are not in the list but embrace those simulation general requirements as highlighted in latest edition of ANSI/ASHRAE/IES Standard 90.1. The applicant will have to submit verification report of the software to prove their suitability for the purposes.

ASHRAE APPROACH

ANSI/ASHRAE/IES Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings is to provide minimum requirements for the energy-efficient design of buildings except low-rise residential buildings. Appendix G of ANSI/ASHRAE/IES 90.1-2010 provides the alternative approach, which is intended for use in rating the energy efficiency of building designs that exceed the requirement of Section 11 of the ANSI/ASHRAE/IES standard 90.1-2010. It may be useful for evaluating the performance of all proposed designs, including alterations and additions to existing buildings, except designs with no mechanical systems. The detailed requirement, assumption and modelling methodology for calculating the proposed and baseline building performance shall be made reference to the ANSI/ASHRAE/IES Standard.

EXCEPTIONAL CALCULATION METHODS

When no simulation program can adequately model a design (Note: For example: passive design with significant contribution on the reduction of CO_2 emissions), material, or device, the BSL TRC may approve an exceptional calculation method to demonstrate above-standard performance. The exceptional calculation shall make reference to Section A3.4 of Code of Practice for Energy Efficiency of Building Services Installation - 2012 Edition [3] and/or Appendix G2.5 of ANSI/ASHRAE/IES 90.1–2010 [4] and/or Appendix D of the Advanced Energy Modelling for LEED – Technical Manual v1.0 (September 2011 Edition)[5].

9.1.4 PRESCRIPTIVE-BASED APPROACH

Whilst computer simulation is the generic and preferred approach for predicting energy use, the implementation of prescriptive strategies in reducing the energy consumption from the air-conditioning and lighting in the project area can be used as an alternative to the simulation method (i.e. Performance-based Approach).

The prescriptive strategies include the use of high efficiency equipment, the implementation of energy saving measures and the provision of appropriate zoning and controls.

Further details of the potential strategies are provided below.

MINIMUM SYSTEM REQUIREMENTS FOR PRESCRIPTIVE HVAC&R STRATEGIES

Appropriate Zoning and Thermostat Distribution

Credit shall be achieved where the following requirements are met.

i. Every solar exposure has a separate control zone; and

ii. Interior spaces are separately zoned to enable independent control of space conditions.

Occupancy Sensors and/or Programmable Timers

Credit shall be achieved where the following requirements are met.

i. Normally occupied areas during business hours (open plan offices, retail areas, etc.) are provided with programmable timer controls capable of modulating HVAC system (either setting higher temperature and/or turning off air-conditioning)

in response to lower / no air conditioning demand after business hours; and

ii. Private offices and specialty occupancies (conference rooms, multi-purpose rooms, kitchen, pantry, plantroom, store rooms, etc.) are provided with occupancy sensor controls capable of sensing space use and modulating HVAC system (either controlling the set temperature and/or on/off of air-conditioning) in response to space demand.

Automatic Blinds Controlled by Daylight Sensor

Credit shall be achieved where the following requirements are met.

i. Every solar exposure window has a separate control (i.e. one control zone for one orientation of façade at the minimum);

ii. Switches are installed for occupants to overwrite the control;

iii. The automatic blinds must be able to adjust the access of daylight in response to the lighting level in space; and

iv. Testing and commissioning records must indicate at what levels of daylight the blinds are automatically closed and half closed, and the installation location of the sensors selected allows proper sensing of daylight level of the space.

Ceiling or Wall Mounted Fans

Credit shall be achieved where the following requirement is met.

i. Ceiling and/or wall mounted fans must serve at least 50% of the project area.

Variable Speed Drive Fan Coil Units

Credit shall be achieved where the following requirements is met.

i. All fan coil units installed by the Applicant and serving the project area must be variable speed drive or with high efficiency fan motor that is at least 80% efficiency at full load.

High Efficiency Air Conditioning Units

Credit shall be achieved where the following requirements is met.

i. All air conditioning units installed by the Applicant and serving the project area must be at least 15% better than the minimum requirements as stated in the latest Building Energy Codes in terms of Coefficient of Performance (COP) at full load.

Heat Recovery System

Credit shall be achieved where the following requirements are met.

i. The system is capable of conditioning or pre-conditioning the fresh air by utilising the cooling/heating energy from the exhaust air; and

ii. Heat recovery rate shall be at least 60%.

