

# HONG KONG GREEN OFFICE GUIDE



Funding Support



## SEMINAR

# HONG KONG GREEN OFFICE GUIDE

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## DESIGN STAGE

## chapter 3.2

Indoor environmental quality affects the health, well-being and productivity of users. Important strategies include:

- Thermal comfort
- Adequate ventilation
- Natural daylight
- Glare Control
- Good acoustic environment
- Indoor air quality (IAQ)
- Indoor greenery
- Low VOC materials
- Possibility of IAQ certification

STEP 2  
Indoor Environmental QualitySTEP 1  
Planning and Design

A green building starts from a holistic approach to planning and design. Starting from the earliest stage, every decision can have an impact over the building's lifetime performance.

Proper planning and design of office buildings and office units includes:

- Location selection
- Design
- Materials use
- Indoor environmental quality
- Energy efficiency and water saving
- Construction noise and pollution control

**Important consideration:**

Review possibility of certification for green building or green interiors and get professional advice at this stage.

## chapter 3.1

STEP 3  
Energy Efficiency and Water Saving

Design of a sustainable building services system helps to improve the building performance. Important strategies include:

**Energy aspects:**

- Energy saving technology
- Renewable energy

**Water aspects:**

- Reduce water use
- Water recycling

## chapter 3.3

## OPERATION AND MANAGEMENT STAGE

## chapter 4.1

Even the best green building can have a poor performance without proper operation and maintenance.

Green operation and maintenance involves both the facility management team as well as landlord, tenants and occupants. Important strategies include:

- Intelligent building management system
- Waste management
- Green education and support
- Occupants' behaviour
- Maintain efficiency
- Energy audit
- Monitoring and benchmarking
- Pest control
- Post occupancy survey

STEP 4  
Operation and Maintenance

## chapter 4.2

Collaboration between landlord and tenant is important to reach the goal of creating greener offices. Important strategies include:

- Incentives for landlord and tenants
- Landlord support
- Green lease
- Guidelines for tenants
- Collective bargaining for green products
- Performance monitoring
- Pest Control
- Post occupancy survey

Step 5  
Landlords and Tenants

# INTRODUCTION

The Hong Kong Green Office Guide aims at providing guidance and introducing best practices to stakeholders, including the owners, property facility managers, tenants and occupants of office premises, regarding the constraints, opportunities and benefits arising from different environmental aspects of the building and facilities for office premises, and how the potential opportunities, benefits and improvements can best be realised.

## Key Figures:

**Hong Kong** being one of the world's largest commercial centres, the total stock of private offices at the end of 2014 amounted to 11 million m<sup>2</sup>, that is about the size of 1500 standard football pitches.

(Source: Hong Kong Property Review 2015 by HKRVD)

**Hong Kong office workers spend 1/3 of their working days in offices.** On a five day 9-6 working basis, office workers spend about 2000 hours per year per person in offices excluding the overtime hours which are excessive compared to London (1740 hours) and New York City (1847 hours).

(Source: Prices and Earnings 2015. Report, UBS Wealth Management, 2015. Accessed February 29, 2016.)

**Offices consume 300kWh/m<sup>2</sup>/yr energy in Hong Kong.** Offices have a high energy consumption, especially when compared with residential buildings, which consume 100kWh/m<sup>2</sup>/yr in Hong Kong. There is a high potential for improving energy efficiency in offices.

(Source: Research on HK's Climate Change Strategy published by Arup)

It is vital to have a pleasant working environment that does not have any adverse effect on their health and wellbeing. This will also help to improve workers satisfaction, and increase productivity.

**Occupants and Tenants** are increasingly demanding a sustainable work environment of higher standards.

**Owners** are aiming for a higher performance standard for their new office developments.

**In 2014, 62 tonnes of office paper is disposed of to landfills everyday<sup>1</sup>.** This paper should have gone into recycling bins or being reused. It takes 17 trees and 1500 litres of oil to make one tonne of paper.<sup>2</sup> This means more than 1000 trees needs to be cut down for the 62 tonnes of paper we throw away every day.

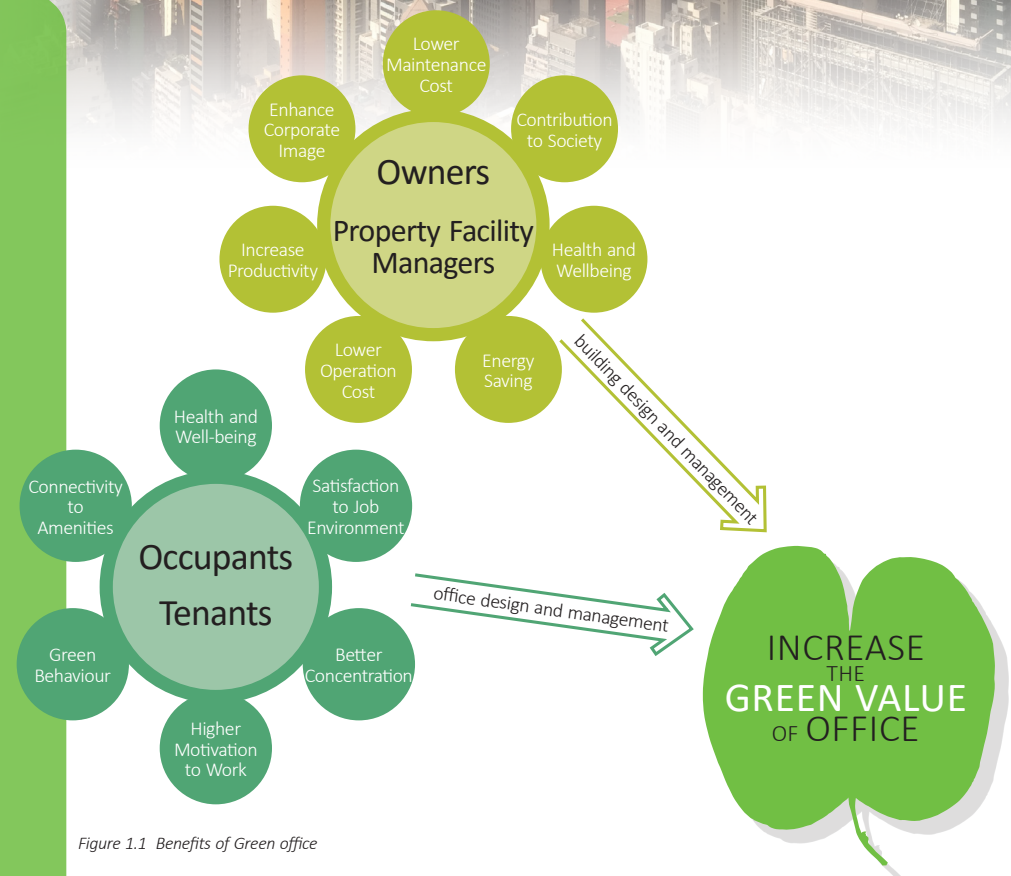


Figure 1.1 Benefits of Green office

1. Monitoring Of Solid Waste In Hong Kong Waste Statistics for 2014 published by Environmental Protection Department  
 2. "Waste Reduction Website." Green Office. Accessed November 20, 2015. [https://www.wastereduction.gov.hk/en/workplace/tips\\_green\\_office.htm](https://www.wastereduction.gov.hk/en/workplace/tips_green_office.htm).

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## Considerations

## Planning and Design



The creation of green offices needs to start with planning and design. Appropriate use of green planning and design can help to reduce operational and maintenance costs as well as create a comfortable and healthy work environment which can help to increase productivity. More detail will be discussed in CH. 3.1.

## Strategies

- Sustainable Architectural Design
- Consideration of Impact on the Neighbourhood
- Exterior Landscape
- Exterior Envelope Insulation
- Considerations for Tenant Use
- Provision for Tenant Exhaust
- Provision for Tenant Drainage and Water Point
- Convenient Public Transportation
- Connectivity to Nearby Amenities
- Green Building Materials
- Reuse of Materials
- Construction Noise and Pollution Control
- Construction Waste Reduction

## Benefits

- Lower initial investment costs by having proper planning
- Enhance ease of modification to suit tenants' needs by considering their use during design stage
- Lower energy consumption by adopting passive design
- Lower operational and maintenance costs with passive design

## Indoor Environmental Quality



Poor indoor environmental quality may result in sick building syndrome and affect the well-being of occupants and productivity of the office workers. Simple measures carried out by

different parties can have a significant impact on occupants' health. More detail will be discussed in CH. 3.2.

