Pre-Design

Design

Construction

Operation

CEPAS

Comprehensive Environmental Performance Assessment Scheme for Buildings

Operation Stage

2006 Edition

ARUP

屋宇署
BUILDINGS DEPARTMENT

Comprehensive Environmental Performance Assessment Scheme for Buildings

Operation Stage Assessment Manual

Buildings Department

HKSAR Government

2006 Edition

CONTENT

PREFACE

Thank you for reading this CEPAS Operation Stage Assessment Manual.

This assessment manual for **Operation Stage** forms one part of the holistic life-cycle considered comprehensive environmental performance assessment scheme (CEPAS) for buildings in Hong Kong. It is for use during the building operation period. The target users for these publications are building developers, owners, designers and building environmental specialists, i.e. all parties of the building industry. The general public is also encouraged to use this scheme to understand more about building environmental issues. It is expected that the building performance will be improved when all the users are involved.

The entire CEPAS assessment scheme consists of the following publications:

- CEPAS Application Guidelines
- CEPAS Pre-design Stage Assessment Manual
- CEPAS Design Stage Assessment Manual
- CEPAS Construction Stage Assessment Manual
- CEPAS Operation Stage Assessment Manual

The CEPAS manuals are prepared to provide a measure to evaluate sustainability performance for all building types in Hong Kong. It is expected that this assessment scheme (2006 edition) will continue to develop by sharing research supports and implementation experience with other local and international assessment scheme. In order to maximise the flexibility of building planning, design, construction and operation, there is flexibility in a number of the indicators within this assessment scheme. It is recommended that this assessment scheme be used with reference to related technical guidelines from local and international academia, professional organisations and the Government.

These CEPAS manuals were written by Ove Arup & Partners Hong Kong Limited and the associated sub-consultants. The scheme has incorporated advices from local experts and the Steering Group members, issues raised in the Discussion Forum and Expert Panels, as well as findings of Questionnaire Survey to the stakeholders. The CEPAS assessment schemes, application guidelines and other codes, handbooks and information published by the Buildings Department can be downloaded at http://www.bd.gov.hk.

December 2006

CEPAS Building Data Sheet (Operation stage)

BD Ref. No.				
Building Name				
Building Address				
Building Type	**RESIDENTIAL**		**NON – RESIDENTIAL**	
	Usages		**Usages**	
Building Dimensions	Total site area (m^2)		Total site area (m^2)	
	Total floor area (m^2) (A_{O-R})		Total floor area (m^2) (A_{O-NR})	
	Occupancy (Person)		Occupancy (Person)	
	Building Height (m)		Building Height (m)	
	No. of floor (include basement)		No. of floor (include basement)	
	Open space area (m^2)		Open space area (m^2)	
			Non – residential building (Office & public place floor area, i.e. area assigned for use by the tenant / landlord / public, such as office, common area, shop, within the total enclosed space) (m^2)	
			Non – residential building (Other than office & public place floor area) (m^2)	

Completed Assessment Submission Record

Building Type	**RESIDENTIAL**		**NON – RESIDENTIAL**	
STAGE	This submission (Tick one)	Building stage assessed (Tick relevant)	This submission (Tick one)	Building stage assessed (Tick relevant)
Pre-design				
Design				
Construction (Construction works)				
Construction (Demolition works)				
Operation				
Operation (Re-assessment)				

INDOOR ENVIRONMENTAL QUALITY (IE)

IE 1 Health & Hygiene

IE 1.1 Health & Hygiene

Intent To minimise the threat of health and hygiene problems arising from building operation

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		IE 1.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Formulation of a building hygiene management plan	0	1		0	1	
2	Good ventilation in common corridors and lift lobbies	0	1		0	1	
3	No narrow and deep re-entrant in high rise residential block	-	-	N/A	0	1	
4	Carry out regular inspection of hygienic conditions and cleansing of common parts of the buildings	0	1		0	1	
5	Space provision in core and shell area for cleansing facilities and storage of cleansing equipment	0	1		0	1	
6	Maintain water trapping of the floor drain	0	1		0	1	
7	Operate and maintain a good cooling tower, hot water system and associated water treatment system with efficient minimisation of health risk	0	1		-	-	N/A
8	Sufficient air relief / transfer air is provided in lavatories and bathrooms when mechanical air extraction is used	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	

RESIDENTIAL	Sub-criteria performance score (P_O)	(B)/(A) = P_O	

Explanation

Item 1: This indicator aims to encourage the building operator to formulate a building hygiene management plan and to provide a well-managed hygienic environment for building. Formulation of building hygiene management plan should include developing policies and programme with regard to cleaning (materials, time, and frequency), occupant complaint log and response, and refit and renovation activities. Proactive management and appropriate operation and maintenance measure will minimize operational problems and demonstrate due diligence. Proper operations and maintenance of the building and systems can effectively provide good IAQ. It also demonstrates that the building owners or other concerned parties have diligently applied good practices for the health and safety of building occupants.

Item 2: This indicator is assigned to recognise better ventilation at common corridor and lift lobbies on typical floor and main entrance lobby in order to enhance the environmental hygiene. Natural ventilation and mechanical ventilation are both acceptable. Intake and exhaust points, and ventilation openings should be properly provided to prevent contaminated outdoor air and avoid short-circuiting of intake and exhaust. For natural ventilation provision, sufficient fresh air through the entire corridor and lobby are required. Cross ventilation i.e. openings provided at both ends of corridor and lobby, is encouraged to enhance the thermal comfort. If natural ventilation is not feasible, mechanical ventilation shall be provided. For air-conditioned/ mechanical ventilated lobby and common corridors, mechanical ventilation with minimum 1.5 ACH is considered as acceptable minimum. The air path of both air-conditioning and mechanical ventilation installations shall be conveniently accessible for maintenance. In addition, the BD PNAP 287 can also be referred.

Item 3: In Hong Kong, residential buildings are usually provided with windows of kitchens and habitable rooms opened into the re-entrants for satisfying the requirements on natural lighting and ventilation. The quality of air and light of the re-entrant affects the health and hygiene of the interior space. Under the prevailing high-rise and high-density built environment of Hong Kong and current hygienic conditions the re-entrants of many existing buildings, such building provisions may pose potential health risk associated with the badly-maintained deep re-entrants. This indicator aims to give credit to high-rise building not provided with such deep re-entrants. This criterion can be satisfied if the rooms facing into the re-entrants can achieve the performance requirements of lighting and ventilation as stipulated in the BD PNAP 278. If the condensers of air-conditioners are also located inside the re-entrant, the designers are also required to justify that the chimney effect will not affect the normal operation of the air-conditioners at high-level floors.

Item 4: Regular inspection and cleansing of common areas of buildings regularly (at least once a day for general cleansing and once a month for intensive cleansing) is required. The common areas include the main entrance lobby, lift cars, escalator, security guard booth, public toilets, garden, refuse collection chambers, corridors, common and recreational facilities, and other public places such as open space, shopping centre, market, carpark and club house, etc. Refuse collection and removal shall be carried out everyday.

For instance, mosquitoes breed in stagnant water and may bite building occupants, causing reddening, swelling and itching as well as transmission of diseases. Inspection of the building should take place a minimum of once a week to eliminate health risks such as mosquito growth and bad smell. A designated person (assigned by the building operator) is required to arrange cleansing and remedial works such as stagnant water removal. The leaflet “Let’s Remove Stagnant Water: Eliminate

Mosquito for Healthy Living" published by Food and Environmental Hygiene Department can be referred.

Item 5: The designated space / room(s) shall be in form of a cleaning room with sufficient storage area and a washing basin or cleansing water tap inside the store room or adjacent area, to allow the washing of cleansing equipment and the storage of cleansing commodities. The number of cleaning room on each floor shall be provided relative to the size of each floor, but a minimum of one room is required for each floor of non-residential building. For residential building, at least one cleaner room should be provided for each building block.

Item 6: The water held in the water trap of the floor drain may evaporate and lead to disease transmission. Putrid air and insects in the soil pipe should be prevented from entering building. A designated person is recommended to pour water into floor drain, regularly (at least once a week), where necessary, in order to maintain effective water trapping within the floor drain. The pre-requisite requirement for this indicator is U-shaped water traps, bottle traps or anti-syphon traps should be installed for all floor drains within the building. The leaflet "How Drainpipe Traps Protect Your Health", published by the Department of Health can be referred.

Item 7: This indicator is assigned to encourage well operated and maintained cooling towers, and hot water and water treatment systems with effective control of water quality in cooling water circulation and storage installations. This indicator aims to prevent disease such as Legionnaires Disease from occurring and to prevent the creation of adverse environmental effects within the building and the surroundings. The HKPLDC Code of Practice for the Prevention of Legionnaires Disease shall be adopted as the minimum requirements in the operation and maintenance of relevant systems.

Item 8: For bathrooms and lavatories with a mechanical air extraction system, insufficient mechanical fresh air supply or natural air relief / transfer air may create excessive-negative pressure environment inside the space. Excessive-extraction of air coupled with insufficient supply of fresh air to bathroom and lavatories, is thought to be one of the many factors that may have contributed to the spread of diseases. Hence, this indicator is assigned to recognise proper provision of air extraction system to maintain a balanced pressure or slightly negative pressure inside bathrooms and lavatories, to minimise the risk of disease and smell spreading. This indicator is not applicable for solely natural ventilated bathrooms and lavatories.

Innovation Item:

Innovative method to enhance the health and hygiene of the building

This is a bonus score for innovative method to enhance the health and hygiene environment of the building by means of additional measures or management strategies during building operation.

Submittal

The following information shall be provided to demonstrate compliance with the Strategy Indicators:

- Building hygiene management plan.
- Hygiene management plan implementation records.
- Photos to support the management plan implementation.
- Drawings to show the building provisions, systems and access / cleansing routes.

IE 2 Indoor Air Quality

IE 2.1 Indoor Air Quality Certification

Intent To provide and maintain good indoor air quality in occupied space and to achieve IAQ Certification

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings (office & public places only)	Residential & Non-residential building (other than offices and public places)
Fail	Any poor fresh air intake location is identified	Any poor fresh air intake location is identified
1	All fresh air intakes located away from pollutant source with reasonable separating distance	All fresh air intakes located away from pollutant source with reasonable separating distance
2	Building certified as `Good' class by the EPD IAQ Certification Scheme and with good fresh air intake locations	Building achieved the **relevant** criteria in the `Good' Class of EPD IAQ Certification Scheme and with good fresh air intake locations
3	Building certified as the `Excellent' class by the EPD IAQ Certification Scheme and with good fresh air intake locations	Building achieved the **relevant** criteria in the `Excellent' Class of the EPD IAQ Certification Scheme and with good fresh air intake locations
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		IE 2.1 Score

Explanation In this indicator, non-residential buildings (offices and public places) refer to all buildings and totally enclosed areas served with mechanical ventilation and air-conditioning systems, except for a whole building / part of the building used for residential, medical and industrial purposes.

Non-residential buildings (other than offices & public places) refers to buildings served with mechanical ventilation and air-conditioning systems, but not limited to the usages of industrial buildings, such as building for manufacturing and godown; medical buildings, such as clinics, infirmaries & hospitals.

The EPD Indoor Air Quality Certification Scheme for Offices and Public Places is referred in these sub-criteria. The indoor air quality objectives for `Good' and `Excellent' classes have been described in the EPD guideline. A building not operated to satisfy the air quality objectives of the `Good' class of the EPD guideline, is considered not to satisfy the EPD IAQ Certification Scheme.

The requirements of IAQ measurements shall in any case fulfil the latest requirements as published by the EPD IAQ Certification Scheme. Possible methods to achieve the indoor air quality objectives are referred to in the EPD Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places, and the Section A5: Indoor Air Quality of the General Specification for Air-conditioning,

Refrigeration, Ventilation and Central Monitoring & Control System Installations in Government Buildings of the HKSAR, 2001 edition, ArchSD.

For residential buildings, the IAQ objectives of Radon and Formaldehyde in the EPD IAQ Certification Scheme are applicable.

For medical buildings, all IAQ objectives, except for relative humidity in the EPD IAQ Certification Scheme, are applicable. The required relative humidity in the common spaces and general ward of medical buildings is 40-70% RH.

For industry buildings and other building types, all IAQ objectives, except for room temperature, relative humidity and air movement in the EPD IAQ Certification Scheme, are applicable.

For the requirement of locating fresh air intake, all fresh air intakes should be away from pollutant sources, that include, but are not limited to building exhaust air louvers and exhaust outlet from adjacent buildings, air exhaust openings of refuse collection room enclosed / semi-enclosed car parks and public transport terminal, smoke discharge openings, and gas discharges, exhaust from toilets and kitchens, drainage vents, etc. (e.g. hydrogen discharge from electro-chlorinator).

Natural or mechanical fresh air intakes located at least 5 meters away (horizontal / vertical) from any potential pollutant source is considered acceptable, providing the louvers are not facing a permanent external obstruction within 5 metres in radius. If a permanent external obstruction is located within 5 metres (horizontal / vertically above louver) in a radius away from a fresh air louver, the fresh air intake located at least 10 meters away from any potential pollutant source is also accepted. Fresh air intake openings protected from rain entrainment and covered by a screen to prevent entry of birds, rodents and extraneous articles are also required. ASHRAE Standard 62.1-2004 or its updated versions, The CIBSE TM21:1999 Minimising Pollution at Air Intakes can be referred as reference.

For renewal of the CEPAS label, buildings attained “Good” or “Excellent” class of the EPD IAQ Certification Scheme must have maintained the IAQ certification status (i.e. to renew their IAQ certificates annually) in the past four years before renewal of the label.

Submittal

The following information shall be provided to demonstrate compliance with the Performance Indicators:

- IAQ strategy report together with relevant certificates.
- Drawings to indicate the louvre locations, surrounding pollutant sources and their separation.
- Relevant photo evidence.

IE 2.2 Thermal Comfort

Intent To provide and maintain good thermal comfort in occupied space

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	PMV > ± 2 for the hottest and coldest month of a year	Provision of openable windows as required by the Building Regulations
1	PMV ≤ ± 2 for the hottest and coldest month of a year	Indoor operative temperature = 80% acceptability limits prescribed in ASHRAE Standard 55-2004
2	PMV ≤ ± 1.5 for the hottest and coldest month of a year	80% acceptability limits prescribed < Indoor operative temperature ≤ 90% acceptability limits
3	PMV ≤ ± 1 for the hottest and coldest month of a year	Indoor operative temperature > 90% acceptability limits
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		IE 2.2 Score

Explanation

Thermal comfort depends on a large number of factors. According to ASHRAE Standard 55-2004, these factors include the activity (metabolic rate) and clothing (thermal resistance) of occupants, air temperature, mean radiant temperature, relative humidity of the space. Predicted Mean Vote (PMV) method as adopted by ISO 7730:1995 could be used as a measure to assess the thermal comfort of a space. The calculation method and assumptions as detailed in ISO 7730:1995 have considered the above-mentioned parameters to define comfort.

For a non-residential building provided with air conditioning, the dominating parameters are the air temperature and the humidity, which can be controlled through effective air conditioning provisions and can be validated by standard measurements. This indicator is applicable to typical floor lobby and occupied areas only. The values of other secondary parameters for PMV calculation may use the assumed design values or that suggested by ISO 7730:1995 and the ASHRAE Standard 55-2004. Mean radiant temperature should also be measured for building performance that may result in an asymmetric radiation cased by a warm ceiling.

For residential buildings, which are normally designed with natural ventilation by means of openable windows, the thermal comfort is determined by the acceptable operative temperature, the value of which has been established in ASHRAE Standard 55-2004. This indicator is applicable for habitable rooms of typical residential flats and typical floor lobby.

Submittal

The following information shall be provided to demonstrate compliance with the Performance Indicators:

- Site measurement report and drawings indicate the locations designated for assessment.
- HVAC system descriptions and relevant calculations.
- Indoor environmental conditions and usage information.

IE 2.3 IAQ Strategies

Intent To provide and maintain good indoor air quality in occupied spaces

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		IE 2.3 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Survey of baseline outdoor air quality of the site to compare the findings with the EPD outdoor air quality objectives	0	1		0	1	
2	Provide with sufficient fresh air in HVAC systems	0	1		-	-	N/A
3	Provide with good natural ventilation in habitable rooms and kitchens	-	-	N/A	0	1	
4	Provide with effective ventilation systems in car parks and semi-confined public transport Interchanges	0	1		-	-	N/A
5	Dedicated exhaust air duct provided to serve smoking area / Entire building employed non-smoking policy	0	1		-	-	N/A
6	Dedicated exhaust air duct provided with serve landlord / tenant copy / printing areas, and other pollutant generating areas	0	1		-	-	N/A
7	Provide well-maintained commercial kitchen ventilation system with effective oily fume and odour removal in restaurants and food business	0	1		-	-	N/A
8	Use of low emission materials in building construction	0	1		0	1	
9	Carry out regular visual inspection and test on the cleanliness of MVAC installations	0	1		-	-	N/A
10	Implement and review IAQ management plan	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

While achieving the "Excellent" class of the EPD IAQ Certification Scheme is one of the major objectives that CEPAS would encourage, there are some other good practices / strategies, that are outside the scope of the current EPD IAQ Certification Scheme, are as important to achieve a good IAQ of the overall performance of buildings .

Item 1: The indicator aims to encourage the building operator to conduct a yearly review of the fresh air flow rate or indoor air quality management measures serving the managed building, by means of reviewing the changes of outdoor air quality around the buildings. Baseline outdoor air quality of the premises can be obtained by conducting desktop survey or field measurement. Statistical data measured from the EPD air quality monitoring station, academic institutions or environmental consultants can be applied as a reference. For the site location without nearby air quality monitoring station, substantial air quality discrepancies from the nearby station are expected; or alternatively field measurement of the air quality may be required. The worst air pollution period should be predicted before carrying out the field measurement, or to carry out a year-long field measurement. The baseline outdoor air quality shall be compared with the EPD outdoor air objectives. In the case of the outdoor air quality around the site is poor than that of the EPD outdoor air quality objectives, addition of indoor air quality remedial measures is required. Chapter 3.3 of the EPD Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places can be referred.

Item 2: This indicator is assigned to assess whether the interior of building is provided with good quality fresh air to the indoor. The ASHRAE Standard 62-1999, 62.1-2001or 2004 edition: Ventilation for Acceptable Indoor Air Quality, shall be referred as the minimum compliance requirement for this indicator. The design of fresh air amount should also consider the issue of energy efficiency. Whenever possible, IAQ and energy efficiency should be optimised with response to the building usage, occupancy requirements and building services control and operations.

Item 3: The performance should be measured and complied with BD PNAP 278 Lighting and Ventilation Requirements – Performance-based approach. The provisions of effective natural ventilation should consider the site conditions and built form. Relevant standards such as BS 5925:1991 *Code of practice for Ventilation principles and designing for natural ventilation* can be referred.