CO_2 Sensors Controlling Fresh Air Rate

Credit shall be achieved where the following requirements are met.

i. All air handling units and/or primary air handling units installed by the Applicant and supplying fresh air to the project area must be variable speed drive and controlled by CO2 sensors capable of sensing space use and modulating fresh air rate in response to space demand; and

ii. Testing and commissioning records must indicate at what CO2 level the economiser will introduce natural cooling into the space.

Recommended Installation Positions for Air-conditioning Units

Credit shall be achieved where the following requirements are met.

i. All air-conditioning units (including indoor and outdoor units of split-type / VRF air-conditioning units and window type air conditioning units) installed by the Applicant and serving the project area shall comply with the recommended installation dimensions given in manufacturer installation specifications;

ii. Installation drawings demonstrating that the installation dimensions of the air-conditioning units installed must be provided; and

iii. Letter from manufacturer or supplier stating that the installation position of air-conditioning units complying with the recommended installation dimensions for specific project is not the preferred supporting documentation.

Provision of Openable Windows

Credit shall be achieved where the following requirement is met.

i. There are openable windows within the project space and the total area of the openable windows is at least 1/16 of the floor area.

MINIMUM SYSTEM REQUIREMENTS FOR PRESCRIPTIVE LIGHTING STRATEGIES

Reduction of Lighting Power Density (LPD)

Credit shall be achieved where the following requirements are met.

i. The calculation method for Lighting Power Density (LPD) must follow the latest version of BEC; and

ii. Baseline value shall follow the latest version of BEC.

Appropriate Zoning and Manual Control Distribution

Credit shall be achieved where the following requirements are met.

i. Every solar exposure has a separate control zone allowing occupants to switch on/off (or adjust lighting level) of a lighting zone according to their need;

ii. Open plan spaces are separately zoned (1 control for every 15 m^2) to enable independent control of lighting zones; and

iii. The manual controls must have indication / illustration (e.g. electronic touch-screen control, simple illustration next to switches) allowing occupants to easily identify the lighting arrangement.

Daylight Dimming Controls

Credit shall be achieved where the following requirements are met.

i. All lightings located in areas with access to daylight are controlled by daylight dimming controls; and

ii. Testing and commissioning records must indicate at what levels of daylight the lighting are automatically adjusted, the power consumption and the installation location of the sensors selected allows proper sensing of daylight level of the space.

Occupancy Sensor Controls

Credit shall be achieved where the following requirements are met.

i. Normally occupied areas during business hours (e.g. open plan offices) are provided with programmable timer integrated with occupancy sensors controls capable of modulating lighting system (either controlling the lighting level and/or on/off of lighting) in response to lower / no lighting demand after business hours;

ii. Private offices and specialty occupancies (conference rooms, multi-purpose rooms, kitchen, pantry, plantroom, store rooms, etc.) are provided with occupancy sensor controls capable of sensing space use and modulating lighting system (either controlling the lighting level and/or on/off of lighting) in response to space demand;

iii. Open plan spaces are separately zoned (1 occupancy control for every 15m^2) to enable independent control of lighting zones; and

iv. Switches are installed for occupants to overwrite the control.

Task Light for Every Workstation

Credit shall be achieved where the following requirements are met.

i. The lighting level of overhead lighting can be lower during business hours; and

ii. The task light can provide at least 300 lux measured on the desk level.

Main switch at the entrance of the premises

Credit shall be achieved where the following requirement is met.

i. A main switch at the entrance of the premises so that the last staff can switch off all the lighting systems when leaving the premises;

External Lighting Control

Credit shall be achieved where the following requirements are met.

i. The lighting control can turn off the signboards and non-essential lighting after operating hours, or no later than 11pm.

9.2 PROVISIONS FOR ENERGY MANAGEMENT

9.2.1 COMMISSIONING PLAN

To execute commissioning in a comprehensive and orderly manner a commissioning plan, covering a given system, equipment or component shall be prepared. The plan shall include:

i. start-up and inspection checklists and procedures;
ii. functional performance testing procedures and checklists;
iii. testing, adjusting, and balancing;
iv. development of an operations and maintenance manual and energy management manual; and
v. completion of the commissioning report.

For each system commissioned the plan shall provide:

i. an overview of the tasks to be executed during commissioning;
ii. a list of all features to be commissioned;
iii. a list of reference documents related to commissioning, including specification references, drawing list, and submittal drawings;
iv. a list of primary participants in the commissioning process and their responsibilities;
v. a plan for management, communication and documentation;
vi. description of checklists and tests to be performed, with reference to specification;
vii. pre-start and start-up checklists;
viii. list of the functional performance tests to be performed; and
ix. description of the training to be provided to the operations and maintenance personnel.