- Thermal Comfort
- Adequate Ventilation
- Natural Daylight
- Glare Control
- Quality Views
- Good Acoustic Environment
- Indoor Air Quality
- Indoor Greenery
- Low-VOC Emitting Material
- The Indoor Air Quality Certification Scheme

- Increase productivity
- Fewer lost work days and better business
- Enhance physical and mental health

## Energy Efficiency and Water Saving



Resources are limited on Earth, including energy, water and materials. We should use them wisely through

reduction, reuse and recycling. Also innovative technology may be adopted to save resources. More detail will be discussed in CH. 3.3.

- Sustainable Building Services System
- Renewable Energy
- Energy Saving Technology
- Reduce Water Use
- Water Recycling

- Increase efficiency of the appliances
- Retain operational efficiency of building services system
- Lower the chance of system failure and increases energy efficiency
- Good reputation with customers on environmental sustainability

## Considerations

## Planning and Design



By planning ahead, office units can enable workers and visitors to enjoy the benefits of a more convenient neighbourhood and healthy work environment. A good construction plan can also create a more pleasant interior space. More detail will be discussed in CH. 3.1.

## Strategies

- Office Layout and Design
- Convenient Public Transportation
- Connectivity to Nearby Amenities
- Green Building Materials
- Reuse of Materials
- Construction Noise and Pollution Control
- Construction Waste Reduction

## Benefits

- Enhance occupants' health and well-being
- Enhance office productivity

## Indoor Environmental Quality



There is a wide variety of evidence showing the implications of office design on health, well-being and productivity. How an office can serve its basic purpose of providing a comfortable and healthy environment is the key focus. More detail will be discussed in CH. 3.2.

- Thermal Comfort
- Adequate Ventilation
- Natural Daylight
- Glare Control
- Quality Views
- Good Acoustic Environment
- Indoor Air Quality
- Indoor Greenery
- Low-VOC Emitting Material
- Separation of Printing Room
- Separation of Server Room
- The Indoor Air Quality Certification Scheme

- Increase well-being, less fatigue
- Increase job satisfaction
- Easier to concentrate
- More ergonomic postural changes
- Fewer errors, increase accuracy
- Alleviate mental stress and illness

## Energy Efficiency and Water Saving



Due to the growth of business in Hong Kong, the total energy consumption for office buildings

is still an increasing trend despite the Government's efforts. For a green office, different energy saving approaches can be considered within the office life cycle. More detail will be discussed in CH. 3.3.

- Energy Saving Technology
- Reduce Water Use
- Water Recycling

- Improve the well-being of occupants by certain behavioural changes
- Reduce energy bills

## Considerations

### Operation and Maintenance



Well-planned operational, maintenance and management practices and procedures for green office buildings are critical for long-term implementation and achievement

throughout the whole process in maintaining the green office environment. Even if an office building or premises are designed and constructed as a green office, in spite of a good foundation for a green office environment, the benefits of a green office may be reduced or nullified if not properly maintained or managed. More detail will be discussed in CH. 4.1 Operation Maintenance and Management.

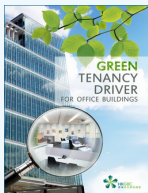
## Strategies

- Green Operation and Management
- Intelligent Building Management System
- Waste Management
- Green Education and Support
- Occupant's Behaviour
- Maintain Efficiency
- Energy Audit
- Monitoring and Benchmarking
- Pest Control
- Post Occupancy Survey

## Benefits

- Establish energy saving strategies for the building owner
- Reduce operational costs
- Increase efficiency and saves time in monitoring and measuring power use

### Landlord and Tenants



Participation and support of both landlords and tenants are important in contributing to the success of green offices. Landlord and tenants need

to be aware of the benefits of the green office. Having a green fitting out guide can be an effective tool for education and promotion purposes for green practices. More detail will be discussed in CH. 4.2 Landlord and Tenants.

- Landlord and Tenant Consideration
- Incentive for Landlord and Tenant
- Landlord's Support
- Green Lease
- Guidelines for Tenants
- Collective Bargaining for Green Product
- Performance Monitoring

- Bring long term economic payback
- Premium rental value and occupancy rate
- Enhance social responsibility, reduce regulatory, market and weather-related risks
- Increase business network of tenants
- Recognition as an industry leader
- Improve working environments for employees

Increase the  
Green Value of  
**OFFICE  
BUILDING**

## Considerations

### Operation and Maintenance



Operation, maintenance and management of the office building and premises require a team effort.

Green strategies need to be adopted to maintain the building system and overall building. This will help to reduce operational costs and maintain green and healthy office buildings and premises. More detail will be discussed in CH. 4.1.

## Strategies

- Green Operation and Management
- Waste Management
- Green Education and Support
- Occupant Behaviour
- Green Housekeeping
- Maintain Efficiency
- Energy Audit
- Monitoring and Benchmarking
- Pest Control

## Benefits

- Affect occupants' health and well-being
- Enhance well-being and satisfaction of the office environment
- Provide better environmental comfort by having better control

Increase the  
Green Value of  
**OFFICE  
UNIT**

# DESIGN

3.1.1  
Sustainable Architectural Design

3.1.2  
Consideration of Impact on Neighbourhood

3.1.3  
Exterior Landscape

3.1.4  
Exterior Envelope Insulation

3.1.5  
Office Layout and Design

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Consideration to Tenant Use

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Connectivity to Nearby Amenities

3.1.10  
Green Building Material

3.1.11  
Reuse of Materials

3.1.12  
Construction Noise and Pollution Control

3.1.13  
Construction Waste Reduction



## Sustainable Architectural Design

### Benefits of Green Office Building

- Reduce the cost of building service equipment like air-conditioning and electrical systems
- Reduce energy consumption by using daylight to offset the amount of electric lighting needed
- Lower operational costs
- Reduce solar heat gain and glare
- Enhance indoor environmental quality of the offices
- Enhance occupant's work performance due to improved indoor air quality
- Reduce heat island effect on the neighbourhood
- Enhance air ventilation for the neighbourhood

### Green Strategies for Office Building

✔ Sustainable Master Layout Plan

✔ Building Disposition and Orientation

✔ Building Information Modelling (BIM)

✔ Greenery

✔ Building Shape

✔ Building Height (optimum floor to floor height) and Roof Geometry

✔ External Building Projection

✔ Window/Door Sizes and Locations

✔ Natural Ventilation

✔ Daylight

✔ Shading

✔ View

✔ Floor Layout



## Consideration of Impact on Neighbourhood

### Benefits of Green Office Building

- Greenery can help to reduce heat gain and decrease energy consumption.
- Avoid the use of excessive façade lighting can reduce the demand for electricity and cut down the initial investment cost.
- Enhance weather protection for pedestrians
- Enhance connectivity to public transportation for office workers, visitors and the neighborhood
- Enhance air ventilation and improve visual permeability in the neighbourhood
- Reduce heat island effect
- Subject building also benefits from a good neighbourhood, eg. community amenities

### Green Strategies for Office Building

▣ Building massing and height

▣ Building disposition and configuration to align with prevailing wind

▣ Provide urban windows to enhance air ventilation and visual permeability in the neighbourhood

▣ Use of wind guide to enhance ventilation in the neighbourhood

▣ Podium design to enhance ventilation, and avoid large coverage (particularly on extensive and wall-like buildings) to promote permeability

▣ Set back of buildings to provide air path to facilitate ventilation

▣ Covered Walkway

▣ Connectivity to public transportation

▣ Greenery as amenity which helps to reduce heat island effect

▣ Avoid use of highly reflective glass wall

▣ Avoid extensive use of external façade lighting

▣ Minimise noise from construction, renovation and demolition



in collaboration with KPF

## Exterior Landscape

### Benefits of Green Office Building

- Protect against heat build-up and control ambient temperatures at a macro level
- Create a more habitable space for people and animals thereby promoting biodiversity
- Reduce runoff, provide natural rain water filtration, and alleviate storm drainage pressure
- Cool the air in summer by a process called evapotranspiration, reducing the need to cool the building
- Green roofs can last two or even three times longer than conventional roofs hence it reduces the material waste from re-roofing and induces lower costs over time
- Green roofs can reduce building heat gain, and also mitigate urban heat island effect
- Green roofs also provide insulation and acoustic dampening
- Tree planting at pedestrian level is very effective in moderating urban climate and in promoting human thermal comfort as tree canopy not only cools the air space at pedestrian level, but also provides shading and thus lowers direct radiation from the sun

- Vertical greening not only reduces heat transmission into the building, especially if installed on the east and west façades but also protects the façade from weathering
- Outdoor greenery can provide a quality view for another building, creating a pleasant view for staff working in an office building
- Landscape is believed to affect human beings in many ways, including aesthetic appreciation, health and well-being
- Experience of nature can improve working experience, mood and happiness