Item 4: This indicator is assigned to assess whether the existing ventilation systems in car park and semi-confined public transport interchange (PTI) were well designed and are able to provide a good indoor air environment for the building users. For car park, the EPD ProPECC PN 2/96: Control of Air Pollution in Car Parks shall be referred as the minimum requirements for this indicator. For PTI, the EPD ProPECC PN 1/98: Control of Air Pollution in Semi-Confined Public Transport Interchanges (PTI) shall be referred to as the minimum requirements for this indicator. On-site air quality measurement or the air quality records from the CCMS / BMS can be used to determine the air quality. Car park and PTI are considered as shared facility for both residential and non-residential portions. If a composite building is assessed, a score shall be allocated to both residential and non-residential portions.

Item 5: This indicator is assigned to assess whether dedicated exhaust air duct is provided to extract smoke (from cigarette) from the designated smoking areas to the

outdoor. If the entire building adopted a `No Smoking Policy', this indicator is also eligible to obtain a score of 1.

Item 6: This indicator is assigned to assess whether dedicated exhaust air ducts are provided to extract polluted air from landlord's / tenants' copy / printing areas, or other pollutant generating areas. For the air duct serving landlord areas, the ducts shall be connected from the pollutant generating areas to the outdoors. For the air duct serving tenant areas, the ducts can be connected from external louvres to any part of tenant area (where it is easy for further connection by tenants to the tenant's pollutant generating areas).

Item 7: This indicator is assigned to assess whether an effective commercial kitchen ventilation system is well-maintained with effective oily fume and odour removal in Restaurants and Food Business. This indicator is applicable for the kitchen ventilation system provided and maintained by building operator and/or serving landlord area only.

Apart from the oily fume and odour removal equipment, regular cleaning of kitchen exhaust air duct and exhaust air louvers is also recommended. The air duct cleaning method and the frequency of cleaning shall refer to the HVCA TR/17: Guide to Good Practice - Cleanliness of Ventilation Systems (2002) or equivalent publications. The EPD A Guide to Control of Oily Fume and Cooking Odour from Restaurants and Food Business can also be referred.

Item 8: This indicator is assigned to check whether the building contractor / operators have used low/no VOC paint for all indoor areas instead of conventional paint in order to minimize the emission of volatile organic compounds, which contribute to the formation of photochemical smog. In addition, this indicator encourages the avoidance of high emission adhesives, sealants and wood products, which are one of the most effective indoor air pollution control strategies. Assessed building is eligible to obtain score in this indicator if low/no VOC paint is used in all indoor areas during construction stage and subsequent decoration and refurbishment works during operation stage, or, any paint used during construction stage but the subsequent decoration and refurbishment works during operation stage used no/low VOC paint in all indoor areas.

Item 9: This indicator is assigned to encourage the building operator to carry out regular visual inspection on the cleanliness of MVAC installations (air distribution portion), such as air handling unit, ventilation fan, air filter, air duct, damper, louver, etc.). Inspection shall be conducted no more than every 3 months for heavily used MVAC systems (system operate more than 12 hours a day) and 6 months for lesser frequent use MVAC systems (system operate less than 12 hours a day).

This indicator also encourages the building operator to carry out regular cleanliness test for the MVAC installations. The test shall be carried out for all air ducts not less than once a year. The testing method shall refer to the HVCA TR/17: Guide to Good Practice - Cleanliness of Ventilation Systems (2002) or equivalent publications.

Item 10: This indicator is assigned to resolve IAQ problems through in-house resources and documentation, and expert advice on IAQ management. Good health and IAQ are best achieved by periodic review and improvement of IAQ management plan, and other relevant procedure.

Innovation Item :

Innovative method used to further improve IAQ during building operating period

This is a bonus score for using an innovative method to maintain a good IAQ in the

building.

Submittal

The following information shall be provided to demonstrate compliance with the Strategy Indicators:

- Report incorporated with air quality survey results.
- MVAC system descriptions.
- IAQ strategy implementation records with relevant MVAC system maintenance & inspection records and checklist.
- Drawings to show the locations and major components of relevant installations.
- Other relevant supporting documentation for improved and innovative ideas.

IE 3 Noise and Acoustic Environment

IE 3.1 Noise and Acoustic Environment

Intent To provide and maintain good indoor acoustic quality in occupied space

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		IE 3.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Actual room criteria fulfills the recommended value without implication of background noise level	0	1		0	1	
2	Indoor environment provided with good acoustic quality	0	1		0	1	
3	Indoor environment provided with good vibration isolation	0	1		0	1	
4	Appropriate acoustic environment for the intended purposes	0	1		0	1	
5	Provision of sufficient noise insulation	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation **Item 1:** This indicator is assigned to encourage the provision and maintenance of good background noise levels to meet the recommended criteria as stipulated in recognised standards. The recommended background noise criteria shall meet the recommended Room Criteria range as described in the Table 11: Design Guidelines for HVAC-Related Background Sound in Rooms, Chapter 7, ASHRAE Fundamental

Handbook 2001 edition. The operator may choose to adopt other standards that are more appropriate to meet the specific usage requirements of the buildings.

Item 2: This indicator is assigned to minimise external noise influence to the interiors. Mitigation measure such as external noise barriers can be considered as described in the BD, LandsD & PlanD Joint Practice Note No. 1 & 2. In addition, appropriate building layout and design (e.g. orientation of building and podium, etc) should also be addressed under this item. This indicator is applicable for the building or portion(s) of the building suffer from frequent outdoor noise nuisance. Even the outdoor noise level must satisfy the current statutory requirements (i.e. minimum requirements). Potential noise nuisance shall be identified by site survey to determine the applicability of the design indicator.

Item 3: This indicator is assigned to maintain an indoor environment with minimal excessive vibration, where it is generated from building services installations and external vibration source. The criteria is set to ensure that the vibration levels do not exceed the prescribed limited as stipulated in ISO 2631-2:1989.

Item 4: This indicator is assigned to maintain an indoor environment with good noise absorption, by meeting the following requirements.

- Non-residential buildings (except hotel and serviced apartment rooms): Reverberation time (RT) of A-weighted sound pressure level in modular offices, conference rooms, and classrooms or similar premises ≤ 0.6s.

- Residential buildings and non-residential buildings (hotel and serviced apartment rooms): Reverberation time (RT) in bedrooms and living rooms: 0.4s ≤ Reverberation Time ≤ 0.6s.

RT can be measured by making reference to some standard acoustics handbooks, which state the notional sound absorption coefficient (e.g. Woods Practical Guide to Noise Control etc.). It is suggested that using the mid frequency at 500Hz would be appropriate as far as speech intelligibility is concerned.

In general, the RT compilation is subjected to the Sabine reverberation time equation. For premises with specific features (e.g. tall atrium and long adits), alternative methodology could be considered.

Item 5: This indicator is assigned to award building provided with noise insulation of buildings based on relevant established industry standards. The operator may choose to adopt other standards that are more appropriate to meet the specific usage requirements of the buildings.

- Non-residential buildings (except hotel and serviced apartment rooms): ≥ STC 50 for private offices and other noise sensitive area or Sound Transmission Class of walls between classroom ≥ STC37 for classroom on the same floor.

- ≥STC 50 & Impact Noise Insulation Class IIC46 between floors.

- Residential buildings and non-residential building (hotel and serviced apartment l rooms): Sound Transmission Class for bedroom to living room: ≥ STC46 (same unit). Bedroom-to-bedroom: ≥ STC52, IIC52 (between units), STC 44 (same unit) and living room to living room: ≥ STC52, IIC52 (between units).

Sound transmission class (STC), which is a single number rating, used to compare sound insulation properties of walls, floors, ceilings, windows, and doors can be used for operation stage assessment.

Impact sound insulation is expressed in terms of impact insulation class (IIC). IIC measures the impact sound isolation provided by a floor/ceiling construction. In general, higher IIC gives greater impact noise insulation provided by the construction. Detailed criteria and specification of IIC measurement can refer to British Standard BS8233 – Sound insulation and noise reduction for building – Code of Practice

Innovation Item:

Innovative method to further improve the indoor noise and acoustic environment during building operating period

This is a bonus score for innovative method to improve the acoustic quality.

Submittal

Site measurements shall be carried out to survey the noise and vibration levels in critical areas of the building. The following information shall be provided to demonstrate compliance with the Strategy Indicators:

- Report incorporated with acoustic quality measurement results.
- Descriptions and drawings showing the major noise control methods and components.
- Other relevant supporting documentation for improved and innovative ideas.

IE 4 Lighting Environment

IE 4.1 Daylighting

Intent To maximise access to daylight for the purposes of improved health and comfort

Performance Indicators

a) Residential buildings

Sub-criteria Performance Scale	Residential buildings	
0	< 15% VDF for over 80% of habitable rooms **or** < 6% VDF for over 80% of kitchens	
1	15% VDF for over 80% of habitable rooms **or** 6% VDF for over 80% of kitchens	
2	15% VDF for over 80% of habitable rooms **and** 6%VDF for over 80% of kitchens	
3	20% VDF for over 80% of habitable rooms **and** 10%VDF for over 80% of kitchens	
	Residential Buildings Score **(P_{O-R})**	
	IE 4.1 Score	

b) Non-Residential buildings

Item	Strategy	Office			School			Shopping Centre			Hotel			Hospital			Others		
		No	Yes	N/A	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A
1	Appropriate room depth	0	1		0	1		-	-	N/A	-	-	N/A	-	-	N/A	-	-	N/A
2	Sufficient Vertical Daylight Factor (not less than 30%)	-	-	N/A	0	1		-	-	N/A	-	-	N/A	-	-	N/A	-	-	N/A
3	Provide with view	0	1	N/A	0	1		-	-	N/A	0	1		0	1		-	-	N/A

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Sub-criteria Performance Scale	Non-residential buildings	
0	$0 \le P_O < 0.25$	
1	$0.25 \le P_O < 0.5$	
2	$0.5 \le P_O < 0.75$	
3	$0.75 \le P_O \le 1$	
	Non-residential Buildings Score **(P_{O-NR})**	

Explanation This indicator is assigned to verify that sufficient amount of daylight has been provided for the occupied areas. An appropriate amount of daylight admitted into

building interiors provides a comfortable and better environmental quality inside building. These benefits can be reflected from the improved occupant satisfaction and enhanced productivity. With proper integration of the window and building layout designs, daylight collected either directly or indirectly from the sky can provide sufficient illumination and good colour rendering in the interior. The requirements on daylight are different for residential and non-residential buildings.

For **residential buildings**, the provision of daylight is necessary to safeguard the health requirement. Recently, the Buildings Department has conducted a study to review the current building regulations on lighting requirements. Performance standards were established to safeguard the health requirement. Minimum daylight requirement was established and defined by Vertical Daylight Factor (VDF). The minimum VDF for habitable room and kitchen are 8% and 4% for windows designed with area of 1/10 of the room floor area. For CEPAS, the required performance should be higher than these minimum values to promote the design of sustainable building. To score 3, the VDF should be at least 20% for habitable space. This, together with a window to floor ratio of 10%, will yield approximately 1% interior average daylight factor, which is comparable with international standard. At least 80% of all the habitable rooms and kitchens should achieve the performance standards.

For **non-residential buildings**, the required daylight performance will be affected by diverse applications of the buildings and therefore need to be considered separately. In CEPAS, non-residential buildings are broadly divided into 3 types based on their different requirements on daylight:

Type 1: Premises that requires daylight to enhance the lighting environment for the occupants to perform tasks, such as office and school;

Type 2: Premises that requires daylight for energy saving and improved environment for transient stage of occupants, such as the circulation area of shopping centres and indoor game halls;

Type 3: Premises that requires daylight primarily for view, such as hotel and hospital.

For office, the daylight can be effectively controlled by the depth of the room. For assessing the performance, the following table give values of the maximum depth for different room widths and window head heights, and for different reflectances at the back of the room.

Reflectance	0.4	0.4	0.5	0.5	0.6	0.6
Room Width (m)	3	10	3	10	3	10
Window Head Height (m)	Maximum Depth (m)					
2.5	4.5	6.7	5.4	8.0	6.8	10.0
3.0	5.0	7.7	6.0	9.2	7.5	11.5
3.5	5.4	8.6	6.5	10.4	8.1	13.0

In general, higher reflectances and higher window heads allow deeper rooms. If a building is lit by windows on two opposite sides, the maximum depth that can be satisfactorily daylight is twice the limiting room depth from window wall to window wall. To provide a uniform daylight distribution, the ratio of average daylight factor in the first half of the room, which includes the side window, to the average daylight factor in the other half of the room should not be exceeded by 3.

For school, daylight for classrooms is crucial for the students to perform the reading

task. The provision of sufficient daylight can be safeguarded by the requirement on VDF. It is required to demonstrate by means of measurement or calculation that VDF of 30% can be achieved.

For Type 2 buildings, the general requirement of daylighting is for energy saving and good light environment. Please refer to IE4.2 item3 for specific requirements on daylight for energy saving.

For Type 3 buildings, the requirement of daylight is primarily for view to sky and open space. But the requirements are different for hotel and hospital. Design for view can be referred to recognised standard, such as *CIBSE Daylighting and Window Design*. For hotel, the occupants are just passing through the space in most of the day time and therefore the quality of view is not critical. Nevertheless, people prefer almost any view out to no view out. For hospital, the occupants are sitting in fixed positions all day. The requirements for view are critical. It is required to demonstrate that the windows in hospital is facing into an attractive view of trees and planting.

For both residential and non-residential buildings, conducting daylight performance studies to demonstrate the performance achievement of natural daylight is required. On-site measurement is generally necessary. However, simple fish eye lens photo can also be used to convert the Sky Component to VDF and DF.

Submittal

The following information shall be provided to demonstrate compliance with the and Performance and Strategy Indicators:

- Drawings showing the building layout and elevation.
- Drawings or maps (not more than 1:1000 scale) showing the locations, sizes and height of the surrounding permanent daylight obstructions.
- Photos of the site measurement tool and process
- Site daylight measurement results and the associated calculations.
- A comparison sheet describing the design average illuminance and the measured result of functional public and landlord areas.

IE 4.2 Visual Quality & Comfort

Intent To provide and maintain good visual comfort in occupied space and enhance energy efficiency of electric lighting installations

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		IE 4.2 Score

Item	Strategy	Office			School			Shopping Centre			Hotel			Hospital			Residential			Others		
		No	Yes	N/A	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A
1	Daylight comfort and quality	0	1		0	1		-	-	N/A	-	-	N/A	0	1		-	-	N/A	-	-	N/A
2	Artificial lighting comfort and quality	0	1		0	1		0	1		0	1		0	1		-	-	N/A	0	1	
3	Lighting for energy conservation	0	1		0	1		0	1		0	1		0	1		0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria	**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL	**Sub-criteria performance score (P_O)**	**(B)/(A) = P_O**		
(A)	Total maximum score (applicable items only) in this Sub-criteria	**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL	**Sub-criteria performance score (P_O)**	**(B)/(A) = P_O**		

Explanation **Item 1**: This indicator is assigned to recognise the provision of spatial arrangement and building details that minimizing discomfort caused by excessive glare and contrast. For residential buildings, occupants are free to move around and to draw the curtains, daylighting comfort and quality are of little concern. Therefore, it is not considered in CEPAS. For non-residential buildings, where people may be confined to a desk, drawing board or computer screen, undue brightness (or glare) may cause

discomfort or reduce the ability to discern details. Most of complaints of glare from daylight are attributable to direct sunlight. Glare can also arise from excessive contrast between the luminance of visible sky and the luminance of the interior surfaces within the field of view. Site measurements on sensitive areas where direct sunlight or excessive contrast from daylight, is expected necessary to demonstrate the visual comfort has achieved by effective shading and glazing design.

Item 2: There are many criteria that define the quality and comfort of artificial lighting. Among them, glare is the major concern. Glare control for artificial lighting can be achieved by means of selecting proper designed luminaries to limit the glare created by lamps. This indicator is to verify that appropriate provisions has been provided to achieve the relevant standards. The lighting installations in various areas and space usage should achieve the optimum standard maintained illuminance as recommended by the lightings schedule of the CIBSE Code for Lighting (2002) and CIE unified glare rating (UGR) for the assessment of glare for indoor lighting. Other issues that need to be verified include Illuminance, Iluminance Variation, Luminance and illuminance ratios, Room Surface properties and Colour rendering etc.

Site measurements should be conducted to measure and record the illuminance level in all functional public and landlord areas, such as corridor, lobby, games hall, ward, classrooms, etc. This indicator is not applicable for feature lighting. The illuminance measurement result (measurement conducted by contractor) in building handover period is considered as more or less equivalent to the required site measurement in Operation Stage assessment, provided that the lighting installations are unchanged and well-maintained.

Item 3: This indicator is assigned to assess the energy saving performance of lighting, while providing a high visual quality. On-site investigation should be conducted to verify if the following provisions have been provided:

- Design with an average daylight factor (DF) of 2% to achieve the energy saving purpose. It should be noted that introducing daylight from outdoors may also increase solar heat gain, which may have adverse implication on the cooling load. Therefore, careful considerations should be given to skylight and façade design to ensure that benefits obtained from daylighting would not be compromised by an increase in cooling load in summer. Recognised standards / guidelines, such as the CIBSE *Daylighting and Window Design Guide*, can provide the required reference for the daylight design that optimises these criteria. The OTTV requirements should also be achieved.
- Use of automatic lighting control system for integrated daylight and electric lighting operation in daylight zones. Appropriate control and sensor facilities provided to allow coordinated and active operation between natural and artificial light sources in response to the interior requirements and outdoor daylight conditions. The integrated control shall be able to minimize the operating period of electric lighting and to allow for more use of daylight. Also, a more pleasant indoor environment can be created through daylight access.
- Use of individual control of a small group (e.g. 2 groups in each zone) of luminaries can reduce lighting energy consumption. Separate power circuits for the lighting in internal and daylight zones is able to enhance the control flexibility. Reduction of lighting energy consumption is particularly significant for perimeter zone during daytime and whole interiors in the night time. This indicator is applicable for all public and landlord area (exclude tenant area and residential flats) or installations provide by landlord inside tenant area.
- Use of T5 fluorescent lamp or better installation is recommended for majority area. This strategy is applicable for all public and landlord area (exclude tenant area and residential flats) or installations provided by landlord inside tenant area.Technical details for energy efficient lighting installations can refer to the

EMSD Guidelines on Energy Efficiency Equipment: T5 Fluorescent Lamps.

For residential building, this indicator is applicable for all public and landlord areas or installations provided by landlord inside tenant areas.

Innovation Item:

Innovative method provided to further improve visual comfort and lighting energy efficiency during building operating period

This is a bonus score for innovative method to further improve the interior visual quality.

Submittal

Site measurement shall be carried out to survey the illuminance level of various interior areas in the building if illuminance measurement for the same lighting installation does not exist. The following information shall be provided to demonstrate compliance with the Performance and Strategy Indicators:

- Descriptions of relevant lighting systems.
- Drawings showing lighting and power zones.
- Site illuminance measurement results.
- Technical information of the site measurement tool and process.
- Other relevant supporting documentation for improved and innovative ideas.