9.2.2 COMMISSIONING REPORT

The report shall contain:

i. an executive summary;
ii. list of participants and their respective roles;
iii. a brief building / space description;
iv. an overview of the scope of commissioning and testing;
v. a general description of testing and verification methods;
vi. a list of each feature or system commissioned; and
vii. for each piece of commissioned equipment, the determination of the CxA regarding the adequacy of the equipment, documentation and training.

The commissioning report shall address the following areas:

i. adequacy of equipment with respect to construction documents and design intent;
ii. equipment installation;
iii. functional performance and efficiency;
iv. equipment documentation;

v. operations and maintenance review and recommendations; and

vi. operator training.

The functional performance and efficiency section for each piece of equipment shall identify the verification method used observations and conclusions from the testing.

The report must also include a list of outstanding commissioning issues and any testing that is scheduled for a later date.

All outstanding deficiencies identified during or as a result of commissioning activities shall have been corrected or must be separately listed and highlighted in the commissioning report.

Each non-compliance issue must be referenced to where the deficiency is documented.

Verification and documentation of installation of systems, equipment and components shall ensure:

i. that they are installed according to construction documents and manufacturer's instructions;

ii. or any differences between the final installation and the original construction documents are documented;

iii. that other building systems or components are not compromising the efficiency of the systems or features being commissioned;

iv. the start-up and inspection checklists were completed and performed as required;

v. that functional performance tests are completed as required.

vi. that HVAC piping testing and duct testing is completed and documentation is included in operations and maintenance manuals;

vii. functional testing of any control systems;

viii. that testing record include any deficiencies and corrections;

ix. final testing outcomes are included in the commissioning report and in operations and maintenance manuals;

x. documentation of any seasonally deferred testing and corrections of any deficiencies;

xi. the operations and maintenance manual and energy management manual are complete for all components, equipment, subsystems, and systems that have been commissioned; and

xii. adequacy of training provided for the Owner's management, operations and maintenance personnel.

If components, equipment, subsystems, or controls, or sequences of operations as-built are differing from the original construction documents, the report shall detail these differences.

If seasonally deferred testing is completed to be under the original contract, the CxA shall issue an addendum to the report, arranged in the same manner as in the initial report.

9.2.3 OPERATIONS AND MAINTENANCE MANUAL

The parties responsible for the design of each system to be commissioned shall provide in writing:

i. the design intent;

ii. the basis of design; and

iii. full sequences of operation for all equipment and systems, all

of which must meet the legal requirements and industry wide standards.

The description of the design intent should include as a minimum:

i. space temperature and humidity criteria (refer also to the section on IEQ);

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

iii. ventilation requirements and related indoor air quality criteria (refer also to the section on IAQ);

iv. performance criteria related to energy efficiency;

v. environmental responsiveness of the facility; and

vi. commissioning criteria.

The basis of design shall include at a minimum:

i. details of occupancy;

ii. space activity and any process requirements;

iii. applicable regulations, codes, and standards;

iv. design assumptions;

v. performance standards and benchmarks; and

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

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

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

ii. submittal data; and

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

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

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

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

iii. parts list and details of and special tooling requirements; performance data; and

iv. warranty information.

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

i. control drawings and schematics;

ii. normal operation;

iii. shutdown;

iv. unoccupied operation;

v. seasonal changeover;

vi. manual operation;

vii. controls set-up and programming;

viii. troubleshooting;

ix. alarms; and

x. final sequences of operation.

9.2.4 ENERGY MANAGEMENT MANUAL The details shall include:

i. guidelines for establishing and tracking benchmarks for space energy use and primary plant equipment efficiencies;

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

iii. final sequences of operations for all equipment;

iv. procedures for seasonal start-up and shutdown, manual and restart operation;

v. as-built control drawings;

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

vii. specifications for re-calibration frequency of sensors and actuators by type and use;

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

ix. recommendations regarding seasonal operational issues affecting energy use;

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

xi. schedules of inspection frequency for reviewing the various set points and reset schedules to ensure they still are near optimum;

xii. list of time-of-day schedules and a frequency to review them for relevance and efficiency; and

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

9.3 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 space.

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 space and the baseline space.

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 $9m^2$/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 same occupancy load shall apply to the project space and the baseline space.

FLOW RATE CONSIDERATIONS

The flow rate of the water appliance should be read as an absolute figure irrespective of the working pressure in predicting the water consumption.