### Green Strategies for Office Building

- ▣ Consider the ease of maintenance, tolerance to pollution and vandalism and public safety when selecting plant species
- ▣ Native species should be widely used as a priority
- ▣ Enhance biodiversity by increasing the diversity of plants and the structure of vegetation provided, as well as establishing connected habitats for wildlife

▣ At grade tree-planting can be introduced at suitable locations to provide shade for the buildings and pedestrians

▣ Location to enhance natural ventilation and reduce glare and heat gain (create shading)

▣ Establishment of connected green corridors and lines of trees to provide more shaded routes for pedestrians

▣ Vertical green wall can be adopted to lower building heat transmission and prevent weathering of building façade

▣ Green roof to provide thermal insulation

▣ Participatory farming



## Exterior Envelope Insulation

### Benefits of Green Office Building

- A good building envelope will save on energy consumption and reduce investment costs
- Lower initial investment cost of air-conditioning systems
- Reduce heat gain during summer months and reduce the demand for air-conditioning
- During winter, heat loss through the external envelope is also reduced, which helps to reduce demand for heating of the interior space
- Higher thermal comfort because of warmer surface temperatures on the interior surfaces in winter and lower temperatures in summer. This also results in a lower risk of mold growth on internal surfaces

### Green Strategies for Office Building

► Better insulation of exterior wall reduces heat gain and heat loss and reduces demand for air-conditioning and heating

► Use of double glazing or an integrated glass unit (IGU) helps to provide better insulation in glass areas and window areas

► Adopt/effective use of sun-shading devices

► Window to wall ratio in the external envelope during the design stage

► Motorised sun louvres





## Office layout and design

### Benefits of Green Office Unit

- Give employees a break from their usual work stations.
- Boost creativity and productivity
- Improve occupants' mood
- Create a calming ambience where staff can work more efficiently
- Furniture can be reused to minimise waste and reduce cost of renovation

### Green Strategies for Office Unit

► Open plan layout that enables better views and ventilation

► Flexible space use such as areas that can be converted into meeting rooms or a large meeting room to be converted to 3 meeting rooms

► Create break-out space

► Bright and comfortable space

► Paint the room in colours that promotes comfort and productivity

► Comfortable furniture

► Incorporate ergonomics into design considerations to ensure the workspace is healthy and safe for staff

► Integrate artwork into interior design to enhance the working environment, such as paintings, sculptures, etc

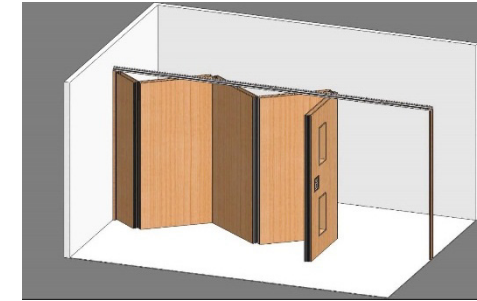
## Consideration of Tenant Use

### Benefits of Green Office Building

- Flexibility in building services design can reduce the construction waste during the fitting out stage
- Reduce construction waste at the time of renovation for each new tenant
- Enhance ease of modification to suit tenants' needs
- Provide standardisation for easier adaptation for different tenants
- Reduce the time spent on office renovation as modification of the as-built building services systems is not required

### Green Strategies for Office Building

- ✔ Flexibility in planning and design to consider use by different tenants
- ✔ Flexibility in building services to consider use by different tenants
- ✔ Flexibility in structural design to consider use by different tenants
- ✔ Modular design
- ✔ Reduce construction waste due to renovation by different tenants
- ✔ Leave space for recycling on each floor



## Tenant Provisions

### Benefits of Green Office Building

The provision of tenant exhaust systems in office building design can help to improve the indoor air quality and the thermal comfort as the air pollutants and excessive heat from office appliances such as copiers and printers can be taken away from the office area.

Benefits from the tenant exhaust system are:

- Reduce odour caused by certain materials, cleaning products and human beings
- Enhance the well-being of tenants
- Increase productivity of employees

Provision of tenant drainage and water points can encourage tenants to install drinking fountains or pantries, which provide a better working environment for staff

Reduction in the use of plastic bottles by installing drinking fountains can reduce waste.

It also reduces the time spent on office renovation as modification of the plumbing and drainage system is not required

### Green Strategies for Office Building

- ▣ Flexibility in planning and design to consider use by different tenants
- ▣ Flexibility in building services to consider use by different tenants
- ▣ Flexibility in structural design to consider use by different tenants
- ▣ Modular design
- ▣ Provide tenant drainage and water points in the new building design
- ▣ Reduce the use of plastic drinking bottles by adopting drinking fountains



Office BUILDING

**Benefits for Office Building**

- Increase the marketability of the office building
- Since it encourages more people to use public transportation, it results in better air quality
- Noise and air pollution can also be better controlled

**Green Strategies for Office Building**

✔ Link the office buildings with all-weather pedestrian bridges

✔ Have direct indoor connections to MTR station, bus terminus, mini-bus or shuttle bus stops

✔ Promote carpooling by reserving parking spaces for carpool vehicles

✔ Develop an incentive programme for building occupants that adopt sustainable commuting methods

Convenient Public Transportation

**Benefits for Office Unit**

- Motivate employees to work, and increases productivity of staff
- When more employees use public transportation, air quality can be improved
- Reduce traffic congestion and save workers' time commuting from home to office
- Enhance overall well-being

**Green Strategies for Office Unit**

✔ Choose site with high accessibility to public transportation

✔ Provide shuttle bus service if office is not close to public transport

Office UNIT





Office BUILDING

**Benefits for Office Building**

- Increase the marketability of the office building
- Promote usage of existing infrastructure
- Provision of a missing service to the neighbourhood
- Motivate employees to work, and increases productivity of staff

**Green Strategies for Office Building**

- ▣ Locate in a BEAM Plus Neighbourhood
- ▣ Provide bicycle parking to encourage cycling
- ▣ On-foot access to fitness and leisure facilities
- ▣ Provision of charging facilities for electric vehicles

▣ Provide sufficient parking facilities

▣ Loading/unloading bay should be located below ground level if structurally possible in order to ease the traffic flow near the building

▣ Provision of walking tracks, relaxation and exercising areas

Connectivity to Nearby Amenities

**Benefits for Office Unit**

- Facilitate walkable access to nearby amenities to improve productivity of building occupants by reducing the time spent driving and finding a parking space
- Improve employees' health by increasing the level of physical fitness with the provision of exercise related amenities

**Green Strategies for Office Unit**

- ▣ Locate in a BEAM Plus Neighbourhood or place with access to nearby amenities
- ▣ Access to green space
- ▣ Make healthy and sustainable food choices by managing on-site canteen facilities

Office UNIT

Office BUILDING

**Benefits for Office Building**

- Promote better indoor air quality for building occupants, by using green building materials in construction
- Lower the energy consumption and greenhouse gas emissions from extraction, transportation and manufacturing by using green building material
- Lower expenditure on shipping and transport of building materials by using regional materials

- Help the community and gain a good reputation
- Increase the variety of styles used hence enhancing building marketability

**Green Strategies for Office Building**

Use recycled content

Use rapidly renewable materials

Use regional materials

Use certified wood products

Use material with reduced PVC content

Use low-emitting materials

Green Building Materials

**Benefits for Office Unit**

- Promote health and the well-being of staff by using green building materials
- With better indoor air quality there will be less discomfort caused by indoor air. This can boost morale and increase productivity to a large extent

**Green Strategies for Office Unit**

Use durable, recyclable materials, such as metal to replace timber used in formwork

Use low-emitting material

Purchase products with high recycled content

Use system furniture (case)

Use rapidly renewable materials, eg. FSC wood

Refer to HK G-PASS for green building materials

Office UNIT



Office BUILDING

**Benefits for Office Building**

- Offset cost of construction by salvaging existing materials
- Reduce the demand for virgin materials and in turn lowers the cost of extraction and transportation of materials
- Enhance the corporate image of environmental sustainability
- Induce great environmental and economic savings by reusing buildings. It may take 10 to 80 years

for a new energy-efficient building to overcome the environmental impacts created by its construction

**Green Strategies for Office Building**

- ▣ Reuse the structure of an existing building
- ▣ Reuse basement structure

▣ Adaptive Reuse

▣ Use Salvaged brick for walkway

▣ Use second-hand freight container

Reuse of Materials

**Benefits for Office Unit**

- Save the cost of buying brand new furniture
- Add value to the item so that it continues to be useful and productive
- Savings on old materials disposal
- Provide items to low-income or disadvantaged people supports the community and helps those in need