BUILDING AMENITIES (BA)

BA 1 Safety

Pre-requisite Criteria

BA 1.1 Safety Regulations

Intent To provide a safe habitation and working environment for building occupants and users

Requirements	Compliance
This indicator is assigned to reassert the importance of Safety issues in the overall building environmental performance through the current statutory requirements. Maintaining a safe environment for occupants is essential for a sustainable community. The government is endeavouring to protect and promote the health and safety of the community. Compliance with safety related statutory requirements is considered to be the minimum requirements for building operation. It is recommended that additional safety measures should be provided by the building owner / operator. Below are some safety related statutory requirements in Hong Kong. ▪ Code of Practice for Fire Resisting Construction, BD. ▪ Code of Practice for the Provision of Means of Access for Firefighting and Rescue Purposes, BD. ▪ Code of Practice for the Provision of Means of Escape in Case of Fire, BD. ▪ Design Manual – Barrier Free Access, BD. ▪ Code of Practice published by Labour Department	Statutory requirements, no assessment in CEPAS is required.

BA 1.2 Safety Management

Intent Provision of effective safety management by the building operator

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
	Non-residential Buildings Score **($P_{O\text{-}NR}$)**	Residential Buildings Score **($P_{O\text{-}R}$)**
		BA 1.2 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Formulation of a safety management and fire evacuation plan by building operator	0	1		0	1	
2	Designated person to identify potential hazards and to implement safety measure regularly	0	1		0	1	
3	Fire drill arranged for building users regularly	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

Item 1: This indicator is assigned to encourage the building operator (building owner / property manager) to formulate a safety management and fire evacuation plan for building occupants. The plan shall consist of a safety checklist and fire evacuation plan. The safety checklist shall cover all aspects relating to fire and other hazard matters, and it should be understood and used by all building operation staff. The checklist shall be kept by the building operator, and reviewed periodically with necessary follow-up actions. The fire evacuation plan shall specify the escape routes and meeting points for building occupants to follow during emergency.

Item 2: A designated person shall be assigned by building operator to identify potential risks in the building in addition to the identified hazards listed in the safety checklist. The building operator shall implement relevant safety measures as described in the safety management plan. Building safety and risk inspection shall be

carried out daily. The inspection and safety checklist record shall be kept by building operator for at least 3 years (a minimum of 1 year record shall be provided for the first CEPAS assessment in the operation stage).

Item 3: This indicator is assigned to encourage the building operator to arrange a regular fire drill for building occupants, and let them familiarise themselves with the fire escape routes to avoid panicking in the event of a real fire, and to facilitate a safe and smooth escape. A fire drill shall be conducted not less than once a year. The fire drill record shall be kept by the building operator for at least 3 years (a minimum of 1 year record shall be provided for the first CEPAS assessment in the operation stage).

Submittal

The following information shall be provided to demonstrate compliance with the Strategy Indicators:

- Safety management and fire evacuation plan.
- Safety measures implementation records.
- Fire drill implementation records.

BA 2 Management

BA 2.1 Building Management

Intent To provide effective management for the building and its facilities

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings		Residential buildings	
0	$0 \le P_O < 0.25$		$0 \le P_O < 0.25$	
1	$0.25 \le P_O < 0.5$		$0.25 \le P_O < 0.5$	
2	$0.5 \le P_O < 0.75$		$0.5 \le P_O < 0.75$	
3	$0.75 \le P_O \le 1$		$0.75 \le P_O \le 1$	
Innovation	0 or 1		0 or 1	
	Non-residential Buildings Score **(P_{O-NR})**		Residential Buildings Score **(P_{O-R})**	
		BA 2.1 Score		

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Property management company accredited with quality management system – ISO 9000 standard	0	1		0	1	
2	Property management company accredited with environmental management system – ISO 14000 standard	0	1		0	1	
3	Property management company accredited with occupational health and safety management system – OHSAS 18001 standard	0	1		0	1	
4	Periodic training for property management company staff	0	1		0	1	
5	User and environmental manual / guideline for tenants and building occupants	0	1		0	1	
6	Technical training from Contractors and/or Designers in building handover period provided for property management company	0	1		0	1	
7	Occupant feedback records & regular management reviews	0	1		0	1	
8	Keeping of full set building records	0	1		0	1	
9	Annual review of insurance coverage	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

Item 1: Quality Management is a fundamental requirement for effective activities and it is essential to provide building occupants with the quality of services that they require. This indicator is eligible for award if the property management company obtained the ISO 9000 accreditation.

Item 2: Environmental Management System is an overall management system, which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy. It provides a framework for the systematic presentation of environmental information for decision making, as well as to help improving the environmental performance of the organization, and enhancing its creditability with financial institutions, insurance companies, regulators and customers. This indicator is eligible for award if the property management company has obtained the ISO 14000 accreditation.

Item 3: Occupational Health and Safety Management System is a part of the overall management system which includes organization structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the occupational health and safety policy, and so managing the occupational health and safety risks associated with the business of the organization.

The technical specification of OHSAS 18001 takes a structured approach to occupational health and safety management. The elements of successfully OH&S management are depicted as a process model consisting OH&S Policy, Planning, Implementation and Operation, Checking and Corrective Action, Management Review and ultimately Continual improvement. All of these processes are considerably important to building operation. A plan for OH&S should be implemented to satisfy this criterion.

Item 4: The indicator is assigned to recognise the effort of arranging periodic training to the property management company staff of the building. The training topics shall cover, but not limited to health and hygiene, fire and safety, security, communication method with building occupants and building technology. The training materials shall include basic and latest information on relevant topics. Training provided to the property management staff shall be conducted at least once a year.

Item 5: The indicator is assigned to recognise the effort of property management company to prepare a building-specific user and environmental manual / guideline for the tenants and building occupants. The manual / guideline shall comprise of the following information.

- Facilities and provisions provided in the building.
- Services provided by the building and the property management company.
- Contact persons and methods of contact for the building's major property management staff.
- Health, hygiene, fire, safety and security information for the building.
- Environmental guidelines, such as the recyclable materials collection and sorting locations, and the basic information introducing the types of recyclable materials.
- Guidelines to minimise nuisance to other building occupants and users.
- Methods to reduce adverse environmental impacts.

The above-mentioned information can be conveyed to building users by means of a

single manual and leaflet/poster to convey updated information.

Item 6: This indicator is assigned to ascertain whether effective and comprehensive training has been provided by the Contractors and/or Designers to the representatives of property management company during the new building handover period. A checklist of building handover training courses shall be recorded for assessment. The training shall cover but not be limited to the following information:

- Building design philosophy and characteristics.
- Usage and provisions provided in the building.
- Operation, trouble-shooting and maintenance of all building facilities.
- Operation, trouble-shooting and maintenance of all building systems and equipment.

Item 7: This indicator is assigned for the implementation of effective property management strategies provided for the building. A systemic occupant feedback recording system and regular management review help to identify the property management problems and inadequate services in the building. Comments, complains and opinions from building occupants shall be recorded. The solutions and improvement proposals for the comments, complaints and opinions shall be reviewed periodically. To obtain score in this indicator, the occupants' feedback and response records for at least 3 years shall be kept by building operator (Minimum 1 year record shall be provided for the first CEPAS assessment in operation stage). The management review shall be conducted periodically, but depends on the impact and scale of the issues. For the problems that affect normal services, they shall be responded by the property management company immediately.

Item 8: This indicator is assigned to award the property management / Owners' Corporation for keeping full set of building records and the updated versions properly. Missing a portion of building record or updated versions due to A&A works in operation period is not uncommon in many buildings. To obtain score in this indicator, the property management company is required to keep and update the records effectively. The property management company shall present the latest checklist of building records for assessment. Meanwhile, the checklist shall also be kept by property management company and / or Owners' Corporation, and available for inspection by building owners.

The building records shall comprise, but not limited to the following items:

- Building, structural, drainage, site formation, alterations and additions plans approved by the Building Authority (BA). Documents associated with the approval such as calculations, undertakings, certificates, permits, etc. and records on any change of use of certain parts of the building accepted by the BA.
- Building services as-built drawings, including fire services, underground drains, drainage, water supply, electrical, lighting, broadcasting, gas supply, MVAC systems, etc. The plumbing, drainage and fire services drawings shall be the approved drawings by the Water Supplies Department and Fire Services Department respectively.
- Layout plan for hidden utilities such as electricity cables, gas pipes, telephone lines, etc.
- Testing, commissioning and operation manuals for building services, mechanical components and installations.
- Maintenance certificate, installation contract, etc. of the building services
- Testing records and certificates required under Fire Service (Installations and Equipment) Regulations
- Testing records and certificates required under Building (Ventilating Systems) Regulations

- Testing and inspection records and certificates required under Lifts & Escalators (Safety) Ordinance
- Testing records and certificates required under Electricity (Wiring) Regulations
- Certification for the performance of specific materials and components as well as warranties from specialist contractors or suppliers (e.g. on waterproofing materials and its installation work)
- Completed CEPAS Pre-Design, Design, Construction and Operation (available for Operation Stage reassessment) Stages assessment forms, results and submission details.

Item 9: This indicator is assigned if optimum building insurance policy is adopted for the building. The coverage, terms and conditions of the insurance policy shall be varied for building usage, age, location, size, building maintenance effectiveness, and building facilities and systems of the building. The property management company and / or Owners Corporation shall review the insurance policy for the building every year. A balance of insurance policy and premium should be achieved. The insurance policy, premium and relevant documents shall be presented to the building owners for inspection. For additional details, the Building Maintenance Guidebook, published by the Building Department, can be referred to.

Innovation Item:

Innovative method to further improve the effectiveness of buildings management by the building operator

This is a bonus score to recognize innovative method to further improve the building management services of the building.

Submittal

The following information shall be provided to demonstrate the implementation effectiveness and compliance with the Strategy Indicators:

- Relevant valid certificates.
- Training materials and records.
- User and environmental manual / guideline.
- Checklist of building handover training.
- Occupants' feedback and response records.
- Building records checklist.
- Records of building insurance review.
- Other relevant supporting documentation of improved and innovative ideas.

These indicators aim to assess whether the strategies are implemented such that the details inside the submitted checklist, strategy plan and records will not be assessed, unless the submitted document is too simple that the property management performance in practical implementation is questionable.

BA 3 Controllability

BA 3.1 Building Controllability

Intent To recognise the effort for providing the building and its facilities ease of effective control and operation

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
	Non-residential Buildings Score **($P_{O\text{-}NR}$)**	Residential Buildings Score **($P_{O\text{-}R}$)**
		BA 3.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Capability of partial operation of building facilities & systems	0	1		0	1	
2	Capability of control over major environmental systems by building users	0	1		-	-	N/A
3	Comprehensive automatic monitoring system serving major electrical and mechanical installations provided	0	1		0	1	
4	Comprehensive automatic control system serving major electrical and mechanical installations provided	0	1		0	1	
5	Comprehensive automatic control & monitoring system serving major lighting installations provided	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation **Item 1:** This indicator is assigned to award the building if a higher building operational flexibility is provided to suit the variation of the instantaneous demands of the building occupants and facilities. For the buildings with centralized building services systems

that serve all building occupants, there should be certain level of operational flexibility, such as a variable flow plumbing water system is able to reduce energy consumption in a part-load operation. On some occasions, whole floor building systems may have to be activated in order to serve a single building occupant outside of normal operating hours, resulting in the building system being operated uneconomically and energy being wasted. The optimum size of control zones shall be determined according to the space usage and floor area. Hence, effective provisions provided to allow partial operation based on system part-load operation and strategies for centralized system and major areas are able to demonstrate the compliance of this indicator.

Item 2: Effective control of the indoor environment is one of the most important factors defining the users' comfort and satisfaction. Individual occupant having the possibility of modifying his/her local indoor environment while maintaining the remaining indoor environment within acceptable limits is recommended. The degrees to which the building air-conditioning and lighting systems satisfy the need for partial-floor and off-hours service are concerns. Occupants in many buildings experience an uncomfortable environment when working at odd hours (at night or on weekends) because the HVAC and lighting control systems have not been designed to permit occupants to control their own needs. For instance, zonal lighting and temperature control are possible areas to enhance the degree of user controllability. Other more sophisticated control methods, such as remote, telephone or web-based control are also accepted fro this indicator.

This indicator applies to the level of personal control for individual occupants. Also, it applies to the extent to which passive strategies in hybrid ventilated (air-conditioned & natural ventilated) buildings are capable of providing a range of control as it does to the fully air-conditioned buildings.

Items 3 to 5: Central Control and Monitoring Systems (CCMS), also termed as Building Management System (BMS), provide a systematic tool for the building operator to control and monitor various building facilities and systems in a building. Routine operations can be programmed and operated automatically. The EMSD Guidelines on Application of Central Control and Monitoring Systems (2002) shall be referred to. For residential buildings, the indicators are applicable only for centralised systems serving the entire building and decentralised systems serving landlord area only.

Item 3: This indicator is assigned to award the building for using automatic monitoring system to monitor the operating status of various major electrical and mechanical installations, such as lift & escalator, electrical systems, chiller plant, boiler plant, pumping systems, air distribution systems and water circulation systems. Energy used by HVAC systems is particularly important, as these may contribute to more than half of the total building energy used. The CCMS/BMS is a convenient tool to monitor the daily operation automatically such that system faults and abnormal operation can be identified at an early stage. Also, the operating history recorded by the monitoring system helps the building operator to establish effective maintenance plan. The level and scale of the CCMS/BMS shall be demonstrated as being appropriate relative to the complexity of building systems.

Item 4: This indicator is assigned to award the building for using automatic control system to control the operation of various major electrical and mechanical installations as described in item 3. The CCMS/BMS is a convenient tool to control the system daily operation automatically such that failure due to human errors can be minimized. Also, for large buildings, the building services systems are complicated such that the operation strategies programmed in the CCMS/BMS helps to improve the overall building control efficiency. Under emergency condition, the automatic system able to command the necessary installations to protect the life and well-being of the building occupants and properties. The level and scale of the CCMS/BMS shall be demonstrated to be appropriate relative to the complexity of the building systems.

Item 5: Energy used for lighting installations is the second largest energy

consumption sector in a building. CCMS/BMS is able to control and monitor the lighting installations automatically according to the scheduled occupancy programme.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- System descriptions and relevant schematic diagrams.
- System control and monitoring strategies.

BA 4 Maintainability

Pre-requisite Criteria

BA 4.1 Essential Maintenance

Intent To ensure regular and effective maintenance is provided for essential building services installations

Requirements	Compliance
This indicator is assigned to reassert the importance of regular inspection, testing and maintenance for essential building services installation in the overall building environmental performance through the current statutory requirements. To satisfy this pre-requisite requirement, the following building services installations shall be inspected, tested and maintenance conducted according to the relevant BD, FSD and EMSD regulations. Checklists for the inspections and tests, together with the valid certificates issued by relevant Government departments, shall be kept by the property management company and/or Owners' Corporation. ▪ Fire services installations ▪ Plumbing, Drainage installations ▪ HVAC installations ▪ Lift & escalator installations ▪ Electrical installations	Statutory requirements, no assessment in CEPAS is required.

BA 4.2 Regular Inspection

Intent To provide good serviceability for the building and its facilities by means of effective inspections

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		BA 4.2 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Appropriate building inspection conducted by the property management company	0	1		0	1	
2	Regular inspection of the means of escape and fire resisting construction conducted by the property management company	0	1		0	1	
3	Regular inspection of building fabric, structure and facade	0	1		0	1	
4	Regular inspection of slope, retaining wall and private roads	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria	**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL	**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria	**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL	**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

Item 1: This indicator encourages appropriate building inspection conducted by property management company, in order to ensure proper, effective and safe functioning of various building elements, installations, services and facilities inside a building. The inspection items can refer to the Building Management Handbook, Section 3.4.2 (a-i), published by the Buildings Department.

Item 2: This indicator encourages regular inspection of the means of escape and fire resisting construction conducted by property management company, in order to ensure the fire safety performance of all fire safety related building components and structure are in good conditions. The inspection items shall include the means of

escape, walls, floors, staircases, fire-resisting doors, openings, fire-resisting enclosures, etc. Details shall refer to the Building Management Handbook, Section 3.4.2 (a-ii and iii), published by the Buildings Department. The inspection shall be conducted every year. To obtain score in this indicator, the inspection checklist and inspection record shall be kept for at least 3 years by building operator (a minimum 1 year's record shall be provided for the first CEPAS assessment in operation stage).

Item 3: This indicator aims to encourage the property management company to conduct regular inspection of building fabric, structure and facade. A checklist shall be prepared and include, but not limited to visual inspection of defective concrete, concrete spalling, structural cracks, wall tiles and finishes, cracks, loose concrete, claddings, glass panes, window, locking devices, etc.

Coarse visual inspection for the building fabric and structure can be incorporated into the day-to-day inspection checklist, or to conduct separate inspection regularly. A detailed visual inspection shall be conducted at least once a year. In addition, inspection, for window and other building fabrics that are sensitive to wind effect shall be inspected when Typhoon Signal No.1 has been hoisted and after typhoon. To obtain score in this indicator, the inspection checklist and inspection record (include typhoon record) for at least 3 years shall be kept by building operator (Minimum 1 year record shall be provided for the first CEPAS assessment in operation stage).

Item 4: This indicator aims to encourage the property management company to conduct regular inspection of the slope, retaining wall and private roads. A checklist shall be prepared and include, but not be limited to visual inspection of private roads, slope, retaining wall, and the associated surface drainage system, rigid surface and vegetated surface covered slope, rock slope and boulders, street lighting, railing, road side and retaining planters and flower-beds, ramp surface, etc. within the site.

Coarse visual inspection for private road, slope and retaining wall can be incorporated into the day-to-day inspection checklist, or a separate inspection can be conducted regularly. A separate detailed visual inspection shall be conducted at least once a year. In addition, inspection for surface drainage system, such as the drainage channels, catchpits and sand traps, shall be inspected when Typhoon Signal No.1 has been hoisted and after a typhoon. To obtain a score in this indicator, the inspection checklist and inspection record shall be kept by building operator for at least 3 years (Minimum 1 year's record shall be provided for the first CEPAS assessment in operation stage).

Submittal

The following information shall be provided to demonstrate the implementation effectiveness and compliance of the Strategy Indicators:

- Day-to-day building inspection checklist and record.
- Inspection checklist and record for regular inspection on the means of escape and fire resisting construction.
- Inspection checklist and record for regular and special inspections on building fabric, structure and facade.
- Inspection checklist and record for regular and special inspections on slope, retaining wall and private roads.

These indicators aim to assess whether the strategies are implemented such that the details inside the submitted checklist and strategy plan will not be assessed, unless the submitted document is too simple that the effectiveness in practical implementation is questionable.

BA 4.3 Regular Maintenance

Intent To provide good serviceability for the building and its facilities by means of effective maintenance

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
	Non-residential Buildings Score **($P_{O\text{-}NR}$)**	Residential Buildings Score **($P_{O\text{-}R}$)**
		BA 4.3 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Convenient and safe access provided for inspection, cleaning and maintenance of spaces throughout building	0	1		0	1	
2	Convenient and safe access provided for inspection, cleaning and maintenance of all building facilities, building envelope and slope	0	1		0	1	
3	Regular inspection and performance testing of building services installations	0	1		0	1	
4	Preventive & corrective maintenance plan for building and services provided by the property management company	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

Item 1: This indicator aims to provide convenient and safe access to every part of the building floors, such as the back of house areas, utility platform and lightwell, for regular inspection and cleansing. Since some of the building cleaners and caretakers in Hong Kong are elderly persons, convenient access can improve effectiveness of routine cleaning work. Also, sufficient space for moving large cleansing equipment is required.