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 space 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.

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 8 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. 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.

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1 Buildings Department (2011), Code of Practice for Fire Safety in Buildings.
2 Buildings Department. Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers. PNAP No. ADV-28 Provision of Sanitary Fitments in Offices, Shopping Arcades, Department Stores, Places of Public Entertainment, Cinemas and Other Public Places.

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
Tap Toilet (Model 123)	10	5	6	4	5	3.3
Tap Pantry (Model 456)	15	1	8	4.5	2	1.1
Estimated total daily consumption per occupant (litres)					7	4.4
Number of occupants[(B)]					30	
Number of day					365	
Estimated total annual consumption (litres)					76,650	48,180
% of water saving:					37.1%	
Credit Anticipated:					1 credit	

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.

9.4 FEATURES CONSIDERED AS INNOVATIONS

The section provides features that will be favourably considered as innovative techniques and performance enhancements for, which bonus credit may be achieved upon at the sole discretion of BSL TRC based on the features implemented and its supporting information.

The list below will be updated from time to time in order to reflect the latest trend of building technology development and construction practices that should be encouraged.

REAL TIME ENERGY MONITORING DISPLAY	1 bonus credit will be considered for the adoption of real time energy monitoring display installed at entrance (or at high pedestrian flow path) for staff or space user to monitor their energy usage.
IAQ EXCELLENT CLASS	1 bonus credit will be considered for achieving Excellent Class in indoor air quality of the project space. Valid IAQ certificate or IAQ measurement report conducted by HOKLAS certified service provider should be provided.
OUTSTANDING ENERGY PERFORMANCE	1 bonus credit will be considered for achieving 2 or more credits in addition to the 14 credits achieved in EU 1 using the Prescriptive-based Approach. Please note: the maximum credits achievable in EU 1 are still 14 credits.
RENEWABLE ENERGY SYSTEMS	1 bonus credit will be considered for adoption of renewable energy system(s) that generate energy for space usage. (e.g. electricity by PV panel, hot water by solar hot water system)
EFFICIENT HOT WATER HEATING	1 bonus credit will be considered for adoption of heat pump water heater (or other forms of water heating technology) that can save 50% or more energy compared to fossil fuel or resistance type electric water heater.
MIXED MODE VENTILATION SYSTEMS	1 bonus credit will be considered for project space utilises natural ventilation when outdoor condition is suitable or project located in building that can provide mixed mode ventilation to the project space.
AIR-CONDITIONING CONDENSATE REUSE	1 bonus credit will be considered for adoption of air-conditioning condensate reuse system installed by the Applicant or provided by the host building and serving the project space.
TEMPORARY PROTECTION MADE FROM RECYCLED MATERIALS	1 bonus credit will be considered for adoption of recycled materials for all temporary protection during construction works.
WASTE RECYCLE FACILITIES FOR BUSINESS SPECIFIC MATERIALS	1 bonus credit will be considered for providing the storage facility for 1 type of recyclable materials which are not addressed in section MA 1 and hire a recycler for collection. The proposed type of recycle material shall be one of the major waste regarding to the Applicant's business operation within the project space.
CERTIFICATION TO ISO / OHSAS	1 bonus credit will be considered if the management of Applicant's organisation operates ISO 14001 / OHSAS 18001 / ISO 50001.
ENERGY CUM CARBON AUDIT	1 bonus credit will be considered for conducting energy cum carbon audit for premises being occupied for more than 12 months.
MOVABLE PARTITIONS SYSTEM	1 bonus credit will be considered if the project space has adopted movable partitions system for flexibility.

9.5 ABBREVIATION

ACQWS	Advisory Committee on the Quality of Water Supplies
ARCHSD	Architectural Services Department
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
BS EN	British Standard
BSRIA	Building Services Research and Information Association
CFC	Chlorofluorocarbons
CIBSE	The Chartered Institution of Building Services Engineers (UK)
CSR	Corporate Social Responsibility
CxA	Commissioning Authority
EMS	Environmental Management System
EMSD	Electrical and Mechanical Services Department
EPD	Environmental Protection Department
FSC	Forest Stewardship Council
GWP	Global Warming Potential
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HKIE	Hong Kong Institution of Engineers
HKSAR	Hong Kong Special Administrative Region
HVAC&R	Heating, Ventilating, Air Conditioning and Refrigeration
IAQ	Indoor Air Quality
IEQ	Indoor Environmental Quality
LPD	Lighting Power Density
MERV	Minimum Efficiency Reporting Value
ODP	Ozone Depleting Potential
OHS	Occupational Health & Safety
R.P.E.	Registered Professional Engineer

SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
US EPA	The United States Environmental Protection Agency
VRF	Variable Refrigerant Flow
VSD	Variable Speed Drive
WACS	Water-cooled Air-Conditioning Systems
WELS	Water Efficiency Labelling Scheme by Water Supplies Department
WHO	World Health Organization
WSD	Water Supplies Department
WWF	World Wildlife Fund

9.6 GLOSSARY

ALTERNATIVE ASSESSMENT METHOD	Proposed criteria and assessment method submitted by Applicants 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 Appeals 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 Interiors, BEAM Plus Section refers to assessment sections such as GBA 1 - Green Building Attributes, MAN 2 - Construction IAQ Management, MA P1 - Minimum 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 or interiors project expressed as a performance level of Bronze (above average), Silver (good), Gold (very good) or Platinum (excellent).
BEAM PRO	A trained professional engaged by the Applicant to help integrate sustainability measures into the project and facilitate information submissions for assessment.
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.
BONUS CREDITS	Bonus credits may be achieved only in the Innovations and Performance Enhancements category (not in any of the other six BEAM Plus Interior categories), where the BSL TRC has approved the Applicant's submission. Bonus credits count towards the total credits obtained, but not towards the total credits obtainable.
BSL COORDINATOR	An officer of the BSL that maintains day-to-day liaisons between the Applicant, the BSL, and the assigned BEAM Assessor 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.
CENTRAL BUILDING SERVICES	Independent central plant equipment (i.e. air-conditioning, lighting, electrical installations and lifts and escalators) in the host building that are controlled by the landlord and not by the Applicant.
CENTRALISED AIR-CONDITIONING SYSTEM	Central air conditioning systems serve multiple units within the same building from one location. These typically use chilled water as a cooling medium and use extensive ductwork for air distribution.
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.
CHLOROFLUOROCARBONS	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.
COMMISSIONING AUTHORITY	The CxA is the individual designated to organise, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the owner, designer, and contractor to ensure that systems are installed and function in accordance with the owner's requirements.
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.
CONDITIONED SPACE	Conditioned space is the part of a building that is cooled or heated, or both, for the comfort of occupants.
CREDIT	In BEAM Plus Interiors, 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.
DECENTRALISED AIR CONDITIONING SYSTEM	Decentralised air conditioning systems typically serve a single or small spaces from a location within or directly adjacent to the space. These are essentially direct expansion (DX) type and in accordance with Building Energy Code, these include: window type air conditioners, split type air conditioning systems, Packaged Air Conditioners, VRF, etc.
DECONSTRUCTION AND CONSTRUCTION WASTE	All waste (including recyclable waste) generated from demolition, renovation and construction works are counted as demolition and construction waste. Tools that can be reused in other construction projects (such as, metal platform, bamboo scaffolding, temporary timber formwork, etc.) are not classified as waste or recyclable material and hence are excluded from the waste calculation.
DESIGN CONDITION	The condition that is controlled, designed and renovated by the Applicant.
DESIGN TEAM	The design team comprises all those professionals normally engaged in the design and contract administration of a fit-out project. These typically include architects, engineers (structural, civil, building services, mechanical, electrical, fire), project manager, quantity surveyor, environmental consultant, landscape architect, acoustics consultant, facade engineer, lighting consultant, etc.
DESIGNED FOR DISASSEMBLY	Materials which can be disassembled by using non-specialist tools and for reuse, recycling or reprocessing.
DIRECT EXPANSION (DX) REFRIGERATION	In DX refrigeration the air is cooled directly exchanging heat from the refrigerant.
EMBODIED ENERGY	Embodied energy is the energy used during the entire life cycle of a product, including its manufacture, transportation, and disposal, as well as the inherent energy captured within the product itself.