- Require fewer resources, less energy and less labour when compared with recycling<sup>1</sup>

**Green Strategies for Office Unit**

▣ Apart from new purchases, consider reuse of furniture, office equipment and accessories from other premises

▣ Use salvaged wood for flooring, cabinets, desks, etc

▣ Reuse partitions from other fitting out projects

▣ Use salvaged construction waste for other purposes

Office UNIT



## Office BUILDING

### Benefits for Office Building

- Construction noise and dust control helps to minimise the nuisance to the immediate neighbourhood
- Quality is well controlled to avoid potential defects and poor workmanship
- Decrease project costs by having a well-planned schedule

### Green Strategies for Office Building

- ▶ Use quiet machines like a hydraulic crusher for demolition
- ▶ Store cover cement, sand, debris or any other dusty materials stored outside the site or keep them moist
- ▶ Spray water before breaking, grinding, polishing or wood cutting operations
- ▶ Use electrical elevated platform to allow flexible installation
- ▶ Adopt low noise construction and demolition methods, eg. Core and burst, saw cut, mechanical scissors, etc
- ▶ Minimise impact on the environment

## Construction Noise and Pollution Control

### Benefits for Office Unit

- Airborne dust from construction activity can have both environmental and human health impacts. Fine dust particles enter airways and lungs with ease and have been linked to numerous health problems including asthma, decreased lung function, and breathing difficulties. Having a good construction management plan can have a great positive impact on occupants' health and wellbeing

### Green Strategies for Office Unit

- ▶ Use noise barriers or absorbers and fit noise mufflers to machines
- ▶ Place rubber mats/pads beneath work benches and noisy machines
- ▶ Notify the affected tenants and customers of the schedule of noisy work
- ▶ Only use windows for fresh air supply. Keep main door closed
- ▶ Construction IAQ Management Plan
- ▶ Low noise demolition methods, eg. saw cut, mechanical scissors

Office UNIT



## Office BUILDING

### Benefits for Office Building

The substantial building cost due to reduced waste can be lessened, since the need to pay hauliers to dispose of construction and demolition debris is nullified with a proper waste management scheme.

### Green Strategies for Office Building

- Sort waste for reuse and recycling
- Use precast building components, such as façade, staircases, semi-precast flooring, mid-landings, slabs and beams, as much as possible
- Reuse excavated spoils or inert waste for backfilling, slope stabilisation and reclamation
- Reuse used timber for formwork on site
- Order the right amount of building materials to be delivered at right time to avoid unnecessary costs
- Send the waste back through a recycling programme
- Development of a waste management plan. Refer to <http://www.epd.gov.hk/epd/misc/cdm/guidelines6.htm>

## Construction Waste Reduction

### Benefits for Office Unit

Recycling of construction and demolition waste reduces demand for virgin resources and reduces the environmental impacts associated with resource extraction, processing and transportation.

### Green Strategies for Office Unit

- Sort waste for reuse and recycling
- Order the right amount of building materials to be delivered at the right time to avoid unnecessary costs
- Development of a waste management plan



## Office UNIT

# INDOOR ENVIRONMENTAL QUALITY

3.2.1  
Thermal Comfort

3.2.2  
Adequate Ventilation

3.2.3  
Natural Lighting

3.2.4  
Glare Control

3.2.5  
Quality Views

3.2.6  
Good Acoustic Environment

3.2.7  
Indoor Air Quality

3.2.8  
Indoor Greenery

3.2.9  
Use of Low-VOC Emitting Materials

3.2.10  
Separation of Printing Room

3.2.11  
Separation of Server Room

3.2.12  
The Indoor Air Quality Certification Scheme

Office BUILDING

**Benefits for Office Building**

Office buildings with good thermal control design help to lower the energy consumption of the air-conditioning system and allow future tenants to provide a comfortable indoor thermal environment within their own office units.

**Green Strategies for Office Building**

- Install thermometers to monitor the room temperature to avoid excessive cooling. Avoid setting air conditioning temperature below 23°C in summer months
- Clean dust filters and air-side system regularly. Remove obstructions at air inlets and outlets of the air conditioning and ventilation units
- Conduct regular occupancy surveys and air temperature and humidity monitoring



Thermal Comfort

**Benefits for Office Unit**

- Good control of thermal comfort in the work place:
- Increase well-being, and lessens fatigue
- Increase job satisfaction
- Improve staff morale
- Staff find it easier to concentrate and make more attempts at solving difficult tasks
- Increase productivity

**Green Strategies for Office Unit**

- Find the obvious places where air can sneak into your office, then make repairs to plug the leaks by caulking, weather stripping and using plastic covers
- Switch off lighting and heat-producing appliances that are not in use to reduce air conditioning load
- If necessary, use fans to enhance the cooling effect by increasing cool air circulation
- Place thermometers and hygrometers in conspicuous locations to monitor the comfort level (air temperature and relative humidity) for the room occupants
- Dress light to minimise the use of air conditioning
- Set the fan coil to low fan speed as the normal setting. Use a high fan speed rather than lowering the temperature setting to cater for increased cooling demand
- Zoning of the office to allow user to set the temperature
- Solar control film applied to glass panels to reduce energy use for cooling
- Relative humidity is recommended to be less than 70%; Recommended room temperature is 24°C-26°C

Office UNIT

## Office BUILDING

### Benefits for Office Building

Well functioning and adequate ventilation in buildings is necessary to ensure that indoor air is free from pollutants, and that indoor temperatures and moisture levels are sufficiently regulated.

### Green Strategies for Office Building

- ✔ Schedule regular maintenance of clean air conditioner filters to ensure proper and efficient operation
- ✔ Operable vents on the building envelope to allow fresh air in
- ✔ Mixed mode ventilation system
- ✔ Free cooling system
- ✔ Slide open façade