Item 2: This indicator aims to provide convenient and safe access for inspection and maintenance of building facilities, such as hard landscape, water features, rubbish bin, planters, flowerbeds, playground facilities and signboard, facade, such as vertical and inclined facade, skylight, roof, external landscape, as well as slope and retaining wall. Cat ladder and fixed maintenance platforms are possible methods for effective maintenance. If movable maintenance platforms and gondola are to be used, sufficient space for platform transportation and erection, and full-coverage of the gondola track are required. For maintenance of the slope and retaining wall, the Layman's Guide to Slope Maintenance published by the Geotechnical Engineering Office of the HKSAR Government can also be referred.

Item 3: This indicator aims to encourage the property management company to conduct regular inspection and performance testing on building services installations regularly as recommended in the O&M manual. A inspection checklist shall be prepared and include, but not be limited to the visual inspection on conditions and performance/ functional tests of swimming pool facilities, public lighting, plumbing and drainage systems, MVAC installations serving public areas, and other facilities and building services systems in the building.

A poorly maintained water drainage system may lead to water leakage from drainage pipe and cause subsequent health hazard to building occupants. Regular visual inspection of drainage pipes and manholes throughout a building shall be conducted, particularly of lightwells and other humid places that may accelerate bacteria growth.

Inadequate provision or operation of grease trap in a non-residential or mixed residential building due to food and beverage business may cause significant loading of grease in sewage discharge, leading to blocked sewers downstream of the building. Associated hygiene problems from grease waste compromise living quality and affects occupants, owners, pedestrians and building operation. Hence, regular inspection, maintenance and safety precautions of grease trap provision, frequent desludging and maintenance of grease traps and associated pipes are encouraged. Also, preventive and corrective maintenance plan to avoid greasy discharge and grease build-up accumulating in the receiving public sewer is required.

Coarse visual inspection for the facilities and systems can be incorporated into the day-to-day inspection checklist, or separate inspection can be conducted regularly. Separate detailed visual inspection and performance testing shall be conducted periodically. Since there is no common performance testing frequency for all building facilities and systems, appropriate inspection and performance frequency, as recommended by the facility and equipment manufacturers and relevant technical guidelines shall be adopted. To obtain score in this indicator, the inspection checklist as well as inspection and performance/functional testing records shall be kept by building operator for at least 3 years (Minimum 1 year record shall be provided for the first CEPAS assessment in operation stage).

Item 4: This indicator aims to encourage the property management company to prepare preventive maintenance plan for the building and its services. Planned preventive and corrective maintenance plans help to minimize accidental breakdown of services.

Planned preventive maintenance works shall be carried out within the anticipated life cycle of the building components, facilities and services before breakdown or abnormal operation are detected. For instance, replacement of a group of lamps before the end of their life will minimize accidental system failure. Since planned preventive maintenance work could not prevent all accidental failure, planned corrective maintenance works are also essential. The corrective maintenance plan shall comprise of accidental system failure response and repairing plan, spare parts and components list, as well as contingency plan for the temporary shut-down of services serving the building occupants.

Submittal

The following information shall be provided to demonstrate the implementation effectiveness and compliance of the Strategy Indicators:

- System descriptions and drawings that illustrate the inspection, cleaning and maintenance access to core and shell areas, such as light well, duct shaft, back of house, etc.
- System descriptions and drawings that illustrate the inspection, cleaning and maintenance access to all building facilities, building envelope and retaining wall, etc.
- Inspection checklist, inspection and performance testing records of building services installations.
- Preventive and corrective maintenance plan.

These indicators aim to assess whether the strategies are implemented such that the details inside the submitted checklist and strategy plan will not be assessed, unless the submitted document is too simple that the effectiveness in practical implementation is questionable.

BA 5 Living Quality

BA 5.1 Liveability

Intent To provide better spatial and facility provisions in the building to enhance living quality

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		BA 5.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Balconies provided in residential flats	-	-	N/A	0	1	
2	Provided with above minimum spatial or environmental provisions, such as common corridor and ventilated lift lobbies	-	-	N/A	0	1	
3	Provided with communal gardens, such as podium and roof gardens, for use by the building occupants and users	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

Item 1: A balcony attached to the living room, dining room and bedroom will improve the comfort of residential flats. Meanwhile, a balcony is an effective shading device to reduce direct sunlight and solar radiation to the interior. A balcony can be constructed in form of an open or semi-enclosure. The majority of sunlight access to the interior will be diffused and reflected sunlight. Detailed guidelines shall refer to the BD, LandsD & PlanD Joint Practice Note No. 1. At least 50% of residential flats provided with balcony (in all or any living room, dining room and bedroom) to obtain a

score in this indicator.

Item 2: The major benefit for providing wider common corridors and lift lobbies (exclude building entrance hall) is to improve the living quality. Long and narrow corridors create an uncomfortable environment, particularly for many typical common corridors in private residential buildings, where natural lighting and ventilation are not provided. Detailed guidelines shall refer to the BD, LandsD & PlanD Joint Practice Note No. 1. At least 50% of common corridors and lift lobbies on typical residential floors constructed with wider space as stipulated in the Joint Practice Note is eligible to obtain a score in this indicator.

Item 3: The indicator is assigned to encourage a reasonable scale of landscape area in the communal podium garden and landscaped roof of a building relative to the scale of the building. Hard & soft landscape or solely soft landscape is acceptable for this indicator.

The landscaped roof shall be accessible by all building occupants and users or for private occupation. However, fixed planter facilities shall be provided for private occupation in order to allow vegetation planted by building/ individual unit owners. Also, communal podium garden is recognized as a green feature for building as described in the BD, LandsD & PlanD Joint Practice Note No. 1.

Using of refuge floor for sky garden purpose may be accepted by the BA and FSD, provided that the sky garden is designed in accordance with the requirements as stipulated in the BD PNAP 258 Provision of Sky Garden in Refuse Floor. For both podium and roof, the soil depth should have a minimum of 0.5m.

Innovation Item:

Provided with other green innovative features to improve living quality

This indicator is assigned to encourage more innovative method and solutions to enhance the living quality. Other possible green features as described in the BD, LandsD & PlanD Joint Practice Note No. 1 & 2, such as wing wall, wind catcher, and wind funnel, are possible methods to improve the living quality. However, the use of green features could be site-specific and may not be applicable for all types of buildings. Hence, this indicator accepts other innovative solutions that are able to improve the living quality of the majority of building occupants effectively, without adverse impact on the minority. Innovative provisions designed at the Design Stage, or innovative method provided by building operator is eligible to obtain a score in this indicator.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Description and photos of the green facilities.
- Drawings to demonstrate the locations and dimensions of the green features.
- Other relevant supporting documentation of improved and innovative ideas.

RESOURCES USE (RE)

RE 1 Energy Consumption

RE 1.1 Energy Consumption

Intent

To achieve higher levels of building energy performance and reduce annual energy consumption above the recognised local standards, and to reduce environmental impacts associated with excessive energy use in the whole life of building

Performance Indicators

Sub-criteria Performance Scale	**Non-residential buildings** (Building types listed in the EMSD Energy Consumption Indicator & Benchmark)
0	[Annual building energy] > [Pi(ai) = 50% cumulative percentage]
1	[Annual building energy] ≤ [Pi(ai) = 50% cumulative percentage]
	OR: Full compliance of EMSD Code of Practice for Energy Efficiency of Air Conditioning, Electrical, Lift and Escalator and Lighting Installations
2	[Annual building energy] ≤ [Pi(ai) = 35% cumulative percentage]
3	[Annual building energy] ≤ [Pi(ai) = 10% cumulative percentage]

Sub-criteria Performance Scale	**Non-residential buildings** (Building types excluded from the EMSD Energy Consumption Indicator & Benchmark)
0	[Annual building energy] > [Total energy budget in PB-BEC energy model]
1	[Annual building energy] ≤ [Total energy budget in PB-BEC energy model]
	OR: Full compliance of EMSD Code of Practice for Energy Efficiency of Air Conditioning, Electrical, Lift and Escalator and Lighting Installations
2	[Annual building energy] ≤ [80% total energy budget in PB-BEC energy model]
3	[Annual building energy] ≤ [60% total energy budget in PB-BEC energy model]

Sub-criteria Performance Scale	**Residential buildings**
0	[Appropriate Energy Simulation Model suggested under PB-BEC] ≤ [Annual building energy]
1	[Annual building energy] ≤ [Appropriate Energy Simulation Model suggested in PB-BEC]
2	[Annual building energy] ≤ [80% Appropriate Energy Simulation Model suggested in PB-BEC]
3	[Annual building energy] < [60% Appropriate Energy Simulation Model suggested in PB-BEC]

RE 1.1 Score	

Explanation

This indicator is assigned to determine the current energy consumption level of the building. The objective of this indicator is to encourage reducing energy consumption during building operation. Meanwhile reducing of building energy consumption leads to direct reduction of CO_2 emission. Owing to the availability of energy performance data for existing buildings in Hong Kong is restricted to particular building types such that different assessment methods have been set. This indicator is applicable for core and shell area only.

EMSD established energy consumption benchmark for private office building and commercial outlet. The benchmarks were developed to let the Government and private sector to manage energy usage, and let the building operator to understand the current building energy use performance.

The scope of the EMSD benchmarks is considerably extensive and comprehensive, which assesses premises classified into groups and sub-groups. In between each groups, primary and secondary indicators are allocated for the benchmarking conducted. Pi(ai) – Primary Indicator reflects the energy consumption with respect to floor area, in terms of annual energy consumption per area (MJ/m2/Annum). Details should refer to the EMSD Energy Consumption Indicators & Benchmarks for Commercial Sector.

Generally, Primary indicators are introduced to measure buildings in the First Level Benchmarking (Screening Level). First Level Benchmarking majority focuses on the energy consumption improvement through better energy usage and management practice (without improving its energy end use system efficiency). Primary indicators basically cover general building information like building age, environment, architectural layout and partition etc. Secondary indicators assess in the Second Level Benchmarking (Refined Level). This level advises users to improve certain energy end use systems efficiency by comparison between the corresponding secondary indicators. Secondary indicators involve more comprehensive information on energy consumption and control for various building components.

A user-friendly benchmarking tool is available on EMSD benchmarking web page at http://www.emsd.gov.hk/emsd/eng/pee/benchmarktool.html. CEPAS applicants are recommended to conduct a benchmark assessment of their building by applying this online tool.

Full compliance of EMSD Code of Practice for Energy Efficiency of Air Conditioning, Electrical, Lift and Escalator and Lighting Installations are considered as equivalent to the minimum requirements in performance-based method.

For residential building, the predicted annual energy consumption using recognised building energy simulation programs as recommended in the Appendix II of PB-BEC, should be compared with the actual annual building energy consumption.

The building energy simulation program used in the modelling evaluation must be able to accurately estimate the energy use of the systems and components concerned. If the energy modelling of each of the systems and components identified cannot be assessed using one program, more than one program can be proposed and used for the calculation and analysis.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- Annual building energy consumption summary sheet and relevant evidence, such as energy bill summary (for core and shell area only), energy consumption record from building management system, etc.

For the simulations of residential building and other non-residential buildings excluding from the building types addressed in EMSD Energy Consumption Indicator & Benchmark, the following information shall be provided:

- A summary of annual total building energy result and input parameter printout from energy simulation software.
- Major building layout, elevation drawings, features, building equipment and system information required for energy simulation.

The input parameters shall include the indoor environmental design criteria, building and space dimensions, physical properties of building materials, and associated information that required for building energy calculation. The standard forms for submission as described in the EMSD Code of Practice shall refer to PB-BEC requirements.

RE 2 Energy Efficiency

RE 2.1 Energy Efficiency (Building)

Intent To enhance building energy efficiency benefits in addition to the existing environmentally considered architectural design and provisions

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
	RE 2.1 Score	

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Built form and building orientation is designed to enhance energy conservation	0	1		0	1	
2	Fixed horizontal/vertical external shading device provided	0	1		0	1	
3	Movable external shading device for major atrium facade window or skylight is provided	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation **Item 1:** This indicator is assigned to award the building if its built form and orientation were designed to minimise heat gain in hot seasons and heat loss in cold seasons based on the local climatic conditions. A minimum surface area of building envelope leads to least thermal transfer through the building fabric. Optimisation of the built form with other considerations, such as space use, material use and energy consumption, is essential to determine building environmental performance. Estimated annual energy savings due to the green features shall be estimated for submission.

Items 2, 3, and

Innovation Item:

Innovative fixed type or automatic internal shading device provided to reduce solar heat gain to the occupied area

The indicators are assigned to award the use of solar shading device to reduce solar heat gain to the interior space. Well-designed solar shading device and reflectors are recognised as innovative green features as described in the BD, LandsD & PlanD Joint Practice Note No. 1. Other innovative method designed in Designed Stage or by building operator to further reduce building energy consumption are encouraged. Estimated annual energy saving due to application of green features shall be estimated for submission.

To obtain a score in the Item 2, fixed external shading device shall cover ≥ 50% facade window area facing from East to West (via South) and ≥ 20% of facade window area facing West to East (via North).

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Descriptions of the energy efficient building features and facilities.
- Drawings to show the locations and details of the green features.
- Photos of the green features.
- Estimated annual energy saving due to the existence of the green features.
- Other relevant supporting documentation of improved and innovative ideas.

RE 2.2 Energy Efficiency (Systems)

Intent To enhance building energy efficiency benefits in addition to the existing environmentally considered building services system design

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings		Residential buildings	
0	$0 \le P_O < 0.25$		$0 \le P_O < 0.25$	
1	$0.25 \le P_O < 0.5$		$0.25 \le P_O < 0.5$	
2	$0.5 \le P_O < 0.75$		$0.5 \le P_O < 0.75$	
3	$0.75 \le P_O \le 1$		$0.75 \le P_O \le 1$	
Innovation	0 or 1		0 or 1	
	Non-residential Buildings Score **($P_{O\text{-}NR}$)**		Residential Buildings Score **($P_{O\text{-}R}$)**	
		RE 2.2 Score		

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Use of evaporative cooling towers or other means of water-cooled heat rejection methods as the major heat rejection equipment for the building	0	1		0	1	
2	Use of an energy recovery system	0	1		0	1	
3	Use of variable speed drive for fans in appropriate systems if operating energy saving can be achieved	0	1		0	1	
4	Use of variable speed drive for pumps in appropriate systems if operating energy saving can be achieved	0	1		0	1	
5	Use of electronic ballasts for all fluorescent lamps	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation The indicators are assigned to award the building for adopting the selected energy efficiency strategies.

Item 1: A water cooled air conditioning system (WACS) is recognised as an energy efficient method to provide a controlled environment and comfort in a building. Refer to EMSD Pilot Scheme for Wider Use of Fresh Water in Evaporative Cooling Towers for Energy-efficient Air Conditioning Systems and associated publications if fresh water-cooling tower system is used. Other means of heat rejection methods, such as seawater evaporative cooling towers or direct / indirect seawater cooling are also acceptable. Other heat rejection method other than water-cooled air conditioning system is acceptable provided that its energy consumption or environmental impact is lower than WACS. For residential buildings, this indicator is applicable for clubhouse within the housing estate/ building.

Item 2: This indicator is assigned to award the use of energy recovery systems in the building for energy saving. For instance, heat recovery between hot fresh air and cool exhaust air can reduce the energy consumption in fresh air treatment. Refer to EMSD Guidelines on Energy Efficiency of Air Conditioning Installations, ASHARE Handbook – HVAC Systems and Equipment, CIBSE Guide F, etc. for further information.

Items 3 & 4: The EMSD Application Guide to Variable Speed Drives (VSD) and associated publications shall be used as reference. This indicator will not be applicable if using VSD will not improve energy efficiency substantially for the building systems.

Item 5: Electronic ballast is encouraged for all areas using fluorescent lamps, where feasible in the lighting strategies. Dimming of fluorescent lamp is feasible only if electronic ballast is used. The EMSD Application Guide to Electronic Ballasts and EMSD Guidelines on T5 Fluorescent Lamps and associated publications shall be referred to. This indicator is not applicable for the lighting installations provided by the tenants and inside residential flats.

Innovation Item:

Other innovative / effective energy efficient system provided

This indicator is assigned to award other effective / innovative system provided and used in the building to further reduce energy consumption in the whole life of building.

The above items can be considered as non-applicable if the building operator or the original building designer is able to demonstrate the energy efficient system cannot be adopted in the building due to practicality reason.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Descriptions of the energy efficient systems.
- Drawings and photos to show the appearance and locations of the energy efficient systems.
- Other relevant supporting documentation of improved and innovative ideas.

RE 2.3 Energy Efficiency (Electrical Appliances)

Intent

To use energy efficient appliances and equipment that help reducing daily energy consumption.

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	Not all electrical appliances and equipment complied with Grade 2 or better as defined in the EMSD Energy Efficiency Labelling Scheme for Household Appliances and Office Equipment / Multifunction Device used in building core and shell areas.	Not all electrical appliances and equipment complied with Grade 2 or better as defined in the EMSD Energy Efficiency Labelling Scheme for Household Appliances and Multifunction Device used in building core and shell areas.
1	-	-
2	All electrical appliances and equipment complied with Grade 2 or better as defined in the EMSD Energy Efficiency Labelling Scheme for Household Appliances and Office Equipment / Multifunction Device used in building core and shell areas.	All electrical appliances and equipment complied with Grade 2 or better as defined in the EMSD Energy Efficiency Labelling Scheme for Household Appliances and Multifunction Device used in building core and shell areas.
3	All electrical appliances and equipment complied with Grade 1 as defined in the EMSD Energy Efficiency Labelling Scheme for Household Appliances and Office Equipment / Multifunction Device used in building core and shell areas.	All electrical appliances and equipment complied with Grade 1 as defined in the EMSD Energy Efficiency Labelling Scheme for Household Appliances and Multifunction Device used in building core and shell areas.
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		RE 2.3 Score

Explanation

To make it easier for the public to choose energy efficient products, EMSD operates a voluntary Energy Efficiency Labelling Scheme for appliances and equipment used in both home and non-residential areas. The scheme aims to save energy by informing customers of the products' energy consumption level and efficiency rating, so that buyers can take these factors into consideration when purchasing.

Up to 2003, the scheme has covered many types of household appliances including refrigerators, room coolers, washing machines, electric clothes dryers, compact fluorescent lamps, electric storage water heaters, electric rice-cookers, dehumidifiers and televisions as well as office equipment including photocopiers, multifunction devices, laser printers and LCD monitors. Other newly included appliances and/or equipment after 2003 should refer to the updated information in EMSD web site.