ENERGY SIMULATION	An energy simulation model is a computer-generated representation of the anticipated energy consumption of a building (or a space). It permits a comparison of energy performance.
ENVIRONMENTALLY MANUFACTURED MATERIALS	Materials that are produced by manufacturer with an recognised environmental management system, EMS in place (such as ISO 14001:2004). The EMS shall help the manufacturer minimise how their operations (processes etc.) negatively affect the environment (i.e. cause adverse changes to air, water, or land), comply with applicable laws, regulations, and other environmentally oriented requirements, and continually improve in the above.
EXFILTRATION	Air leakage through cracks and interstices and through the ceilings, floors, walls and the envelop.
EXHAUST AIR	Air is removed from a space and discharged outside the building by mechanical or natural ventilation systems.
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 less 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.
HOST BUILDING	The building in which the project space is located.
HOST BUILDING PROVISIONS	Those building services and systems provided by the building owner / landlord for use by the Applicant in the occupied space being certified (typically including central air conditioning, fan coil units / VAV terminals, lighting fixtures and controls, power supply, basic plumbing, etc.).
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.
INTERIORS PROJECT	A project that involves the planning, design, construction and commissioning of the fit-out, renovation and refurbishment of internal occupier spaces within a building.
MERV	Minimum efficiency reporting value, commonly known as MERV rating is a measurement scale designed by the American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc. (ASHRAE) to rate the effectiveness of air filters.
MODULAR COMPONENT	Materials which are manufactured with standardise dimensions, and can be arranged or fitted together in various scenarios of design.
MVAC	Mechanical ventilation and air conditioning installations.

OWNER'S PROJECT REQUIREMENTS	A summary document outlining the project owner's goals, expectations and performance criteria to the designers, project team, CxA, BEAM Pro, contractors, operations and maintenance personnel and others. The OPR often includes specific issues for incorporation to fulfil the requirements of green building rating systems to which the project will subscribe.
OZONE DEPLETING POTENTIAL	ODP of a chemical compound is the relative amount of degradation to the ozone layer it can cause.
PARTITION	Partition for separating workstations (usually around the height 1300 – 2000mm high). Construction materials are usually metal, glass, plastic, etc.
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 CREDITS	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.
PRIOR CONDITION	This can be (1) condition when previous tenant's moved out, (2) property management company provided condition of project space for Applicant, or (3) prior to renovation where the area is controlled by Applicant.
PROJECT SPACE	The BEAM Plus for Interiors certified area.
RAPIDLY RENEWABLE MATERIALS	Planted and harvested in less than a 10-year cycle, and do not result in significant biodiversity loss, increased erosion, or air quality impacts.
RECYCLE CONTENT	With reference to ISO 14021, recycle content is defined as the proportion, by mass, of the recycled material in a product.
REGIONAL MANUFACTURED MATERIALS	Materials which are manufactured / assembled within 800km radius of the project space.
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.
REUSE	Materials which can be used again with the same functions as their original use.
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.
SUSTAINABLE FORESTRY PRODUCT	Originally sourced from forestlands participating in an acceptable system or program which certifies sustainable forest management.
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.

UNITARY AIR CONDITIONING UNIT	As defined in decentralised air conditioning system.
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.
WALL	Full height wall (up to ceiling). Construction materials are usually concrete block with plaster or timber stud wall with plaster board (drywall).
ZERO-CREDIT BENCHMARK	In Performance-based approach, zero-credit benchmark means the 'Energy Budget' for an assessed interior space is the predicted annual energy use for a baseline interior space.

9.7 FEEDBACK FORM

BEAM PLUS INTERIORS – FEEDBACK FORM			
The BEAM Society Limited values your opinions and expertise in improving the *BEAM Plus Interiors* standard. Should you have any comments and suggestions, feel free to complete this feedback form template and scan and return it to the BEAM Society Limited Secretariat at enquiry@beamsociety.org.hk.			
Your Name:		**Position:**	
Organisation:			
Contact Number:		**Email Address:**	
Project Title:			
BEAM Plus Reference (if applicable):		**Date:**	
Your Role (please tick):		**Nature of feedback (please tick):**	
client / owner	( )	overall framework	( )
occupant / tenant	( )	credit criteria	( )
designer	( )	assessment method	( )
contractor	( )	submission templates	( )
BEAM Professional	( )	certification process	( )
other	( )	other	( )
Your feedback:			
Declaration: I hereby grant the BEAM Society Limited or its agent the non-exclusive royalty rights, including non-exclusive rights in copyright, for my proposals. I understand that I acquire no rights in publication of the standard in which my proposals in this or other analogous form is used. I hereby attest that I have the authority and am empowered to grant this copyright release.			
BEAM Society Limited | enquiry@beamsociety.org.hk | Tel: (852) 3610 5700 | Fax: (852) 3996 9108 **Address** | 1/F Jockey Club Environmental Building, 77 Tat Chee Avenue, Kowloon Tong, Hong Kong			

9.8 SUBMISSION TEMPLATES

coming soon