## Adequate Ventilation

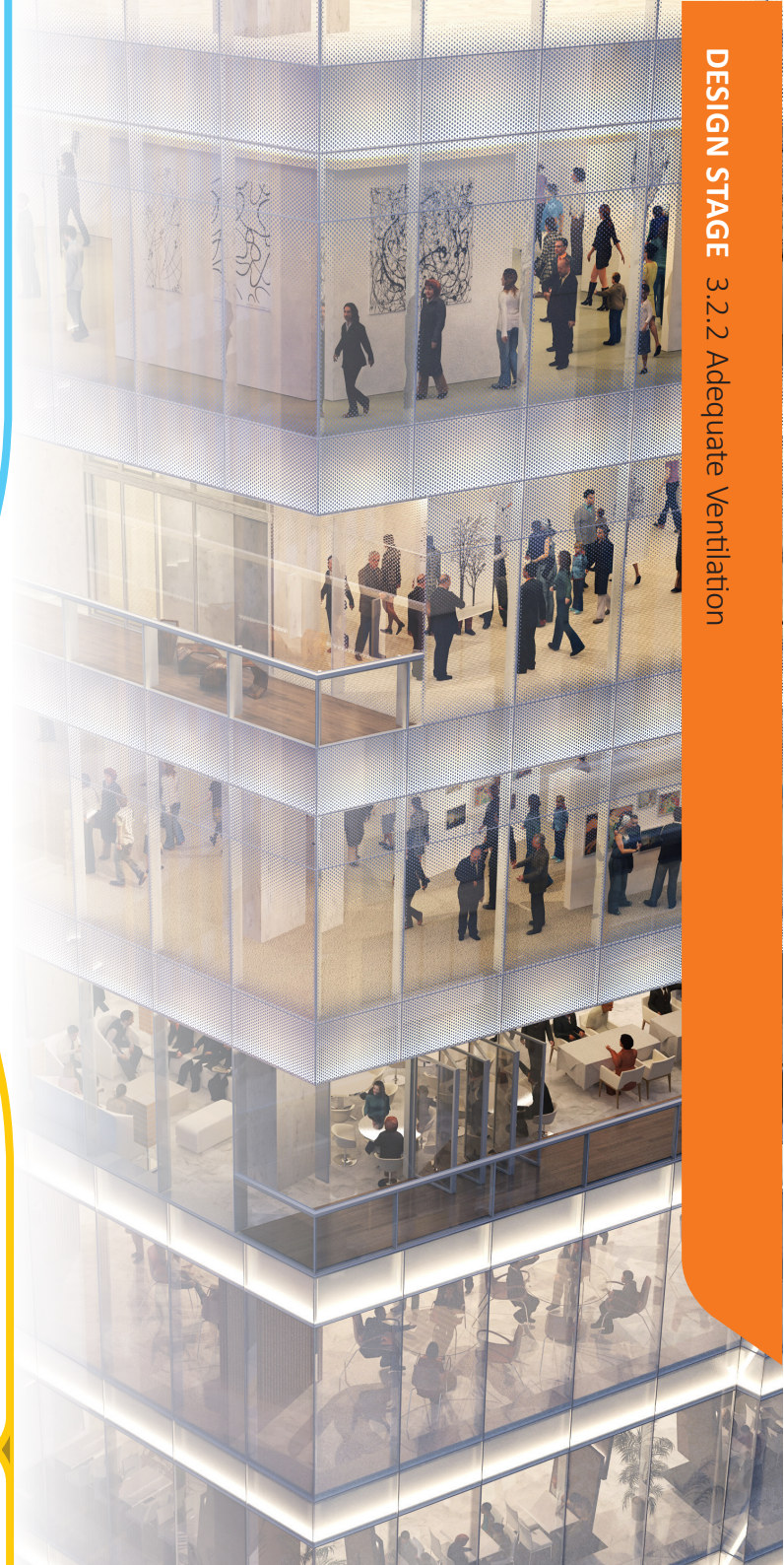
### Benefits for Office Unit

Concentrations of pollutants found indoors are much higher than those outside and are known to have a significant impact on health. Increased ventilation above the minimum standards improves the indoor air quality (IAQ) and benefits occupants' health and well-being directly.

### Green Strategies for Office Unit

- ✔ Use fans on the wall of each side of the building to keep fresh air flowing
- ✔ Proper layout to enhance cross ventilation

Office UNIT





## Office BUILDING

### Benefits for Office Building

Increasing natural lighting in the office can help to reduce the energy consumption of the lighting system. It can also help to lower the energy consumption of the air-conditioning system as the heat dissipation from the lighting system is reduced.

Office buildings introducing natural lighting would attract tenants who would like to improve staff's productivity through provision of natural lighting.

### Green Strategies for Office Building

- Locate and size windows appropriately to increase the amount of daylight in the office space
- Use clerestory windows, light shelves, and a light color on a matt or rough surface and on furnishings can diffuse the natural light
- Incorporate proper sun shading devices in building design
- Visible Light Transmittance (VLT) of glass not less than 50%
- Install skylights/light tubes in appropriate areas such as corridors
- Use light colour finishes

## Natural Lighting

### Benefits for Office Unit

Many fluorescent lights are only concentrated in the yellow-green portion of the spectrum to obtain the most lumens per watt; this unbalanced, narrow spectrum limits the blue in the source, which leads to improper functioning of the eye. Therefore, the superior spectral content of natural light makes it the best light for the eye.

Studies have shown that proximity to windows has a positive effect on staff productivity. It can be partly due to the effect of views, but the positive

impact of light on health and well-being is undeniable. Exposure to light, during the day, particularly in the morning, is beneficial to your health via its effects on mood, alertness and metabolism.<sup>2</sup> Moreover, it also reinforces circadian rhythms.

### Green Strategies for Office Unit

- Locate private offices toward the building core and siting cubicles at the perimeter brings daylight into a large area
- Low cubicle and glass partitions allow daylight to travel to the core spaces to ensure a natural light illuminance level of 100lux.<sup>3</sup>
- Use of light tubes for better utilisation of daylight for office spaces and amenities
- Use of light color finishes



Office BUILDING

**Benefits for Office Building**

Well-designed sun control and shading devices can dramatically reduce building peak heat gain and cooling requirements and improve the natural lighting quality of building interiors. Proper glare control may even reduce the energy consumption by 5-15%. In electric lighting design, it is beneficial to have the right amount of light with appropriate limits to glare. This can reduce the number of light fittings and lower the initial capital cost and operational costs in the long run.

**Green Strategies for Office Building**

- ▶ Access to adjustable window shades by occupants allows excessive daylight and glare to be controlled
- ▶ Incorporate proper sun shading devices in the building design
- ▶ Installation of a drapery system for custom control of the light in

Glare Control

**Benefits for Office Unit**

Proper control of natural daylight by some type of shading device can prevent long-term damage to the eyes caused by excessive sunlight.

Areas of high brightness right next to areas of low brightness cause glare, making people uncomfortable.

Reducing glare will dramatically reduce the strain on the eyes.

Moreover, it increases the comfort level of workers and is a great asset for productivity.

**Green Strategies for Office Unit**

- ▶ Application of anti-glare coating to cut unwanted glare yet allow light in
- ▶ Installation of double layer blinds for a greater degree of glare control
- ▶ Movable awnings
- ▶ For desks located within 4.5m of windows, it is recommended that all computer screens be orientated such that they face within 20° perpendicular to the plane of the nearest window <sup>1</sup>

Office UNIT



## Office BUILDING

### Benefits for Office Building

Office buildings with appropriate access to exterior views provide natural daylight for future tenants and hence lower their energy consumption during the operational stage.

### Green Strategies for Office Building

- Regularly clean windows and skylights to maximise access to exterior views and natural daylight

## Quality Views

### Benefits for Office Unit

Physical workplace environments influence psychological and physiological factors of employees, specifically job satisfaction. People benefit from interaction with plants and nature. Visual access to green space helps to restore the mind's ability to focus, which improves job performance and helps alleviate mental stress and illness. It also improves experience, mood and happiness.

### Green Strategies for Office Unit

- Encourage employees to regularly take breaks and look at outside views
- Organise the interior office space so that more employees will have outdoor views. Workstations or seating should be within 8m of the nearest vision glazing and, while seated, have a direct line of sight at an eye level of 1.2m of the vision glazing

Office UNIT



## Office BUILDING

### Benefits for Office Building

Buildings with a good acoustic environment will result in better well-being and performance, being not only beneficial for the employees, but also increase the efficiency and productivity of the company as a whole.

It will also improve the company's popularity as a workplace, which in turn can help you attract highly qualified employees.

### Green Strategies for Office Building

- Establish green landscaping to soften noisy external environments
- Use of chilled beams rather than fan-coil units to reduce background sound

## Good Acoustic Environment

### Benefits for Office Unit

Having a good acoustic environment is integral to providing people with a sense of well-being and satisfaction about the office in which they work every day.

A good working environment supports people in both communication and concentration.

### Green Strategies for Office Unit

- Identify the balance of concentration and interaction among the workers in the office to help create zones
- Develop a layout strategy which will locate incompatible functions apart from each other

- Carefully consider the effect on neighboring workstations when locating supporting activities such as copier rooms, pantries and entries to conference rooms where a queue could be anticipated – adjacent to large conference rooms, for instance

- Provide a range of different work spaces and allow staff flexibility in their use to strike a balance between openness and privacy

- Specify ceilings having a minimum noise reduction coefficient (NRC) of 0.9 in open plan office areas and NRC of 0.8 in meeting rooms and training facilities. In conference, meeting and training facilities, provide noise absorbing panels on 25% of the walls with a minimum NRC of 0.8

- Cluster people who do the same work together

- Use of sound proofing material for partition walls

## Office UNIT



Office BUILDING

**Benefits for Office Building**

Good indoor air quality is good business. Good indoor air quality management can reduce costs, improve a building's performance, and avoid potentially expensive building remediation.

**Green Strategies for Office Building**

Pre-occupation evaluation of control indoor air quality

Inspection of fitting out units

Regular cleaning of air ducting and filtering system

Odour elimination

Smoke free policy

Greening for air quality improvement

Indoor Air Quality

**Benefits for Office Unit**

Poor indoor air quality has an adverse effect on occupants' health. Improved indoor air quality can result in higher productivity, fewer lost work days and better business.