This indicator is applicable to assess the energy efficiency of electrical appliance and equipment in core and shell areas. All electrical appliances provided by the building tenants and residential flats are not applicable for this indicator.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- Checklist of electrical appliances and equipment together with their energy efficiency ratings (for the electrical appliances and equipment as listed in the EMSD Energy Efficiency Labelling Scheme)

RE 2.4 Energy Efficiency (Energy Monitoring)

Intent To provide sufficient energy consumption measurement provisions for effective energy and performance monitoring

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
	RE 2.4 Score	

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Energy meter(s) for central chiller plant, boiler plant and heat rejection plant and associated water-side system provided	0	1		-	-	N/A
2	Energy meter(s) for air-side equipment and/or a cluster of split-type air-conditioning units serving landlord / public area in floor / zone basis provided	0	1		0	1	
3	Energy meter(s) for electric lighting system serving landlord / public area in floor / zone basis provided	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation **Items 1 to 3:** The indicators are assigned to award the building if energy monitoring / metering facilities are provided. Energy measurement can be carried out by means of central control and monitoring system (CCMS) or energy meters, together with data logger. The facilities shall be able to record the energy consumption data and trends of major systems in a building, such as chiller plant, boiler plant, heat rejection plant, pumping system, air distribution system, lighting in landlord area, etc, as well as to record the actual building cooling and heating loads. The facilities shall also be convenient for the building operator or energy consultancies to conduct regular energy audits. Optimum numbers of metering points / zones shall be determined

according to the system complexity and building usage.

The indicators assess the strategies for effective energy monitoring of various major building services systems, and the energy use profile for different services applications. Energy monitoring enables the building facility operators to monitor the operating performance and develop measures to improve the energy performance of various building services systems under both full load and part load conditions. Effective energy monitoring helps to improve overall energy efficiency of the building. Also, convenient and effective energy audits can be conducted regularly.

Metering of all individual landlord equipment may not be cost-effective, but metering of particular groups of equipment and major equipment could be sufficient in many cases in order to understand the energy use pattern and for future energy use planning. Also, metering provisions allow regular energy audits to be carried by building operators or energy audit consultants. Monitoring of energy use includes both electricity and gas consumption. Energy metering, monitoring and logging provisions for continuous recording of energy use are recommended.

In addition, real-time monitoring instruments shall be provided to record the building cooling and heating loads, which are useful in building energy and operation management.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Descriptions of the monitoring systems and their locations.
- Relevant schematic diagram.

RE 2.5 Energy Audit

Intent To conduct regular energy audit for the building to improve building energy efficiency

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
	Non-residential Buildings Score **($P_{O\text{-}NR}$)**	Residential Buildings Score **($P_{O\text{-}R}$)**
		RE 2.5 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Formation of an energy audit team / employ external energy audit team to carry out walk-through audit for the whole building not less than once for 3 years	0	1		0	1	
2	Building operator to collect annual historical energy data and to determine the Energy Utilisation Index	0	1		0	1	
3	To implement any previously identified Category 2 EMO	0	1		0	1	
4	To implement any previously identified Category 3 EMO	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation **Item 1 to 4:** The indicators assess the strategies and implementation of energy consumption audits for major building services systems and energy use profiles for different services applications. Energy audit is an effective energy management tool. Energy Management Opportunities (EMO) can be identified through the audit process. Subsequently, energy saving can be achieved through facility management and improvement works. The detailed methodology of energy audit can refer to EMSD Guidelines on Energy Audit (2004), CIBSE AM5 Energy Audits and Survey, etc.

This indicator is not applicable for energy audit works in building tenants' / owners' areas or residential flats.

Item 1: Competent in-house experts or an external energy audit team (e.g. building services consultants and tertiary academic institutions) are eligible to conduct energy audit. The team shall always be formed by a combination of energy audit professionals and in-house property management staff and maintenance staff, who are familiar with the building daily operation and its building services installations.

Category 1 EMO involves practically no cost investment and without any disruption to building operation, normally involving general house keeping measures. It is expected that Category 1 EMO will be implemented immediately after the walk-through audit.

Item 2: Building background information and energy bills (a minimum of 3 years records, or all years between the building handover and this assessment) shall be collected to establish an annual monthly energy consumption profile. The Energy Utilisation Index (EUI) can be obtained by dividing the annual energy consumption by the Gross Floor Area. It takes into account the difference in energy consumption due to different building floor areas, and can be used for comparison of energy consumption among buildings of similar nature. For commercial buildings, reference EUI data can be obtained from the EMSD Energy Consumption Indicators and Benchmarks for Commercial Sector. For other building types, EUI can be used to monitor the trends of annual building energy consumption from building handover to the time of energy audit, such that improvement or deterioration of building energy efficiency can be identified.

Items 3 & 4: Category 2 EMO involves low cost investment with some minor disruption to building operation. Category 3 EMO involves relatively high capital cost investment with much disruption to building operation. The indicators are applicable if Category 2 and 3 EMOs are identified after the previous walk-through energy audit. Implement any identified EMO (identified between this assessment and the previous energy audit, but not more than 5 years) whist improvement of building energy efficiently identified is eligible to obtain score in this indicator.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Energy audit team organisation chart.
- Latest energy audit report with energy consumption analysis and EMOs.
- Previous energy audit report (not more than 5 year before this assessment) and the identified EMOs.
- EMO implementation record.
- Other relevant supporting information, such as drawings and photos.

RE 3 Use of Renewable Energy

RE 3.1 Renewable Energy Applications

Intent

To use renewable energy technology to reduce environmental impacts associated with fossil fuel energy use

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	Without application of renewable energy	Without application of renewable energy
1	Renewable energy used in the Building	Renewable energy used in the Building
2	≥ 1% of total building energy generated from renewable sources used in the Building	≥ 1% of total building energy generated from renewable sources used in the Building
3	≥ 2% of total building energy generated from renewable sources used in the Building	≥ 2% of total building energy generated from renewable sources used in the Building
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		RE 3.1 Score

Explanation

Use of renewable energy sources is encouraged by both the Government of the HKSAR and local environmental groups, with the support by many practising building professionals. The technology of many renewable energy generation methods are mature and have been adopted in many other developed countries. Apart from the photovoltaic and solar thermal applications, wind, small-scale hydropower, geothermal, tidal, and so on are possible renewable energy sources for considerations. Albeit there may be many restrictions in using renewable energy within a building based on the current high density urban form and high-rise built form practices in Hong Kong, a certain scale of renewable energy use with proper integration with the building system is still feasible.

The relative percentage of building energy consumption from renewable sources will be determined by comparing the total annual energy output (in terms of kWh of electrical energy for electricity generating installation and kWh of thermal energy for hot water generating installation) from renewable source with the measured annual building energy consumption of fixed electrical and hot water installations in the core and shell area. Energy consumption from socket outlet is excluded from the calculation. The energy output shall be the measured total annual output from the renewable energy generator, such as photovoltaic or solar thermal panel, minus the conversion loss, or power loss from inverter and cables, within the renewable energy source circuit portion. Renewable energy generated from the installation within the site or purchased from other reasonable sources are considered as acceptable.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

1. System descriptions and schematic diagrams.
2. Photos of the renewable energy systems.
3. Calculation of the energy output and energy consumption record.

RE 4 Water Conservation

RE 4.1 Greywater Recycling

Intent To recycle and reuse greywater in order to reduce the consumption of fresh and flushing water

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	Without provision of grey water recycling system	Without provision of grey water recycling system
1	Grey water recycling system provided	Grey water recycling system provided
2	Amount of greywater for recycling ≥ 5% of total amount of fresh water consumption	Amount of greywater for recycling ≥ 5% of total amount of fresh water consumption
3	Amount of greywater for recycling ≥ 10% of total amount of fresh water consumption	Amount of greywater for recycling ≥ 10% of total amount of fresh water consumption
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		RE 4.1 Score

Explanation This indicator is assigned to reduce grey water discharged to the utility drainage system, and to reuse part of the discharged water for building usage. This can reduce the overall water consumption in building. Water treatment system is required to ensure the water quality of recycled water is the same as the water supplied from the Government mains.

Grey water is defined as water discharge from bathtub, shower, washing basin (except for kitchen and clinical areas), condensate from air conditioning system and water discharged from cooling tower, swimming pool and fountain.

For non-residential building, grey water discharged from a building includes the discharge from washing basin (except for kitchen and clinical areas), condensate from air-conditioning system, as well as the blow down water from cooling tower, swimming pools and water fountains.

For residential building, grey water discharged from a building includes the discharge from washing basin (bathroom only), bathtub and shower, as well the blow down from the swimming pool and water fountain inside the residential building portion and residents' clubhouse.

Percentage of total grey water being recycled for reuse = Amount of grey water recycled and reused per year / Amount of freshwater meter reading from the building per year, in terms of cubic metre. The total amount of recycled grey water can be obtained from water meters of the water treatment plant.

The recycled grey water is applicable for cleansing, landscaping and toilet flushing purposes. To satisfy the pre-requisite requirement for performance scale `2' and `3' in residential building, condensate from packaged type air-conditioners in residential flat shall also be connected to the greywater recycling system where possible. However, the amount of condensate shall not be counted in the total grey water percentage calculation.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- System descriptions and schematic diagrams.
- Water flow metering records for the grey water recycling and treatment facilities.
- Operation and maintenance records for the greywater recycling facilities.
- Records of water meter readings

RE 4.2 Rainwater Recycling

Intent To recycle and reuse rainwater in order to reduce the consumption of fresh water

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	Without provision of rainwater capture, recycle & reuse facilities	Without provision of rainwater capture, recycle & reuse facilities
1	Rainwater capture, recycle & reuse facilities provided	Rainwater capture, recycle & reuse facilities provided
2	Amount of rainwater for recycling ≥ 5% of total amount of rainwater captured from building	Amount of rainwater for recycling ≥ 5% of total amount of rainwater captured from building
3	Amount of rainwater for recycling ≥ 10% of total amount of rainwater captured from building	Amount of rainwater for recycling ≥ 10% of total amount of rainwater captured from building
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
	RE4.2 Score	

Explanation

This indicator is assigned to reduce water consumption by using captured rainwater. Water treatment system is required to ensure the water quality of the recycled water is the same as the water supplied from the Government mains. Rainwater can either be conveyed to a standalone system, or to greywater recycling system. The potential applications of rainwater are wider relative to greywater. However, the supply of rainwater is not stable as large amount of rainwater can be collected within a short period of time, the size of water storage is one of the major factors to determine the capacity of the rainwater recycling system, and the choice of standalone / combined system.

Since it is difficult to measure the actual collection of rainwater, estimated amount of rainwater captures, recycled and reused is considered. Relevant installations shall be provided in the building and maintained in good conditions.

Percentage of total rainwater being recycled for reuse = Estimated amount of rainwater recycled and reused per year / Amount of rainwater captured from the collectable area of the building per year, in terms of cubic metre.

The amount of rainwater water can be estimated by the following equation:

Rainwater Volume [m^3] = Collection area [m^2] x collection efficiency [%] x average rainfall [m]

Average annual rainfall is available from the data published by Hong Kong Observatory.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- System descriptions and schematic diagrams.
- Operation and maintenance records for the rainwater recycling and treatment facilities.

Percentage of total rainwater being recycled for reuse = Amount of rainwater recycled and reused per year / Amount of rainwater captured from the collectable area of the building per year, in terms of cubic metre.

RE 4.3 Water Conservation Strategies

Intent To implement water conservation strategies and to use water conservation facilities

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **($P_{O\text{-}NR}$)**	Residential Buildings Score **($P_{O\text{-}R}$)**
		RE 4.3 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Use of low flow / automatic / semi-automatic (cistern type) water closet	0	1		0	1	
2	Use of automatic / manual flow control faucet	0	1		-	-	N/A
3	Use of automatic / manual flow control valve for urinal	0	1		-	-	N/A
4	Use of water saving irrigation system	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation **Items 1 to 4:** The indicators are assigned to award the building if water conservation facilities provided to reduce both potable & flushing water consumption in core and shell areas. Apart from improving water wastage habit of building occupants in an active way by means of education, passive methods by means of using manual / automatic flow control devices for controlling water supply, are also feasible to achieve the aims effectively.

Reduction in water consumption not only reduce the handling capacity of both water supply and waste treatment facilities, but also lessen the demand of building energy

use, pumping power in utility network, chemical treatment and the environmental loadings in water treatment process. Varieties of water saving facilities are commercially available in Hong Kong. Automatic device can provide a better service quality while some manual device can provide the same function with lower cost.

Innovation Item:

Use of other water saving device or innovative idea on management to reduce water consumption

This indicator is satisfied if the innovative devices or management scheme can save water by 10% of the total water consumption.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- System descriptions and relevant photos.
- Schematic diagrams of irrigation system.
- Other relevant supporting document for improved and innovative ideas.

RE 5 Timber Use

RE 5.1 Sustainable Timber Use

Intent To use timber from sustainable source

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	No timber use from qualified sustainable source in the past 3 years	No timber use from qualified sustainable source in the past 3 years
1	≥ 30% timber use from qualified sustainable source in the past 3 years	≥ 30% timber use from qualified sustainable source in the past 3 years
2	≥ 40% timber use from qualified sustainable source in the past 3 years	≥ 40% timber use from qualified sustainable source in the past 3 years
3	≥ 50% timber use from qualified sustainable source in the past 3 years	≥ 50% timber use from qualified sustainable source in the past 3 years
	Non-residential Buildings Score (P_{O-NR})	Residential Buildings Score (P_{O-R})
		RE 5.1 Score

Explanation

The assessment covers wood products used in building including permanent framing, flooring, finishes and partitions in landlord areas. Wood is an important material in the global context since it is a natural renewable material. However, over-harvest of forest leads to extinction of indigenous species and forests that adversely affect the whole ecological cycle of the environment. Therefore, being one of the largest importers of tropical hardwood, the building industry should demonstrate the effort in adopting timber from sustainable managed source.

This indicator assesses the proportion of wood materials used for daily operation and decoration and minor A&A works after building handovered to building operator, conforming the requirement of sustainable forestry practice guidelines and accredited by recognized organizations, such as the non-profit Forest Stewardship Council (FSC) or the American Forest and Paper Association (AFPA). The timber will be certified in form of eco-seals. Alternatively, use of recycled timber in lieu of new timber from sustainable forestry is also acceptable.

As far as global environmental sustainability is concerned, the source of timber rather than the type of timber is more emphasized in this indicator. The operator is required to produce a recording system to validation the strategy implementation.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- Implementation strategy.
- Timber use (locations and usage) records.
- Timber delivery records and the relevant sustainable timber certification.

RE 6 Material Use

RE 6.1 Recycled Material Use

Intent To reduce material consumption and reduce demands on limited reserves of natural resources by use of recycled materials

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	<5% of materials & components used with recycled content in the past 3 years	< 5% of materials & components used with recycled content in the past 3 years
1	≥ 5% of materials & components used with recycled content in the past 3 years	≥ 5% of materials & components used with recycled content in the past 3 years
2	≥ 10% of materials & components used with recycled content in the past 3 years	≥ 10% of materials & components used with recycled content in the past 3 years
3	≥ 15% of materials & components used with recycled content in the past 3 years	≥ 15% of materials & components used with recycled content in the past 3 years
	Non-residential Buildings Score (P_{O-NR})	Residential Buildings Score (P_{O-R})
		RE 6.1 Score

Explanation This indicator is assigned to encourage the building operator to establish a material reuse strategy for daily operation, maintenance and minor alteration & addition works. The operator shall implement the strategy in the daily operation and to produce a recording system to validation of strategy implementation.

The material reuse strategy shall include the categorization of the materials used for daily operation, maintenance and minor alteration & addition works while to determine what aspect of materials to be used can be produced by recycling materials. This indicator is applicable for major building materials, such as building structure, false ceiling, partition wall, paint, door, window, etc., landscaping materials and materials for daily operation such as paper and storage box.

The use of materials with 100% or partial recycled content is encouraged. However, it should be ensured that the reuse or recycled materials should be of good quality and have no adverse environmental and buildability impacts. The BD PNAP 275 Use of Recycled Aggregates in Concrete can be referred.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- Implementation strategy.
- Material use (locations and usage) records for daily operation, maintenance and minor alteration & addition works.
- Material delivery records.

The recycled content of material shall be determined by dividing the weight/volume of recycled content in the item by the total weight/volume of all material in the item. The percentage of materials and components used with recycled content shall be compared with the total materials used for the designated activities in the past 3 years.

RE 6.2 Environmentally-Friendly Materials

Intent To use environmental-friendly building materials to reduce environmental impacts

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	< 25% of environmental-friendly materials used in the past 3 years	< 25% of environmental-friendly materials used in the past 3 years
1	≥ 25% of environmental-friendly materials used in the past 3 years	≥ 25% of environmental-friendly materials used in the past 3 years
2	≥ 50% of environmental-friendly materials used in the past 3 years	≥ 50% of environmental-friendly materials used in the past 3 years
3	≥ 75% of environmental-friendly materials used in the past 3 years	≥ 75% of environmental-friendly materials used in the past 3 years
	Non-residential Buildings Score (P_{O-NR})	Residential Buildings Score (P_{O-R})
		RE 6.2 Score

Explanation

Use of environmentally-friendly materials helps to minimize the life-cycle environmental impact. Adoption of green building materials is encouraged and should be awarded.

This indicator is assigned to encourage the building operator to establish an environmentally-friendly material use strategy and to implement the strategy in the daily operation, maintenance and minor alteration & addition works. This indicator is applicable for major building materials, such as external wall, permanent partition wall, cladding, flat roof, floor finishes, window, curtain wall, doors and paint, where constructed in shell and core area as well as the materials provided by the landlord in rental and sellable areas. Environmental-friendly material is defined as the satisfaction to the (1) Compliance with the Hong Kong Green Label Scheme, Product Environmental Indicator for Construction Materials, produced by the Green Council and Hong Kong Productivity Council, or (2) Summary Rating `A' in The Green Guide to Specification – An Environmental Profiling System for Building Materials and Components, BRE, or (3) `Good' in Environmental Resource Guide, The American Institute of Architects.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- Strategy for using environmentally-friendly materials in daily operation, maintenance and minor alteration & addition works.
- Implementation records, together with other relevant evidence shall be provided to demonstrate the recycled material source, used with locations and amount of used with materials for building construction / refurbishment.

The quantities of environmentally-friendly materials can be counted based on either the weight or volume of the total amount of material used.

LOADINGS (LD)

LD 1 Pollution

Pre-requisite Criteria

Intent To minimise and mitigate outdoor pollution and the subsequent health and environmental impacts under global and local considerations

Requirements	Compliance
This indicator is assigned to reassert the importance of pollution reduction issues in the overall building environmental performance through the current statutory requirements. Manage and operate the Building with full compliance with Air Pollution Control Ordinance, Noise Control Ordinance, Water Pollution Control Ordinance, Ozone Layer Protection Ordinance and all relevant regulations, as well as statutory Code of Practice and Technical Memorandum from various government departments such as EPD, FEHD, AFCD, etc.	Statutory requirements, no assessment in CEPAS is required.

LD 1.1 Air Pollution

Intent To minimise and mitigate outdoor air pollution and the subsequent health and environmental impacts under global and local considerations

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le \mathbf{P_O} < 0.25$	$0 \le \mathbf{P_O} < 0.25$
1	$0.25 \le \mathbf{P_O} < 0.5$	$0.25 \le \mathbf{P_O} < 0.5$
2	$0.5 \le \mathbf{P_O} < 0.75$	$0.5 \le \mathbf{P_O} < 0.75$
3	$0.75 \le \mathbf{P_O} \le 1$	$0.75 \le \mathbf{P_O} \le 1$
Innovation	0 or 1	0 or 1
		LD 1.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	All thermal insulations used for building fabric are CFC/HCFC free	0	1		0	1	
2	All thermal insulations used for water pipes and air ducts are CFC/HCFC free	0	1		0	1	
3	All refrigerants used are zero ozone depleting potential	0	1		0	1	
4	No toilet exhaust outlet located facing any kitchen / living room / bedroom openings directly in 5 metres at open space or within a light well	-	-	N/A	0	1	
5	No refuse storage room opening located facing any kitchen / living room / bedroom openings directly in 5 metres at open space or within a light well	-	-	N/A	0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

Items 1 to 3: The indicators are assigned to award the use of environmentally-friendly thermal insulation and refrigerant. Ozone-depleting substance reduction leads to global and local benefits. The aim of this indicator is to reduce the release of ozone depleting substances such as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) into the atmosphere from building materials and services systems. CFC and HCFC contribute major implications in the depletion of ozone layer. Majority of CFC and HCFC related substances generate from heating, ventilation, air conditioning and refrigeration equipment and building insulation. Meanwhile, changing the use of non-zero Ozone Depleting potential (ODP) refrigerant to zero ODP is also encouraged.

Items 4 to 5: In terms of local environmental aspect, potential risk of pollutant spread around buildings is another concern in air pollution control. The indicators are assigned to alarm the potential risk of pollutant and odour spread, and nuisance from refuse storage room and toilet to the habitable space and food preparation area. Improved building spatial design reduces cross contamination around buildings is encouraged.

Innovation Item:

Innovative method to reduce air pollution substantially due to building operation

This is a bonus score for innovative method to reduce air pollution substantially.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- System descriptions.
- Layout diagrams to indicate the locations of the relevant openings.
- Other relevant supporting document for improved and innovative ideas.

LD 1.2 Water Pollution

Intent To minimise and mitigate water pollution and the subsequent health and environmental impacts under global and local considerations

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
	LD 1.2 Score	

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Cleansing of fresh water tank at least once every 3 months	0	1		0	1	
2	Cleansing of flushing water tank and other water storage tanks at least once every 6 months	0	1		0	1	
3	Effective water filtration system for swimming pool provided	0	1		0	1	
4	Effective water filtration system fountain and landscape pool provided	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

Item 1: Fresh water quality supplied to water taps in a building is important for the well-being of building users. Fresh water tank in building is the last water storage place before delivery to building occupants. Water Supplies Department recommends cleansing of fresh water tank at least once for every 3 months.

Item 2: Flushing water quality requirement is not as stringent as fresh water. However, regular cleansing of flushing water tank is also recommended. Meanwhile, regular cleansing of other water tanks, such as cleansing water and irrigation tanks are also recommended.

Items 3 & 4: Poor designed and maintained water filtration systems may lead to

health risk to building users and surrounding environment. Hence, effective water filtration system is required for major water pools in a building, such as swimming pool, fountain and landscape pool.

The compliance of the indicators depends on the cleanliness and conditions of the filtration system. For instance, if sand filter is used, regular back-washing and replacement of aged filtering materials are able to maintain the filtering efficiency of filtering installations such that water quality of the building facilities can also be maintained.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- System descriptions.
- Water pollution control implementation records, such as inspection and maintenance records.
- Schematic diagrams of filtration systems.

LD 2 Waste Management

Prerequisite Performance

Intent To reduce waste generation, disposal and the associated environmental impacts

Requirements	Compliance
This indicator is assigned to reassert the importance of waste reduction issues in the overall building environmental performance through the current statutory requirements. Manage and operate the Building in full compliance with the Waste Disposal Ordinance and all relevant regulations from various government departments such as EPD, FEHD, AFCD, etc. Some buildings with regular hazardous waste disposal (e.g. Chemical and Asbestos) should also abide by the corresponding Ordinances, Guidelines and Codes of Practice from EPD.	Statutory requirements, no assessment in CEPAS is required.

LD 2.1 Waste Sorting & Storage

Intent To provide effective management of waste, including sorting, recycling and disposal of municipal waste

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le \mathbf{P_O} < 0.25$	$0 \le \mathbf{P_O} < 0.25$
1	$0.25 \le \mathbf{P_O} < 0.5$	$0.25 \le \mathbf{P_O} < 0.5$
2	$0.5 \le \mathbf{P_O} < 0.75$	$0.5 \le \mathbf{P_O} < 0.75$
3	$0.75 \le \mathbf{P_O} \le 1$	$0.75 \le \mathbf{P_O} \le 1$
Innovation	0 or 1	0 or 1
		LD 2.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Building operator established and implemented a municipal waste management strategy	0	1		0	1	
2	Designated centralised space and facilities provided for sorting and storage of recyclable and non-recyclable waste	0	2		0	2	
3	Designated space(s) and facilities provided on each floor for sorting and storage of recyclable and non-recyclable waste	0	1		0	1	
4	Automatic sorting and storage facility provided for recyclable and non-recyclable materials in each building / whole site	0	1		0	1	
5	Provision of self-closing air tight systems for storage of organic waste that may lead to bad smells and hygienic problems	0	1		0	1	
6	Designated person to conduct weekly inspection to the operational effectiveness of the waste management strategies	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation The indicators aim to assess the establishment of waste management strategies and provision of facilities for sorting and storage of municipal waste (including construction

and demolition waste due to minor A&A works). Specific areas shall be assigned for different waste types, such as organic, non-recyclable and recyclable waste. The sorting of waste can be carried out in a manual or automatic way in designated area(s).

Item 1: The building operator is encouraged to establish a municipal waste management plan that suits the managed building. Apart from that, effective implementation is required to ensure that strategies are applicable for all building occupants and property management staff of the assessed building. The strategies can be in the form of management procedures, training, instructions or guidelines.

Item 2: A centralised space shall be allocated for each building or for the whole site is eligible for this indicator. The space could be open space or enclosed area, but enclosed area is recommended. For open space storage, sufficient distance away from habitable area, major circulation space and building fresh air intake such that odour transmission and health risk are minimized. The centralised space provides a convenient waste delivery and minimise the environmental impact due to waste transportation within the building.

Item 3: Solely provides a centralised space can improve the delivery process of large amount of waste, but not convenient to individual building user. A decentralised storage and sorting locations, such as sorting point per floor can encourage frequent use of recycling facilities.

Item 4: Centralised automatic sorting facilities provide a sophisticated and convenient way for waste disposal, while able to sort recyclable and non-recyclable waste.

Item 5: Exposed storage of waste, particularly for organic waste, leads to unwanted odour and health risk to the surroundings. Self-closing air-tight system could be in automatic or manual operation.

Item 6: A designated person is required to inspect the operational effectiveness of various waste management strategies in the managed building every week. The designated person should ensure the strategies are implemented according to the procedure and guidelines as stipulated in the waste management plan. Also, the designated person shall look for improvement strategies to enhance the effectiveness of waste management and maximising the recyclable waste collection.

Innovation Item:

Innovative method to reduce waste generation or effective waste management due to building operation

This indicator is assigned to award the building operator for providing improved and innovative method to reduce waste generation or effective waste management due to building operation.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Municipal waste management plan.
- System descriptions with supporting photos and schematic diagrams.
- Strategy implementation records.
- Other relevant supporting document for improved and innovative ideas.

SITE AMENITIES (SA)

SA 1 Inclusion

SA 1.1 Social Interaction

Intent To provide optimum spatial arrangements and facilities to enhance the sense of social interaction for all building occupants and users

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		SA 1.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Open /covered / enclosed common space with facilities provided to harmonise the space use by all building occupants and users for their interactions and communications	0	1		0	1	
2	Enhanced barrier free access and facilities for convenience provided for disabled and elderly persons	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation **Item 1:** This indicator is assigned to award building with open/ covered / enclosed common space for use by all building occupants and users within the site for their communication and interactions. The space can be in form of open or enclosed space, with barrier free access by all kinds of building occupants. It also provides a comfortable environment for enjoyment and leisure, short break, sport activities, and

so on, used by building occupants and users.

For instance, table with chessboard, open playground or fixed seats are considered as the provisions for occupant's interactions and family activities, and are accepted in this indicator. Common place for chatting, clubhouse in residential building, covered greenery with fixed furniture are acceptable in this indicator, provided that the spaces are barrier free access for all kinds of building occupants.

Harmonization of the designated space use shall cover all kinds of building users, despite of healthy, disabled, children, adult, elderly, new immigrants, different gender and race. Space for particular minorities should be avoided in order to minimize labeling effect and maximize harmonization.

Item 2: This indicator is assigned to award the building if the building operator provided building facilities for convenience and enhanced barrier free access for disabled and elderly persons. The facilities shall be able to enhance the connectivity for all types of occupants and users, such as disabled, elderly persons and healthy people, in addition to the current barrier free access requirements as stipulated in the building regulations, as well as the facilities and provisions provided by the designer/developer.

Innovation Item:

Innovative method to further enhance the effectiveness of social interaction in existing building

This indicator is assigned to award the building operator for providing improved and innovative method to further enhance the effectiveness of social interaction in existing building.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Relevant building and facilities descriptions.
- Layout diagrams to show the locations of the space and facilities provided to enhance inclusion.
- Map to show the distance to nearby large communal leisure and recreational facilities.
- Other relevant supporting document for improved and innovative ideas.

SA 1.2 Connectivity

Intent To provide optimum spatial arrangements and facilities to enhance the sense of connectivity for all building occupants and users

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings		Residential buildings	
0	$0 \le P_O < 0.25$		$0 \le P_O < 0.25$	
1	$0.25 \le P_O < 0.5$		$0.25 \le P_O < 0.5$	
2	$0.5 \le P_O < 0.75$		$0.5 \le P_O < 0.75$	
3	$0.75 \le P_O \le 1$		$0.75 \le P_O \le 1$	
	Non-residential Buildings Score **($P_{O\text{-}NR}$)**		Residential Buildings Score **($P_{O\text{-}R}$)**	
		SA 1.2 Score		

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Large communal leisure and recreational facilities are directly accessible within 15 minutes walk via safe pedestrian path	0	1		0	1	
2	Common space with covered and comfortable pedestrian connections to open space, entrance and building facilities provided within the site	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation .

Item 1: This indicator is assigned to award the building if it is locating in the vicinity of large-scale communal leisure and recreational facilities, which are accessible by walking within 15 minutes via safe pedestrian path. Open space or building provided with communal leisure and recreational facilities, such as public library, sport complex, are particularly important in a high-density urban form. The facilities allow building occupants and users to relax their stress caused by dense living and working environment. Walking distance is calculated by using walking speed at 4km/hr. The

standard scale of the area provided for communal leisure and recreational facilities should refer to the Hong Kong Planning Standard and Guideline issued by Planning Department.

Item 2: This indicator is assigned to award the building for providing common space with covered pedestrian connections to open space, site and building entrance as well as building facilities within the site to create a more comfortable and convenient environment for circulation

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Relevant drawings and facilities descriptions.

SA 2 Landscape

SA 2.1 Landscape

Intent To provide greenery and landscape features

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		SA 2.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Provided with communal landscape areas on ground level	0	1		0	1	
2	Landscape for slope and retaining wall within the site provided	0	1		0	1	
3	Biotope with native species provided within the site	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation The principle objective for these criteria is to encourage proper maintenance and management of the landscaped area and open space in good condition for the use by the building occupants, users or public.

Items 1: Urban greenery and vegetation in a dense-built city can reduce unprotected open space and roof temperature in summer and also mitigate the heat island effect. Also, vegetation helps to increase the retention time for rainwater run-off into soil such that local thermal comfort can be enhanced. Communal landscaped area provides a natural ventilated environment with greenery and recreational garden space. This indicator is assigned to encourage the provision of communal landscape

areas for residential and non-residential buildings as to improve the living and working environment.

Item 2: If slope or retaining wall exists in the premises, landscaping the slope or retaining wall is eligible to obtain score. Bare concrete slope and retaining wall are visual obtrusive. Slope and retaining wall with vegetation create a pleasant environment and mitigate the localized heat island effect as well as to provide fresh air for building occupants. The BD PNAP 270: Improvement of Visual Appearance and Landscape Treatment for Man-made Slopes and Retaining Wall, and GEO Layman's Guide to Landscape Treatment of Slopes and Retaining Walls can be referred.

Item 3: Biotope is an environment that enables the area to be inhabited by a certain flora and fauna species, which has been recreated. The self-sustained eco-system shall be co-existing with the surrounding environment. Preliminary field survey to identify the existence of natural biotope within the site is required. If a natural biotope exists, retaining the natural environment is required. Relocation of natural biotope to other location within the site with special care may be possible. If there is no natural ecosystem with reasonable environmental value in the site, a biotope can be created by building operator. The ecosystem will be able to provide a higher level of natural environmental relative to conventional greenery and vegetation, with the co-existence of natural habitat and the human-being. Also, existence of biotope can create a higher-level harmonization between man-kind and the natural environment.

For a composite building, biotope is considered as a shared facility for both residential and non-residential portions provided that this is accessible by all building user. If the building is eligible for this indicator, score will be awarded for both residential and non-residential portions.

This indicator is assigned to encourage the plantation of native vegetation species in the biotope. Native vegetations have higher chance of survival and higher adoptability than other species. This indicator also server as a good practice on preserving local plantation species.

Innovation Item:

Innovative measures provided to achieve better landscaped environment

This indicator is assigned to recognize improved and innovative method provided to further enhance the landscaped environment in the assessed building.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Relevant landscape and facilities descriptions.
- Layout diagrams to show the locations of the landscape and facilities.
- Descriptions of the biotope and its ecological value and its physical conditions, such as soil depth, natural daylight, ventilation and irrigation, etc.
- Information relating to maintenance and management arrangement and operational measures to maintain a good quality landscape setting for users.

SA 3 Cultural Character

SA 3.1 Cultural Character

Intent To recognise the distinctive cultural character of the building

Performance Indicators

Sub-criteria Performance Scale	Non-residential / Residential buildings
0	The building without a distinctive cultural character
1	-
2	-
3	The building is having a distinctive cultural character
	SA 3.1 Score

Explanation

Cultural character is a broad term and is rather difficult to quantify. However, a building designed or constructed with cultural distinctiveness, which aims to be recognised as a good example or paradigm for the development of building industry and the society in Hong Kong is encouraged. Cultural distinctiveness of individual building and development could create many long-term benefits to Hong Kong, such as the sense of innovation in the local society, diverse cultural characters and distinctiveness that in-line with the mixed culture tradition in this international city. Direct copy of building design is not recommended. The cultural distinctiveness can be recognised in any aspect of sustainability, aesthetics, cultural character, function and technology, as well as beneficial to the building profession, city image and tourism.

The character and distinctiveness of a building can be presented by its appearance, built form, spatial morphology, building technology, or other impressive and innovative idea for assessment.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- Explanation of the cultural character of the building to demonstrate the cultural distinctiveness of the assessed building.
- Substantial justification to prove its unconventional character and distinctiveness as well as cultural benefits over other existing buildings in Hong Kong.
- Recognition and appreciation awarded by professional and authoritative organisations with relevant aspects may be considered as an alternative compliance path.

SA 4 Security

SA 4.1 Security

Intent To provide effective security to the building and its occupants and users

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score **(P_{O-NR})**	Residential Buildings Score **(P_{O-R})**
		SA 4.1 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Space with minimal risk for building occupants and users	0	1		0	1	
2	Effective passive security facilities provided	0	1		0	1	
3	Effective active security measure provided	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation

Item 1: Hong Kong is a city with high living density. Although the crime rate in Hong Kong is relatively low compared with many other developed cities in the world, a sense and provisions of living security are important for well-designed spatial arrangement, in order to enhance the sense of security in the building and minimize risk for building occupants. Spatial design shall be considered, such as elimination of dark cul-de-sac, and unnecessary recess space, providing with wide and open staircase, etc.

Item 2: This indicator is assigned to encourage the building for providing effective passive security facilities in the building, such as access barrier / gate, security fence, as well as other facilities to minimise risk such as fence and barrier for access to

slope, seashore, exposed pipes and cables, etc. Reasonable quantities of facilities and provisions shall be provided to suit the scale and complexity of the building

Item 3: This indicator is assigned to encourage the building and building operator for providing effective active security facilities and measures in the building, such as closed circuit television (CCTV), door alarm, glass alarm, electronic access control and security guards, etc. Reasonable quantities of facilities and provisions shall be provided to suit the scale and complexity of the building.

Innovation Item:

Other innovation measure provided to enhance security provisions

This indicator is assigned to recognize improved and innovative method to further enhance the security performance and safety within the site.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Descriptions of the security facilities and measures.
- Drawings to demonstrate the space were designed to provide a safe environment for the building occupants and users.

NEIGHBOURHOOD AMENITIES (NA)

NA 1 Provisions for Community

NA 1.1 Provisions for Community

Intent

To recognise the effort for providing appropriate spatial and facility provisions in the building that benefits to the community

Strategy Indicators

Sub-criteria Performance Scale	Non-residential / Residential buildings
0	$0 \le \mathbf{P_O} < 0.25$
1	$0.25 \le \mathbf{P_O} < 0.5$
2	$0.5 \le \mathbf{P_O} < 0.75$
3	$0.75 \le \mathbf{P_O} \le 1$
Innovation	0 or 1
NA 1.1 Score	

Item	Strategy	Non-residential / Residential		
		No	Yes	N/A
1	Facilities provided within the site or having similar provisions in the immediate neighbouring sites to support communal and social services	0	1	
2	Facilities provided within the site to or having similar provisions in the immediate neighbouring sites to provide convenient services to community	0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL + RESIDENTIAL	**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**		

Explanation

The indicators cover amenity provisions such as shopping center, market, indoor recreation center, child care center and other social and community facilities. These facilities shall be in easily accessible locations in the immediate neighboring sites, and provide convenient shopping and communal facilities for the local residents.

Item 1: This indicator is assigned to award the building if communal and social services are provided within the building to serve the communities and the assessed building itself, or exist in the immediate neighboring sites to serve the existing local communities as well as the assessed building, which have been identified in a survey. A site survey on local communal and social services, by means of individual survey at the building operation stage shall be carried out to identify the existing communal and social service provisions in the surroundings and to identify duplication of services /

amenity conflict. Provisions and facilities for recreational and leisure purposes for healthcare, elderly, youth, new immigrants, are some of the possible communal and social services to the community that are eligible to obtain score in this indicator, provided that services / amenity conflict doesn't occur.

If the building is located at a site with sufficient communal and social services in the surroundings to serve the local communities and the assessed building occupants, the building is eligible to obtain score in this indicator. Sufficient evidence shall be provided to demonstrate existing provisions for the communities.