**Green Strategies for Office Unit**

Avoid the use of materials with high concentration of pollutants and volatile organic compounds (VOCs)

Specify the use of less harmful/low-emitting materials

Protect air duct system during construction process or use a temporary by pass ventilation system to minimise the dust pollution

Perform air duct cleaning

Ensure adequate ventilation to remove air contaminants

Install air purifier

Isolate areas of work to prevent contamination of clean/occupied spaces

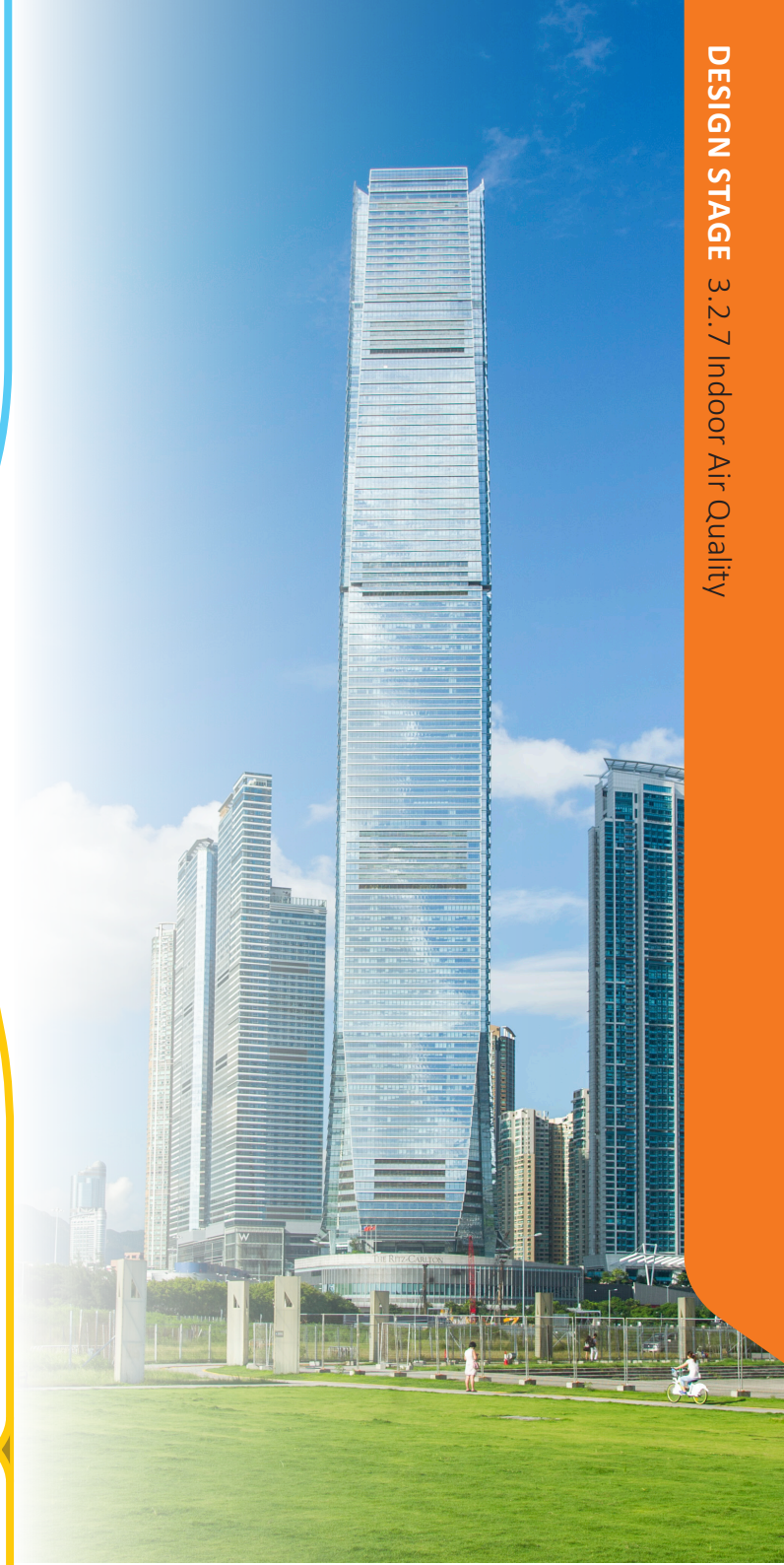
Provide local exhaust systems for polluting activities like redecoration and printing

Avoid unnecessary partitioning of the premises and ensure sufficient fresh air supply after partitioning

Clean up water spills and remove mouldy materials immediately

Properly store all foods and dispose of trash promptly to prevent odours in offices

Office UNIT



## Indoor Greenery

### Benefits of Green Office Unit

Indoor greenery benefits office buildings by improving moisture levels and providing visual enhancement. Seeing nature in the work environment can increase job satisfaction.

Moreover, plants can improve indoor air quality and deodorise gases caused by the use of certain materials, cleaning products and by human beings.

Since indoor plants improve indoor air quality significantly, staff productivity increases as well. Staff work more efficiently and with better concentration, especially staff working with computers.

### Green Strategies for Office Unit

- ▶ Put under skylights or near glass exterior walls or windows where possible
- ▶ When using artificial lighting, light fittings which provide a full daylight spectrum should be used
- ▶ Rotate the plants regularly to enhance healthy plant growth in all directions
- ▶ Choose suitable indoor plants, e.g. when choosing houseplants, consider the resistance to insect infestation
- ▶ Adopt innovative indoor greenery ideas like green columns or green walls
- ▶ Appropriate plant species should be chosen so as not to induce insect problems

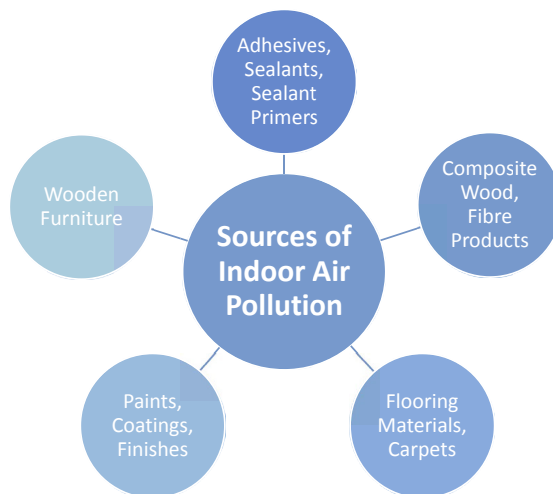


Figure 3.2.37 Indoor plants that can help to improve indoor air quality

Office BUILDING

**Benefits for Office Building**

Office buildings using low-VOC emitting materials provide a healthy indoor environment for future tenants and offer a good opportunity for both host office building and office units to obtain an excellent class under the IAQ certification scheme and to participate in other green building certification schemes.



Low-VOC Emitting Material

**Benefits for Office Unit**

High concentrations of Volatile Organic Compounds (VOCs) are known to cause health problems, including eye and throat irritation, headaches, and damage to the liver and the nervous system<sup>1</sup>. In addition, some Volatile Organic Compounds (VOCs) are thought to cause cancer.

Reducing the Volatile Organic Compound (VOC) emissions from materials such as paints, adhesives, and pesticides can have a positive effect on public health.

**Green Strategies for Office Unit**

Use low Volatile Organic Compound (VOC) products such as paint, carpeting and adhesives whenever possible. (e.g. Volatile Organic Compound (VOC) content limits for adhesives for wood is 30 g/L)<sup>2</sup>

Avoid the use of air fresheners and room deodorisers

Plant indoor plants to remove toxins from the air and make the office a healthier place to work

Acquire handheld detectors for regular detection of Volatile Organic Compound (VOC) concentrations in offices

Office UNIT



## Separation of Printing Room

### Benefits of Green Office Unit

The provision of exhaust systems for photocopying and printer rooms in office buildings can help to improve the indoor air quality and thermal comfort.

Separate rooms for photocopying and printing equipment help to eliminate the potential and direct exposure to ozone which is generated by photocopiers and laser printers. As ozone is such a highly reactive substance, any adverse health effects will be found essentially at the sites of the initial contact; the respiratory tract (nose, throat and airways), the lungs and, at higher concentrations, the eyes. The principal health effects are produced by irritation of and damage to the small airways of the lungs.

### Green Strategies for Office Unit

- Ensure that equipment such as photocopiers, laser printers and fax machines are situated in well ventilated areas and with independent exhaust systems
- Do not locate the equipment in corridors or escape routes because of the increased fire risk and impeding the means of escape
- Regularly service and maintain printers and copiers to ensure the equipment is in good working condition

廢紙回收  
Recycle  
Paper



## Separation of Server Room

### Benefits of Green Office Unit

A dedicated server room with a separate air conditioning system can greatly improve the efficiency of the office air conditioning system.

A separate server room also helps to provide flexible control of the air conditioning system and therefore improves air conditioning efficiency.