Item 2: This indicator is assigned to award the building if convenient commercial service provisions are provided within the building to serve the communities, such as retail shop and restaurant, or exist in the immediate neighboring sites to serve the existing local communities as well as the assessed building, which have been identified in a survey. Building occupants and users in and around the building obtaining commercial services can by means of walking. A site survey on local commercial services by means of individual survey in the building operation stage shall be carried out to identify the existing commercial service provisions in the surroundings. For instance, if food and beverage facility were inadequate around the building, provision of commercial outlet equipped with kitchen ventilation within the assessed building would be able to attract food business.

Sufficient evidence shall be provided to demonstrate the provisions for the communities.

Innovation Item:

Other innovation measure provided to enhance provisions for community

This indicator is assigned to recognize improved and innovative method to enhance provision for community.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Field survey report.
- Facilities descriptions and a map highlighted with relevant information to demonstrate the communal support provided in and around the building.

NA 2 Transportation

NA 2.1 Public Transportation

Intent To encourage the use of public transportation instead of private car

Performance Indicators

Sub-criteria Performance Scale	Non-residential buildings / Residential buildings	
0	Public transportation is accessible away from any building occupant entrance: 10 minutes < walking time	
1	Public transportation is accessible away from any building occupant entrance: 5 minutes < walking time ≤ 10 minutes	
2	Public transportation is accessible away from any building occupant entrance: 2 minutes < walking time ≤ 5 minutes	
3	Public transportation is accessible within 2 minutes walking distance away from any building occupant entrance	
	NA 2.1 Score	

Explanation

A rapid growing urban city like Hong Kong should provide an efficient and accessible transport network to facilitate individual mobility and transportation of people, goods and services. Transport is the major consumer of fossil fuel and is also the major contributor to pollution, traffic congestion and road accidents. There is a strong linkage between traffic networks, social and economic developments, as well as the associated environmental effect. The high-rise high density urban form in Hong Kong leads to relatively lower natural resources input and environmental loadings in the transportation aspect when compared with many other countries. However, room for further improvement still exists and public transport is encouraged.

Public transport is playing a significant role in improving the traffic environmental performance in Hong Kong, and so further improvement of living standard and encouragement of using public transport instead of private vehicle are necessary.

Walking distance to nearby public transport is one of the major factors affecting the transportation culture of building occupants and users. Walking distance to the public transportation station is used as the assessment criterion. Walking distance is calculated by using walking speed at 4km/hr.

Submittal

The following information shall be provided to demonstrate the compliance of the Performance Indicators:

- A map showing the distance between the nearby public transportation station and the building entrances (entrance designed for building occupants' normal access).

NA 2.2 Green Transport

Intent To provide convenient and low energy transportation services in or around the building

Strategy Indicators

Sub-criteria Performance Scale	Non-residential / Residential buildings
0	$0 \le \mathbf{P_O} < 0.25$
1	$0.25 \le \mathbf{P_O} < 0.5$
2	$0.5 \le \mathbf{P_O} < 0.75$
3	$0.75 \le \mathbf{P_O} \le 1$
Innovation	0 or 1
NA 2.2 Score	

Item	Strategy	Non-residential / Residential		
		No	Yes	N/A
1	Covered bicycle parking area is provided within the site if public bicycle path is available nearby the site	0	1	
2	Vehicle access of the building cause minimal traffic impacts to the surrounding	0	1	
3	Elevated / safe pedestrian path to the nearby public transport facilities provided	0	1	
4	Provision for car pool facilities for building occupants / without vehicle parking area in the building	0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL + RESIDENTIAL	**Sub-criteria performance score (P_0)**		**(B)/(A) = P_0**		

Explanation

Item 1: More use of bicycle in lieu of car helps to reduce energy consumption for motor engine and subsequent pollution. However, in an urban area or area with heavy traffic, use of bicycle may be dangerous for cyclists. Hence, this indicator is assigned to encourage the use of bicycle if a dedicated bicycle path is provided around the site. Provision of bicycle parking area is considered as a good method to encourage the use of bicycle. If a bicycle parking area is provided, covered parking instead of open parking is also encouraged because covered parking encourages frequent use of bicycle due to better protection of bicycle.

Item 2: This indicator is assigned to award the building if the building vehicle assess is located away from main road with heavy traffic, where traffic congestion could be easily caused by vehicle access to the building. Vehicle access to building is recommended to locate at a light traffic road, or a large buffer zone provided between

a heavy traffic road and the gate of building vehicle access.

Item 3: Elevated, continuous and sheltered walkways connecting the building to nearby buildings and public transportation facilities provide a convenient, comfort and safe way for the building occupants and users.

However, provisions of elevated, continuous and sheltered walkway may not be feasible for some building due to existing limitations on the urban layout, street arrangements, building arrangements and usage. Hence, provision of a safe pavement along a light traffic street with connection to public transport stations is also acceptable for this indicator. The barrier between a pavement & street can be in form of metal railing, but planters and flower-beds are also highly recommended.

Note: This indicator is applicable for a large development with private road and pedestrian circulation area, or elevated walkway is spatially feasible.

Item 4: No provision of car parking area is one of the methods to discourage people to own a car but also to encourage building occupants to use public transportation. On the other hand, although public transportation is very convenient in Hong Kong, many people still want to own a car for weekend activities. To further minimize the number of privately owned vehicles but to satisfy the demands of driving enjoyment, the concept of car pool is a possible method to reduce privately owned vehicles.

Providing a car pool is applicable for building residents who do not currently own a car, but would like to have access to a car for occasional use. A pool of vehicles can be shared by the building residents. Through the European countries' experience, each car pool car on the road replaces up to five privately owned vehicles. This helps to relieve the crowded streets, creates less pollution and congestion, and helps to make places cleaner and safer.

This indicator is assigned to encourage no parking facility is provided within the site, or a building provided with parking space while designated spaces are assigned for car pool operation. The building operator, property management company and other car rental company are possible car pool operator.

Note: This indicator is applicable for residential building only

Innovation Item:

Other innovative method provided to further reduce environmental impact due to transportation and to enhance convenient transportation services

This indicator is assigned to recognize improved and innovative method provided to further reduce environmental impact due to transportation and to enhance convenient transportation services in an existing building. The method can be either building management strategies or physical measures.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Facility descriptions and relevant drawings showing the existing bicycle parking and path, vehicle access, elevated/safe pedestrian path.
- Details of carpool facilities
- Photo evidence of the facilities
- Other relevant supporting document for improved and innovative ideas.

SITE IMPACTS (SI)

SI 1 Site Environment

SI 1.1 Healthy Environment

Intent To recognise building arrangements within site boundary with full considerations of existing environmental conditions of the land and its surroundings

Strategy Indicators

Sub-criteria Performance Scale	Non-residential buildings	Residential buildings
0	$0 \le P_O < 0.25$	$0 \le P_O < 0.25$
1	$0.25 \le P_O < 0.5$	$0.25 \le P_O < 0.5$
2	$0.5 \le P_O < 0.75$	$0.5 \le P_O < 0.75$
3	$0.75 \le P_O \le 1$	$0.75 \le P_O \le 1$
Innovation	0 or 1	0 or 1
	Non-residential Buildings Score ($P_{O\text{-}NR}$)	Residential Buildings Score ($P_{O\text{-}R}$)
		SI 1.2 Score

Item	Strategy	Non-residential			Residential		
		No	Yes	N/A	No	Yes	N/A
1	Provided with optimum **daylight** access to buildings within the site and the **view** to surroundings	0	1		0	1	
2	Provided with effective **natural ventilation** and **wind** permeability within the site	0	1		0	1	
3	Provided with effective **noise** mitigation measures within the site	0	1		0	1	
4	Provided with optimum **sunlight** penetration within the site	0	1		0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	
(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
RESIDENTIAL		**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**	

Explanation Provision of an integrated approach for better utilisation of the available natural resources and mitigating the environmental problems. Site layout and building design

analysis evaluates various building design options and derives for an optimum building arrangements and built form, as well as the influence form the surroundings. Currently the Building (Planning) Regulations (B(P)R) prescribe the general provisions for buildings and developments in Hong Kong, while the Hong Kong Planning Standards and Guidelines (HKPSG) is a Government manual of indicator in determining the scale, location and site requirements of various land uses and facilities. The HKPSG is applied in planning studies, preparation/revision of town plans and development control. In essence, the provision of various land uses, community facilities and infrastructure according to the size of population should be considered. Usually the minimum standards are stipulated in the B(P)R or HKPSG, but for some facilities, the upper and lower limits are also provided. In CEPAS, it aims to encourage a better building arrangements and beyond the current minimum standards as stipulated in the HKPSG.

The ratio between the area of a site covered by buildings and the open ground area affects the resistance that the wind encounters in the particular site and the access of sun and daylight in the site. In the case like Hong Kong, it is not uncommon that the coverage of building podium occupies 100% of the site area, which affects the neighbourhood environment, especially at the pedestrian level. This would create adverse effect on daylight access, ventilation and pollution dispersion.

Item 1: The daylight analysis aims to optimize daylight access to the interior from upper to lower floors where possible. Stepped building heights and zigzag arrangement of buildings are possible methods to increase the vertical facade area to receive more daylight. Optimization of daylight access is also required to allow even distribution of daylight access, and prevent some vertical facade receive excessive daylight while some are severely shaded. The statutory right of solar access and window shading in some countries can be set as the examples for Hong Kong to improve the surrounding daylight environment in building arrangement planning. Also, amount of daylight received is relating to the angle/distance of view to the surroundings though their relations are not directly proportional.

The concept of solar radiation access is similar to that of daylight. Direct sunlight also brings excessive solar radiation to the interior. Hence, a well-designed built form helps to reduce the direct access of solar radiation, instead it should be accessed with diffuse or reflected daylight. The building is eligible for this indicator if the building was designed and constructed with optimum daylight access and view to surroundings.

Item 2: For a cluster of buildings within the site, optimum separation of building may help to increase wind permeability and enhance natural ventilation in some portions of buildings. For a single building or a cluster of buildings, breezeway, skygarden, or simple openings, may also help to increase the wind permeability and ventilation effectiveness. Hence, annual air conditioning period could be reduced. The building is eligible for this indicator if the building was designed and constructed to provide effective natural ventilation and wind permeability within the site and healthy ventilation.

Item 3: Apart from the noise requirements as stipulated in the Hong Kong Planning Standards and Guidelines, well arrangements of building or built form can further reduce noise impact from the surrounding, or noise interference between buildings or floors within the site. Adverse noise condition in particular area shall be identified and addressed in built form and noise barrier design. To provide a healthy environment, the sound pressure level as measured at 1 m from the façade of all the rooms for prolonged use should not be higher than 75 dBA. The building is eligible for this indicator if the building was designed and constructed to provide effective noise mitigation measures and healthy acoustics environment.

Item 4: For the hot and humid climate of Hong Kong, sunlight will result in ambivalent effects for buildings. On one hand, sufficient sunlight enhances the health and

hygiene of buildings and the satisfaction of users on the light environment. On the other hand, the intense solar heat in summer can result in an elevated indoor temperature for naturally-ventilated building or increase in the cooling load of air conditioned buildings. In dense urban area, ineffective site planning may also result in heat island effect. This indicator is assigned to award the building if sunlight penetration to the building was optimized with site planning. For instance, sufficient sunlight is necessary for the landscape area, while the public circulation area should be covered and sheltered from the intense sunlight. Effective measures such as providing green landscape, proper choice of building material and enhanced outdoor air circulation to address the heat island effect in the design and construction are also recognized in this indicator.

Innovation Item:

Provided with other innovative building arrangements to enhance the overall building environmental quality in and around the site

This indicator is assigned to award other innovative building arrangements that have been conducted in the design stage and implemented effectively in construction and operation stages, such that the overall building environment quality in and around the site is enhanced.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Relevant design report, technical analysis reports together with drawings
- Relevant photos sharing the features

NEIGHBOURHOOD IMPACTS (NI)

NI 1 Environmental Interactions

NI 1.1 Environmental Interactions

Intent To minimise adverse environmental impacts and enhance the environmental performance to the surrounding buildings and streets due to the building operation

Strategy Indicators

Sub-criteria Performance Scale	Non-residential / Residential buildings
0	$0 \le \mathbf{P_O} < 0.25$
1	$0.25 \le \mathbf{P_O} < 0.5$
2	$0.5 \le \mathbf{P_O} < 0.75$
3	$0.75 \le \mathbf{P_O} \le 1$
NI 1.1 Score	

Item	Strategy	Non-residential / Residential		
		No	Yes	N/A
1	To conduct periodic check for any designed daylight and natural ventilation enhancement feature that are degraded and causing impact to the surroundings	0	1	
2	To conduct periodic check for any designed outdoor air quality impact minimization feature that are degraded and causing impact to the surroundings	0	1	
3	To conduct periodic check for any designed noise and visual impact minimization feature that are degraded and causing impact to the surroundings	0	1	

(A)	Total maximum score (applicable items only) in this Sub-criteria		**(B)**	Total score (applicable items only) obtained in this Sub-criteria	
NON-RESIDENTIAL + RESIDENTIAL	**Sub-criteria performance score (P_O)**		**(B)/(A) = P_O**		

Explanation **Item 1:** As many residential and non-residential buildings lie within a high-rise context, the daylight component attainable at low-to-middle levels are usually limited due to the height of nearby buildings and the lack of open space. Besides, wind turbulence created by building barrier effect is particularly severe for urban dense environment like Hong Kong. This indicator is assigned to encourage the building operator to conduct periodic field survey to identify any environmentally designed

feature related to daylight access, natural ventilation and wind permeability enhancement has been degraded due to building operation / surrounding development. The environmental performance can be degraded by A&A and signage/advertising panels works within the site and construction of new buildings in the surroundings, wind shelter, light barrier, etc.

To obtain score in this indicator, the building operator is required to assign a person (property management staff or external person) who is familiar with the existing environmental features of the building, to conduct the survey and identify impacts at least once a month. For performance degrade due to new facilities constructed within the site, the impacts to environmental performance shall be reviewed by the building operator. For external adverse influence, building operator shall collect the information of the potential / existing impact from the surroundings, and to review the adverse effect. The building operator shall consolidate and convey the opinions / comments of environmental impact to the impact creator, on behalf of the building occupants.

Item 2: Addition of air pollutant source in the surroundings may affect the intake air quality, while the exhaust air points of the building may also affect the louver planning of new building design in the surroundings. This indicator is assigned to encourage the information flow between the building operator and the surrounding buildings / developments on the air pollution issues.

To obtain score in this indicator, the building operator shall conduct survey and identify impacts at least once a month to identify any additional pollutant source created in the surroundings that may degrade the quality of fresh air intake to the building. For instance, addition of kitchen exhaust louver at a surrounding building may leads to poor air quality if the additional exhaust louver is located nearby the intake louver of the building. The building operator shall consolidate and convey the opinions / comments to the impact creator, on behalf of the building occupants. Besides, the building operator shall prepare a set of drawing to indicate the locations of fresh air intake and exhaust air louver, upon the request from the building designer of the surrounding new building and major A&A work at their early design stage in order to minimise mutual air quality impacts between the existing building and new installations.

Item 3: Addition of noise and visual impacts from surroundings may deteriorate the existing building environmental performance. This indicator is assigned to encourage information flow between the building operator and the surrounding buildings / developments on the noise and visual impact issues.

To obtain score in this indicator, the building operator shall conduct survey and identify impacts at least once a month to identify any additional noise source, visual pollution and view obstruction, such as signage and advertisement panels, created within the site or in the surroundings that may degrade the building environmental quality. Noise generated from new mechanical installations in the surrounding buildings, human activities, glare from facade, light pollution of signboards, losing of external view corridor, shall be considered in this indicator. The building operator shall consolidate and convey the opinions / comments to the impact creator, on behalf of building occupants.

Submittal

The following information shall be provided to demonstrate the compliance of the Strategy Indicators:

- Survey checklist and its implementation records.
- Records of opinions / comments conveyed to the surrounding impact creator(s).

APPENDIX 1. LIST OF ABBREVIATIONS

The following abbreviations shall be referred in this assessment scheme:

A&A	Addition and Alternation
ACH	Air Change per Hour
AFCD	Agriculture, Fisher and Conservation Department, HKSAR Government
AP	Authorized Person
ArchSD	Architectural Service Department, HKSAR Government
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers, USA
BA	Building Authority, HKSAR Government
BD	Buildings Department, HKSAR Government
BRE	Building Research Establishment, UK
BREEAM	Building Research Establishment Environmental Assessment Method, UK
BS	British Standard
BSRIA	Building Services Research and Information Association, UK
C&D	Construction and Demolition
CASBEE	Comprehensive Assessment System of Building Environmental Efficiency for Japan
CCMS	Central Control and Monitoring System
CEDD	Civil Engineering and Development Department, HKSAR Government
CEPAS	Comprehensive Environmental Performance Assessment Scheme
CIBSE	Chartered Institution of Building Services Engineers, UK
CIE	Commission Internationale de Eclairage
CIRIA	Construction Industry Research and Information Association, UK
COP	Code of Practice
DSD	Drainage Services Department, HKSAR Government
EIA	Environmental Impact Assessment
EMGB-Taiwan	Evaluation Manual for Green Buildings in Taiwan 綠建築標章
EMO	Energy Management Opportunity
EMSD	Electrical and Mechanical Services Department, HKSAR Government
EPD	Environmental Protection Department, HKSAR Government
ETWB	Environmental, Transport and Works Bureau, HKSAR Government
EUI	Energy Utilisation Index
FEHD	Food and Environmental Hygiene Department
FSD	Fire Services Department, HKSAR Government
GBC	Green Building Challenge
GBTool	Green Building Tool
GFA	Gross Floor Area
GHEM - PRC	Green House Evaluation Manual – China Assessment Handbook for Ecological Residential Building 中國生態住宅技術評估手冊
HK-BEAM	Hong Kong Building Environmental Assessment Method
HKHA	Hong Kong Housing Authority, HKSAR Government
HKHD	Hong Kong Housing Department, HKSAR Government
HKIA	The Hong Kong Institute of Architects
HKIE	The Hong Kong Institution of Engineers
HKIP	Hong Kong Institute of Planners
HKIS	The Hong Kong Institute of Surveyors
HKPolyU	The Hong Kong Polytechnic University

HKSAR	Hong Kong Special Administrative Region of the People's Republic of China
HVAC	Heating, Ventilation and Air-Conditioning
HVACR	Heating, Ventilation, Air-Conditioning and Refrigeration
HVCA	Heating and Ventilating Contractors Association, UK
IAQ	Indoor Air Quality
IBI	Intelligent Building Index, Hong Kong
IEQ	Indoor Environmental Quality
IESNA	Illumination Engineering Society of North America
ISO	International Organization for Standardization
LA	Land Authority, HKSAR Government
LandsD	Lands Department, HKSAR Government
LEED	Leadership in Energy and Environmental Design, USA
LCA	Life Cycle Analysis
LCC	Life Cycle Costing
NABERS	The National Australian Building Environmental Rating System of Australia
N/A	Not Applicable
O&M	Operation and Maintenance
ODS	Ozone-depleting substances
OTTV	Overall Thermal Transfer Value
PlanD	Planning Department, HKSAR Government
PGBC	Professional Green Building Council, Hong Kong
PNAP	Practice Notes for Authorised Persons and Registered Structural Engineers, issued by BD, HKSAR Government
PNRC	Practice Notes for Registered Contractors, issued by BD, HKSAR Government
ProPECC PN	Professional Persons Environmental Consultative Committee Practice Notes, issued by EPD, HKSAR Government
SC	Site Coverage
SDU	Sustainable Development Unit, HKSAR Government
SPeAR®	Sustainable Project Appraisal Routine
SUSDEV21	Sustainable Development for the 21st Century, HKSAR Government
WSD	Water Supplies Department, HKSAR Government