### Green Strategies for Office Unit

- ▶ Raise the floors in server rooms to facilitate the distribution of cool air, electrical power, telephone/data cables and water for room cooling units
- ▶ Use the hot/cold aisle principle. Hot-cold aisle configuration in the rack space allows the separation of hot and cold air flows to maximise efficiency of the cooling system. Cold air is delivered to hot equipment and hot air is returned most efficiently to the Computer Room Air Conditioning Unit (CRAC) for cooling
- ▶ Ensure proper cable management for proper ventilation
- ▶ Develop micro-cooling zones in larger server rooms to allow the precise amount of cooling to be delivered to where it is needed

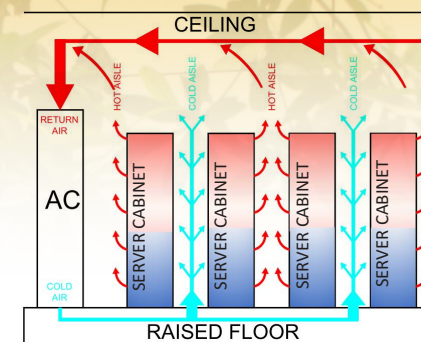


Figure 3.2.46 Green server room design.

Office  
BUILDING**Benefits for Office Building**

The IAQ Certification Scheme helps to recognise good IAQ management practices. Through participating in the Certification Scheme, an office building owner's efforts in providing environment with a good IAQ will be publicly recognised. Furthermore, the competitiveness of the building in attracting tenants will be increased.



## Indoor Air Quality Certification Scheme

**Benefits for Office Unit**

It provides a good and healthy indoor environment for staff, improves productivity and minimises medical expenses by reducing sick leave and absenteeism due to poor indoor air quality. The corporate image is also enhanced.

# ENERGY EFFICIENCY AND WATER SAVING

3.3.1  
Sustainable Building Services System

3.3.2  
Sustainable Energy

3.3.3  
Energy Saving Technology

3.3.4  
Reducing Water Use

3.3.5  
Water Recycling

## Sustainable Building Services System

### Benefits of Green Office Building

- Improved health and indoor environment.
- Reduced water use .
- Reduced amount of indoor pollutants entering the external environment.
- Tenants benefit from office buildings in several ways:
  - Reduce construction waste at the time of renovation for each new tenant
  - Enhance ease of modification to suit tenants' needs
  - Standardisation for easier adaptation by different tenants
  - Reduce energy use by recovery of waste energy

### Green Strategies for Office Building

- ✔ Use of equipment and system with high operating efficiency
- ✔ Better utilisation of energy based on actual demand
- ✔ Reduction of carbon emissions from system
- ✔ Integrate BS system with the use of natural resources
- ✔ Recovery of waste energy and waste water

## Sustainable Energy

### Benefits of Green Office Building

The energy sector is the largest contributor to Hong Kong's carbon dioxide emissions, being responsible for about 97% of the total carbon dioxide emissions, most of which come from electricity generation. Using sustainable energy can help to minimise the environmental impact of energy production and use, and promote the efficient use and conservation of energy. Though its usage is subject to various constraints (such as space and initial capital cost) and its application is usually not more than 1% of the total building consumption, it can improve public health and environmental quality by limiting greenhouse gas emissions.

There is a vast and inexhaustible energy supply if we use renewable energy. This points us to the road of sustainable development.

### Green Strategies for Office Building

- Use of Photovoltaic Panel (PV panel) or BIPV systems
- Use of solar thermal energy for power (electricity) generation and water heating
- Use of wind energy
- Bio-diesel tri-generation
- Use of district cooling systems



Figure 3.3.1 Photovoltaic panels installed on roof  
(Source: Hong Kong Science and Technology Park Corporation)



## Office BUILDING

### Benefits for Office Building

- Reduce building energy consumption and carbon emissions.
- Reduce operational cost of building public systems.
- By applying the latest technologies, not only will it save energy, but it also increases the efficiency of appliances

### Hong Kong Green Building Council Benchmarking and Energy Saving Tool - Office Buildings (HK BESTOF)

(Since Nov 2015) – A certification scheme and a web-based energy benchmarking tool have been developed to promote energy efficiency for commercial buildings, by providing a reference to building owners and property management companies.

## Energy Saving Technology

### Benefits for Office Unit

- Improve energy consumption by the office unit
- Reduce operational costs for the office unit
- By applying the latest technologies, not only will it save energy, but it will increase the efficiency of the appliances

### Hong Kong Green Building Council Benchmarking and Energy Saving Tool – Office Occupants (HK BESTOO)

(Since Nov 2013) – the Scheme and a web-based energy benchmarking tool have been developed to promote energy efficiency and recognise outstanding energy saving performance by office occupants.



**Energy Saving Technology for Office Building****a. Lighting**

- Energy saving lighting such as T5 or LED in common areas
- Occupancy/photo sensors for lighting control (see figure 3.3.4)
- Power over Ethernet (PoE) lighting (for saving on cabling)
- Appropriate number of lighting control zones
- Timer control for lighting

**b. Heating, Ventilation and Air Conditioning (HVAC) system**

- Energy efficient air-conditioning system
- High efficiency chillers with variable speed drives
- Oil-free chillers with magnetic float bearings
- Variable speed drives for motors of

- water pumps and fans
- VRV air conditioners
- Chilled ceilings/chilled beams
- DC motors for fan coil units
- CO<sub>2</sub> sensor control of the amount of fresh air supply
- Heat wheels
- Optimisation in chiller sequencing
- Use of heat pumps for space heating and hot water systems
- Total hydronic balancing in chilled water systems
- VAV system static pressure reset control
- Solar control window film

**c. Lifts and Escalators**

- Energy saving mode for lifts and escalators (see figure 3.3.5)
- Lift parking mode during non-peak hours
- Destination control system for lift bank
- Application of power regeneration

**d. BMS systems**

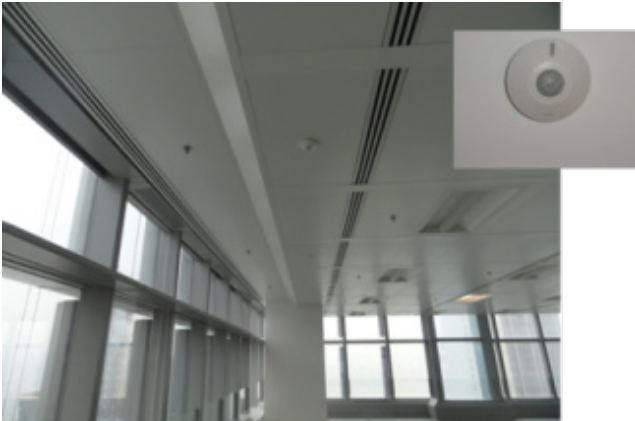
- Provision of smart metering for energy and water consumption

monitoring

**Green strategies for Office Building**

- Oil-free chiller with magnetic float bearings
- High efficiency chillers with variable speed drives
- Variable speed drives for motors of water pumps and fans
- VRV air conditioners
- Heat recovery unit
- Energy saving lighting (such as T5 and LED)
- Occupancy sensors (for automatic switching off light and A/C)
- Daylight sensors and dimmable lighting ballast
- CO<sub>2</sub> sensor controls (minimise excessive fresh air supply)
- Destination control system for lift banks
- Escalator infra-red sensor (low speed at non-peak hours)
- Automated lighting
- Lift parking mode during non-peak hours





### Energy Saving Technology for Office Unit

#### a. Lighting

- Energy saving lighting such as T5 or LED
- Occupancy/photo sensors for lighting control (see figure 3.3.4)
- Automated/time scheduled lighting zones
- Use of task lights

#### b. Heating, Ventilation and Air Conditioning (HVAC)

- VRV air conditioners
- Chilled ceilings/chilled beams
- DC motors for fan coil units
- CO<sub>2</sub> sensor controls on the amount of fresh air supply
- Building-Integrated Photovoltaic panels (BIPV panels)

- Solar control window film

### Green strategies for Office Unit

- VRV air conditioners
- Energy saving lighting (such as T5 and LED)
- Occupancy sensors (for automatic switching off light and air conditioning)
- Daylight sensors and dimmable lighting ballast
- CO<sub>2</sub> sensor controls (minimises excessive fresh air supply)
- Appropriate zoning of lighting
- Appropriate zoning of air side systems with more thermostat controls



## Office BUILDING

### Benefits for Office Building

- Reduce waste disposal into the environment.
- Reduce fresh water use in the building to protect the natural water cycle and to save water resources for future generations.

### Green Strategies for Office Building

Water saving faucets

Low volume flush water closets and urinals

Infra-red sensors for water taps (automatic shut off after use)

Provide check meters to monitor water consumption

Dual flushing fitments

## Reducing Water use

### Benefits for Office Unit

Reduce operational costs.