APPENDIX 2. SUMMARY OF CEPAS INDICATORS

OPERATION STAGE						
Categories		**Sub-criteria**	**Indicators**	**N**	**R**	
Indoor Environmental Quality (IE)						
IE1	Health & Hygiene	IE 1.1 Health & Hygiene	Good ventilation in common corridors and lift lobbies	√	√	Strategy
			No narrow and deep re-entrant in high rise residential block	√	√	
			Formulation of building hygiene management plan		√	
			Carry out inspection of hygienic conditions and cleansing of common parts of buildings regularly	√	√	
			Space provision in core and shell area to provide cleansing facilities and store cleansing equipment	√	√	
			Maintain water trapping of floor drain	√	√	
			Operate and maintain a good cooling tower, hot water system and associated water treatment system with efficient operation and minimisation of health risk	√		
			Sufficient air relief / transfer air is provided in lavatories and bathrooms when mechanical air extraction is used	√	√	
			Innovative method to enhance the health and hygiene of the building	√	√	
IE2	IAQ	IE 2.1 IAQ Certification	Building achieved a certain class of the relevant criteria in EPD IAQ Certification Scheme and with the conditions of fresh air intake locations	√	√	Performance
		IE 2.2 Thermal Comfort	Provide and maintain good thermal comfort in occupied space	√	√	Performance
		IE 2.3 IAQ Strategies	Survey of baseline outdoor air quality of the site to compare the findings with the EPD outdoor air quality objectives	√	√	Strategy
			Provide with sufficient fresh air in HVAC system	√		
			Provide with good natural ventilation in habitable rooms and kitchens		√	
			Provide with effective ventilation system in car parks and semi-confined public transport Interchanges	√		
			Dedicated exhaust air duct provided to serve smoking area/ entire building employed non – smoking policy	√		
			Dedicated exhaust air duct provided to serve landlord / tenant copy / printing areas, and other pollutant generating areas	√		
			Provide well-maintained commercial kitchen ventilation system with effective oily fume and odour removal in restaurants and food business	√		

Categories		Sub-criteria	Indicators	N	R	
			Use of low emission materials in building construction	√	√	
IE3	Noise and Acoustic Environment		Carry out regular visual inspection and test on the cleanliness of MVAC installations	√		
			Implement and review IAQ management plan	√		
			Innovative method to further improve IAQ during building operating period	√	√	
		IE 3.1 Noise and Acoustic Environment	Actual room criteria fulfills the recommended value without implication of background noise level	√	√	Strategy
			Indoor environment provided with good acoustic quality	√	√	
			Indoor environment provided with good vibration isolation	√	√	
			Appropriate acoustic environment for the intended purposes	√	√	
			Provision of sufficient noise insulation	√	√	
			Innovative method to further improve the indoor noise and acoustic environment	√	√	
IE4	Lighting Environment	IE 4.1 Daylighting (Performance for Residential and Strategy for Non-residential)	VDF of habitable rooms and kitchens		√	Strategy / Performance
			Appropriate room depth	√		
			Sufficient Vertical Daylight Factor (not less than 30%)	√		
			Provide with view	√		
		IE 4.2 Visual Quality & Comfort	Daylight comfort and quality	√		Strategy
			Artificial lighting comfort and quality	√		
			Lighting for energy conservation	√	√	
			Innovative method to further improve visual comfort and lighting energy efficiency	√	√	
Building Amenities (BA)						
BA1	Safety	BA 1.1 Safety Regulations	Provide a safe habitation and working environment for building occupants and users	√	√	Pre-requisite
		BA 1.2 Safety Management	Formulation of safety management and fire evacuation plan by building operator	√	√	Strategy
			Designated person to identify potential hazards and to implement safety measures regularly	√	√	
			Fire drill arranged for building users regularly	√	√	
BA2	Management	BA 2.1 Building Management	Property management company accredited with quality management system – ISO 9000 standard	√	√	Strategy
			Property management company accredited with environmental management system – ISO 14000 standard	√	√	
			Property management company accredited with occupational health and safety management system – OHSAS 18001 standard	√	√	

Categories		Sub-criteria	Indicators	N	R	
			Periodic training to property management company staff	√	√	
			User and environmental manual / guideline to tenants and building occupants	√	√	Strategy
			Technical training from Contractors and/or Designers in building handover period provided for property management company	√	√	
			Occupant feedback records & regular management review	√	√	
			Keeping of full set building records	√	√	
			Annual review of insurance coverage	√	√	
			Innovative method to further improve the effectiveness of future buildings management by building operator	√	√	
BA3	Controllability	BA 3.1 Building Controllability	Capability for partial operation of building facilities & systems	√	√	Strategy
			Capability for control over major environmental systems by building users	√		
			Comprehensive automatic monitoring system serving major electrical and mechanical installations provided	√	√	
			Comprehensive automatic control system serving major electrical and mechanical installations provided	√	√	
			Comprehensive automatic control & monitoring system serving major lighting installations provided	√	√	
BA4	Maintainability	BA 4.1 Essential maintenance	Ensure regular and effective maintenance is providing for essential building services installations	√	√	Pre-requisite
		BA 4.2 Regular Inspection	Appropriate building inspection conducted by property management company	√	√	Strategy
			Regular inspection on means of escape and fire resisting construction conducted by property management company	√	√	
			Regular inspection of building fabric, structure and facade	√	√	
			Regular inspection of slope, retaining wall and private roads	√	√	
		BA 4.3 Regular maintenance	Convenient and safe access provided for inspection, cleaning and maintenance of spaces throughout building	√	√	Strategy
			Convenient and safe access provided for inspection, cleaning and maintenance of all building facilities, building envelope and slope	√	√	
			Regular inspection and performance testing of building services installations	√	√	
			Preventive & corrective maintenance plan for building and services provided by property management company	√	√	
BA5	Living Quality	BA 5.1 Liveability	Balconies provided in residential flats		√	Strategy
			Provided with above minimum spatial or environmental provisions, such as common corridor and ventilated lift lobbies		√	
			Provided with communal gardens, such as podium and roof gardens, for use by the building occupants and users	√	√	

Categories		Sub-criteria	Indicators	N	R	
			Provided with other innovative green features to improve living quality provided	√	√	
Resources Use (RE)						
RE1	Energy Consumption	RE 1.1 Energy Consumption	Achieve higher levels of building energy performance and reduce annual energy consumption above the recognised local standards Reduce environmental impacts associated with excessive energy use in the whole life of building	√	√	Performance
RE2	Energy Efficiency	RE 2.1 Energy Efficiency (Building)	Built form and building orientation is designed to enhance energy conservation	√	√	Strategy
			Fixed horizontal/vertical external shading device provided	√	√	
			Movable external shading device for major atrium facade window or skylight is provided	√	√	
			Innovative fixed type or automatic internal shading device provided to reduce solar heat gain to the occupied area	√	√	
		RE 2.2 Energy Efficiency (Systems)	Use of evaporative cooling towers or other means of water-cooled heat rejection methods as the major heat rejection equipment for the building	√	√	Strategy
			Use of energy recovery system	√	√	
			Use of variable speed drive for fans in appropriate systems if operating energy saving can be achieved	√	√	
			Use of variable speed drive for pumps in appropriate systems if operating energy saving can be achieved	√	√	
			Use of electronic ballasts for all fluorescent lamps	√	√	
			Other innovative / effective energy efficient system provided	√	√	
		RE 2.3 Energy Efficiency (Electrical Appliances)	Use energy efficient appliances and equipment that helps reducing daily energy consumption.	√	√	Performance
		RE 2.4 Energy Efficiency (Energy Monitoring)	Energy meter(s) for central chiller plant, boiler plant and heat rejection plant and associated water-side system provided	√		Strategy
			Energy meter(s) for air-side equipment and/or a cluster of split-type air-conditioning units serving landlord / public area in floor / zone basis provided	√	√	
			Energy meter(s) for electric lighting system serving landlord / public area in floor / zone basis provided	√	√	
		RE 2.5 Energy Audit	Forming of energy audit team / employ external energy audit team to carry out walk-through audit for the whole building not less than once for 3 years	√	√	Strategy
			Building operator to collect annual historical energy data and to determine the Energy Utilisation Index	√	√	
			To implement any previously identified Category 2 EMO	√	√	
			To implement any previously identified Category 3 EMO	√	√	

Categories		Sub-criteria	Indicators	N	R	
RE3	Use of Renewable Energy	RE 3.1 Renewable Energy Applications	Use renewable energy technology to reduce environmental impacts associated with fossil fuel energy use	√	√	Performance
RE4	Water Conservation	RE 4.1 Greywater Recycling	Recycle and reuse greywater in order to reduce the consumption of fresh and flushing water	√	√	Performance
		RE 4.2 Rainwater Recycling	Consider the percentage of total amount of rainwater being recycled for reuse and relevant facilities provided	√	√	Performance
		RE 4.3 Water Conservation Strategies	Use of low flow / automatic / semi - automatic (cistern type) water closet	√	√	Strategy
			Use of automatic / manual flow control faucet	√		
			Use of automatic / manual flow control valve for urinal	√		
			Use of water saving irrigation system	√	√	
			Use of other water saving device or innovative idea on management to reduce water consumption	√	√	
RE5	Timber Use	RE 5.1 Sustainable Timber Use	Use timber from sustainable source and percentage of timber use from qualified sustainable source in the past 3 years	√	√	Performance
RE6	Material Use	RE 6.1 Recycled Material Use	Reduce material consumption and reduce demands on limited reserves of natural resources by using recycled materials	√	√	Performance
		RE 6.2 Environmentally-Friendly Materials	Use environmentally-friendly building materials to reduce environmental impacts	√	√	Performance

Loadings (LD)

Categories		Sub-criteria	Indicators	N	R	
LD 1	Pollution	Minimise outdoor pollution and the subsequent health and environmental impacts under global and local considerations		√	√	Pre-requisite
		LD 1.1 Air Pollution	All thermal insulations used for building fabric are CFC/HCFC free	√	√	Strategy
			All thermal insulations used for water pipes and air ducts are CFC/HCFC free	√	√	
			All refrigerants used are zero ozone depleting potential	√	√	
			No toilet exhaust outlet located facing any kitchen / living room / bedroom openings directly in 5 metres at open space or within a light well		√	
			No refuse storage room opening located facing any kitchen / living room / bedroom openings directly in 5 metres at open space or within a light well		√	
			Innovative method to reduce air pollution substantially due to building operation	√	√	
		LD 1.2 Water pollution	Cleansing of fresh water tank at least once every 3 months	√	√	Strategy
			Cleansing of flushing water tank and other water storage tanks at least once every 6 months	√	√	
			Effective water filtration system for swimming pool provided	√	√	
			Effective water filtration system fountain and landscape pool provided	√	√	
LD2	Waste Management	Reduce waste generation, disposal and the associated environmental impacts		√	√	Pre-requisite
		LD 2.1 Waste Management	Building operator established and implemented municipal waste management strategy	√	√	Strategy
			Designated centralised space and facilities provided for sorting and storage of recyclable and non-recyclable waste	√	√	
			Designated space(s) and facilities provided on each floor for sorting and storage of recyclable and non-recyclable waste	√	√	
			Automatic sorting and storage facility provided for recyclable and non-recyclable materials in each building / whole site	√	√	
			Provision of self-closing air tight system provided to store organic waste that may lead to bad smell and hygienic problem	√	√	
			Designated person to inspect the operational effectiveness on waste management strategies every week	√	√	
			Innovative method to reduce waste generation or effective waste management due to building operation	√	√	

Site Amenities (SA)						
Categories		**Sub-criteria**	**Indicators**	**N**	**R**	
SA1	Inclusion	SA 1.1 Social Interaction	Open /covered / enclosed common space with facilities provided to harmonise the space use by all building occupants and users for their interactions and communications	√	√	Strategy
			Enhanced barrier free access and facilities for convenient provided for disabled and elderly persons	√	√	
			Innovative method to further enhance the effectiveness of social interaction in existing building	√	√	
		SA 1.2 Connectivity	Common space with covered and comfortable pedestrian connections to open space, entrance and building facilities provided within the site	√	√	Strategy
			Large communal leisure and recreational facilities are directly accessible within 15 minutes walk via safe pedestrian path directly	√	√	
SA2	Landscape	SA 2.1 Landscape	Provided with communal landscape areas on ground level	√	√	Strategy
			Landscape for slope and retaining wall within the site provided	√	√	
			Biotope with native species provided within the site	√	√	
			Innovative measures provided to achieve better landscaped environment	√	√	
SA3	Cultural Character	SA 3.1 Culture Character	The building having a distinctive cultural character	√	√	Performance
SA4	Security	SA 4.1 Security	Space with minimal risk for building occupants and users	√	√	Strategy
			Effective passive security facilities provided	√	√	
			Effective active security measures provided	√	√	
			Carry out other innovation measures to enhance security	√	√	
Neighbourhood Amenities (NA)						
NA1	Provisions for Community	NA 1.1 Provisions for Community	Facilities provided within the site or having similar provisions in the immediate neighbouring sites to support communal and social services	√	√	Strategy
			Facilities provided within the site to or having similar provisions in the immediate neighbouring sites to provide convenient services to community	√	√	
			Other innovation measure provided to enhance provisions for community	√	√	
NA2	Transportation	NA 2.1 Public Transportation	Building designed to encourage the use of public transportation instead of private car	√	√	Performance

Categories		Sub-criteria	Indicators	N	R	
		NA 2.2 Green Transport	Covered bicycle parking area is provided within the site if public bicycle path is available nearby the site	√	√	Strategy
			Vehicle access of the building cause minimal traffic impacts to the surrounding	√	√	
			Elevated / safe pedestrian path to the nearby public transport facilities provided	√	√	
			Provision for future car pool facilities for building occupants / without vehicle parking area in the building	√	√	
			Other innovative method provided to further reduce environmental impact due to transportation and to enhance convenient transportation services	√	√	
Site Impacts (SI)						
SI1	Site Environment	SI 1.1 Healthy Environment	Provided with optimum daylight access to buildings within the site and the view to surroundings	√	√	Strategy
			Provided with effective natural ventilation and wind permeability within the site	√	√	
			Provided with effective noise mitigation measure within the site	√	√	
			Provided with optimum sunlight penetration within the site	√	√	
			Provided with other innovative building arrangements to enhance the overall building environmental quality in and around the site	√	√	
Neighbourhood Impacts (NI)						
NI1	Environmental Interactions	NI 2.1 Environmental Interactions	To conduct periodic check for any designed daylight and natural ventilation enhancement feature that are degraded and causing impact to the surroundings	√	√	Strategy
			To conduct periodic check for any designed outdoor air quality impact minimization feature that are degraded and causing impact to the surroundings	√	√	
			To conduct periodic check for any designed noise and visual impact minimization feature that are degraded and causing impact to the surroundings	√	√	

APPENDIX 3. CEPAS SCORING & WEIGHTING TABLES FOR OPERATION STAGE

Indoor Environmental Quality (IE)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
IE1	Health & Hygiene	0.79		IE1.1	Health & Hygiene	
IE2	IAQ	0.74		IE2.3	IAQ Strategies	
IE3	Noise and Acoustic Environment	0.72		IE3.1	Noise and Acoustic Environment	
IE4	Lighting Environment	0.60		IE4.1	Daylighting ($P_{O\text{-}NR}$ only)	
				IE4.2	Visual Quality & Comfort	
OPERATION (Strategy)						

Building Amenities (BA)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
BA1	Safety	0.93		BA1.1	Safety Regulations	
				BA1.2	Safety Management	
BA2	Management	0.72		BA2.1	Building Management	
BA3	Controllability	0.61		BA3.1	Building Controllability	
BA4	Maintainability	0.71		BA4.1	Essential Maintenance	
				BA4.2	Regular Inspection	
				BA4.3	Regular Maintenance	
BA5	Living Quality	0.61		BA5.1	Liveability	
OPERATION (Strategy)						

Resources Use (RE)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
RE2	Energy Efficiency	0.63		RE2.1	Energy Efficiency (Building)	
				RE2.2	Energy Efficiency (Systems)	
				RE2.4	Energy Efficiency (Energy Monitoring)	
				RE2.5	Energy Audit	
RE4	Water Conservation	0.70		RE4.3	Water Conservation Strategies	
OPERATION (Strategy)						

Loadings (LD)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
LD1	Pollution	0.84		LD1.1	Air Pollution	
				LD1.2	Water Pollution	
LD2	Waste Management	0.83		LD2.1	Waste sorting & storage	
OPERATION (Strategy)						

Site Amenities (SA)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
SA1	Inclusion	0.56		SA1.1	Social Interaction	
				SA1.2	Connectivity	
SA2	Landscape	0.64		SA2.1	Landscape	
SA4	Security	0.52		SA4.1	Security	
OPERATION (Strategy)						

Neighbourhood Amenities (NA)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
NA1	Provisions for Community	0.42		NA1.1	Provisions for Community	
NA2	Transportation	0.50		NA2.2	Green Transport	
OPERATION (Strategy)						

Neighbourhood Impacts (NI)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
NI1	Environmental Interactions	0.63		NI1.1	Environmental Interactions	
OPERATION (Strategy)						

Site Impacts (SI)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
SI1	Site Environment	0.48		SI1.1	Healthy Environment	
OPERATION (Strategy)						

Indoor Environmental Quality (IE)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
IE2	IAQ	0.74		IE2.1	IAQ Certification	
				IE2.2	Thermal Comfort	
IE4	Lighting Environment	0.60		IE4.1	Daylighting ($P_{o\text{-}R}$ only)	
OPERATION (Performance)						

Resources Use (RE)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
RE1	Energy Consumption	0.67		RE1.1	Energy Consumption	
RE2	Energy Efficiency	0.63		RE2.3	Energy Efficiency (Electrical Appliances)	
RE3	Use of Renewable Energy	0.39		RE3.1	Renewable Energy Applications	
RE4	Water Conservation	0.70		RE4.1	Greywater Recycling	
				RE4.2	Rainwater Recycling	
RE5	Timber Use	0.81		RE5.1	Sustainable Timber Use	
RE6	Material Use	0.74		RE6.1	Recycled Material Use	
				RE6.2	Environmentally-Friendly Materials	
OPERATION (Performance)						

Site Amenities (SA)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
SA3	Cultural Character	0.42		SA3.1	Cultural Character	
OPERATION (Performance)						

Neighbourhood Amenities (NA)						
Criteria		**W_c**	**S_c**	**Sub-Criteria**		**S_{sc}**
NA2	Transportation	0.50		NA2.1	Public Transportation	
OPERATION (Performance)						

Total Performance Score		**Performance Weighting (Wp)**	
Total Strategy Score		**Strategy Weighting (Ws)**	
Total CEPAS Score (Operation)			