### Green Strategies for Office Unit

Water saving faucets

Low flush water closets and urinals

Infra-red sensors for water taps (automatic shut off after use)

Dual flushing fitments

## Office UNIT



## Water Recycling

### Benefits of Green Office Building

- Reduce water demand on water main
- Reduce cost of water usage
- Reduction in the amount of fresh water needed for sewage conveyance
- Reduction in the total amount of fresh water drawn from natural water bodies
- Similarly a reduction in the volume of sewage entering the public sewage infrastructure

### Green Strategies for Office Building

- ▣ Recycle rainwater for irrigation or cleansing uses
- ▣ Recycle grey water from low contaminated waste water in office
- ▣ Recycle air conditioning condensate for flushing use
- ▣ Recycle cooling water bleed-off for flushing use
- ▣ Recycle waste water during fire services system annual inspection for cleansing

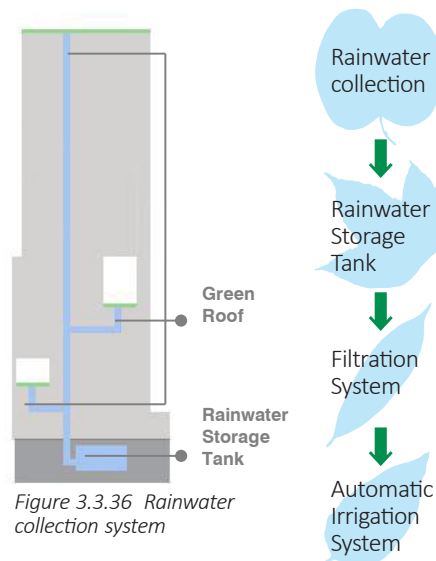


Figure 3.3.36 Rainwater collection system



# GREEN BUILDING CERTIFICATION

New Building

Existing Building

Office Interior

**UK – Building Research Establishment (BRE)**

BREEAM New Construction 2014  
BREEAM In-Use



**Hong Kong – The Hong Kong Green Building Council (HKGBC)**

BEAM Plus New Buildings V1.2  
BEAM Plus Existing Buildings V2.0  
BEAM Plus Interiors  
BEAM Plus Neighborhood

**US – U.S. Green Building Council (USGBC)**

LEED V4 –  
New Construction & Major  
Renovations  
LEED V4 –  
Commercial Interiors

**Australia – Green Building Council of Australia (GBCA)**

Green Star – Design & As Built  
Green Star – Interiors  
Green Star - Performance

**South Africa – Green Building Council of South Africa (GBCSA)**

Green Star SA –  
Office V1 & V1.1

**Singapore – Building & Construction Authority (BCA)**

Green Mark -  
Non-Residential New Buildings V4.1  
Existing Non-residential Building V3

**National Australian Built Environmental Rating System (NABERS)**

NABERS for Offices



### BEAM Plus New Buildings (BEAM Plus NB)

For developer:

- New construction
- Major renovation to existing buildings
- New construction and an existing building, e.g. expansion of a building
- A combination of new construction and major renovation

### BEAM Plus Existing Buildings (BEAM Plus EB)

For developer and property management:

- Existing building

## Green Building Certification

BEAM Plus rating systems  
Platinum, Gold, Silver and Bronze

### Green Strategies

Try to engage BEAM professionals, authorised persons, registered architects, registered professional engineers in structural/building services disciplines to identify sustainable elements which can be incorporated into the office spaces at the early planning and design stage when most significant benefits can be obtained.

### BEAM Plus Interiors

For tenants:

- New buildings' fitting-out and interior projects
- Renovation of buildings' fitting out and interior projects



# OPERATION AND MANAGEMENT

4.1.1  
Green Operation and Management

4.1.2  
Intelligent Building Management

4.1.3  
Green Education and Support

4.1.4  
Waste Management

4.1.5  
Occupant Behaviour

4.1.6  
Maintain Energy Efficiency

4.1.7  
Energy Audit

4.1.8  
Monitoring and Benchmarking

4.1.9  
Pest Control

4.1.10  
Post Occupancy Survey

Office BUILDING

**Benefits for Office Building**

- Higher electricity savings, lower operating costs, longer building lifespan and economic payback
- Increase market reputation and business opportunities
- Reduce regulatory risk when legislation bans inefficient practices
- Reduce weather-related risk as less damage caused by extreme weather

**Green Strategies for Office Building**

Intelligent Building Management Systems

Green Education and Support for Tenants

Maintain Energy Efficiency

Energy Audit

Waste Management

Monitoring and Benchmarking

Green Operation and Management

**Benefits for Office Unit**

- Reduce energy consumption and office operating expenses
- Expand business opportunities and competitiveness
- Staff awareness and, in return, higher staff productivity and lower health costs
- Upgrade of the indoor environment due to green office design

**Green Strategies for Office Unit**

Maintain Energy Efficiency

Green Education and Support for Staff Members

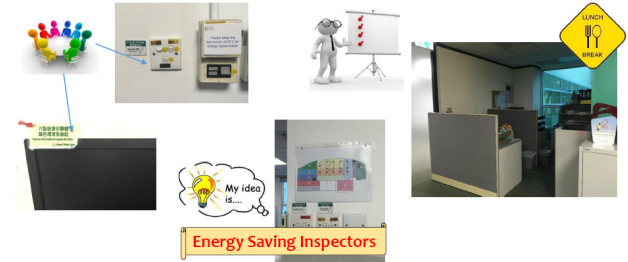
Waste Management

Monitoring and Benchmarking

Office UNIT



- CASE 1**
1. Energy saving reminders
  2. Lighting zones map
  3. Lights off during lunch hour



- CASE 2**
1. Stair Friday
  2. Stair Monday & Friday
  3. Invite tenants to participate



## Intelligent Building Management System

### Benefits of Green Office Building

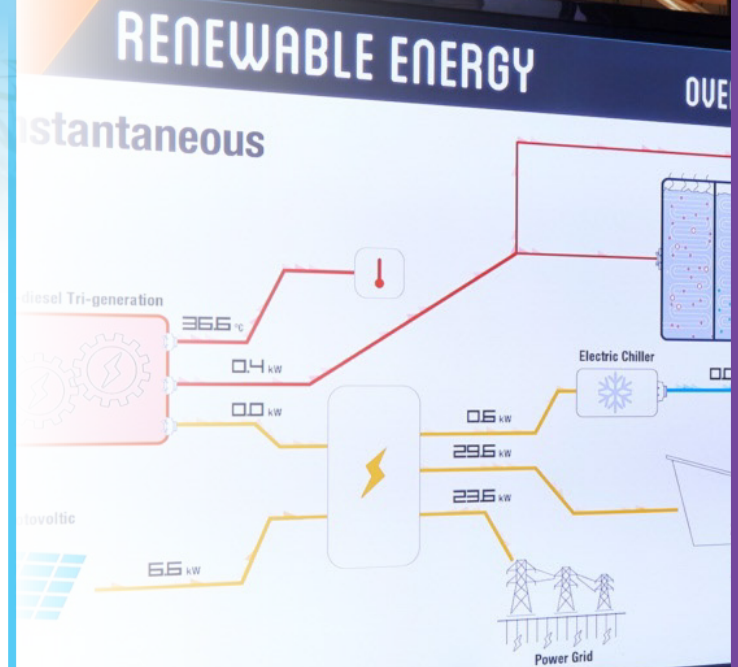
BMS is useful as a tool for improving energy performance for a range of building electrical installations and technical services. It is conducive to:

- Saving on operating costs
- Central or remote control of building equipment
- Efficiency in identification of irregularities
- Save time in monitoring and measuring power use
- Ease of evaluation, analysis and planning for energy efficiency

### Green Strategies for Office Building

▶ Apart from BMS, there are several advanced technologies available to reduce the energy consumption and most of them are commonly used, such as variable speed drive, Light-Emitting Diode (LED) and sensor system, etc. (detail is available in section 3.3.3)

▶ Building Environmental Performance Assessment Dashboard system – functions as graphical user interface for displaying and evaluating a building's environmental performance (refer to Zero Carbon Building in Hong Kong, available at <http://zcb.hkcic.org/Eng/index.aspx>)





## Office BUILDING

### Benefits for Office Building

The environmental programmes aimed at providing green education and support for tenants and occupants to practice “recycle, reuse and reduce” in the building with ease. Green facilities and activities provided by the landlord can promote the introduction of green concepts to tenants and encourage opinions about improvements in the green policy for the building.

### Green Strategies for Office Building

#### Targeting Green Goals

1. Engage a BEAM Professional (BEAM Pro) for setting adoptable green strategies
2. Building provisions and guidelines to allow tenants to implement green practices with ease
3. Measures and campaigns for encouraging green behavior among occupants
4. Formation of green teams and encourage participation by different parties
5. Planning and implementation of green programs

## Green Education and Support

### Benefits for Office Unit

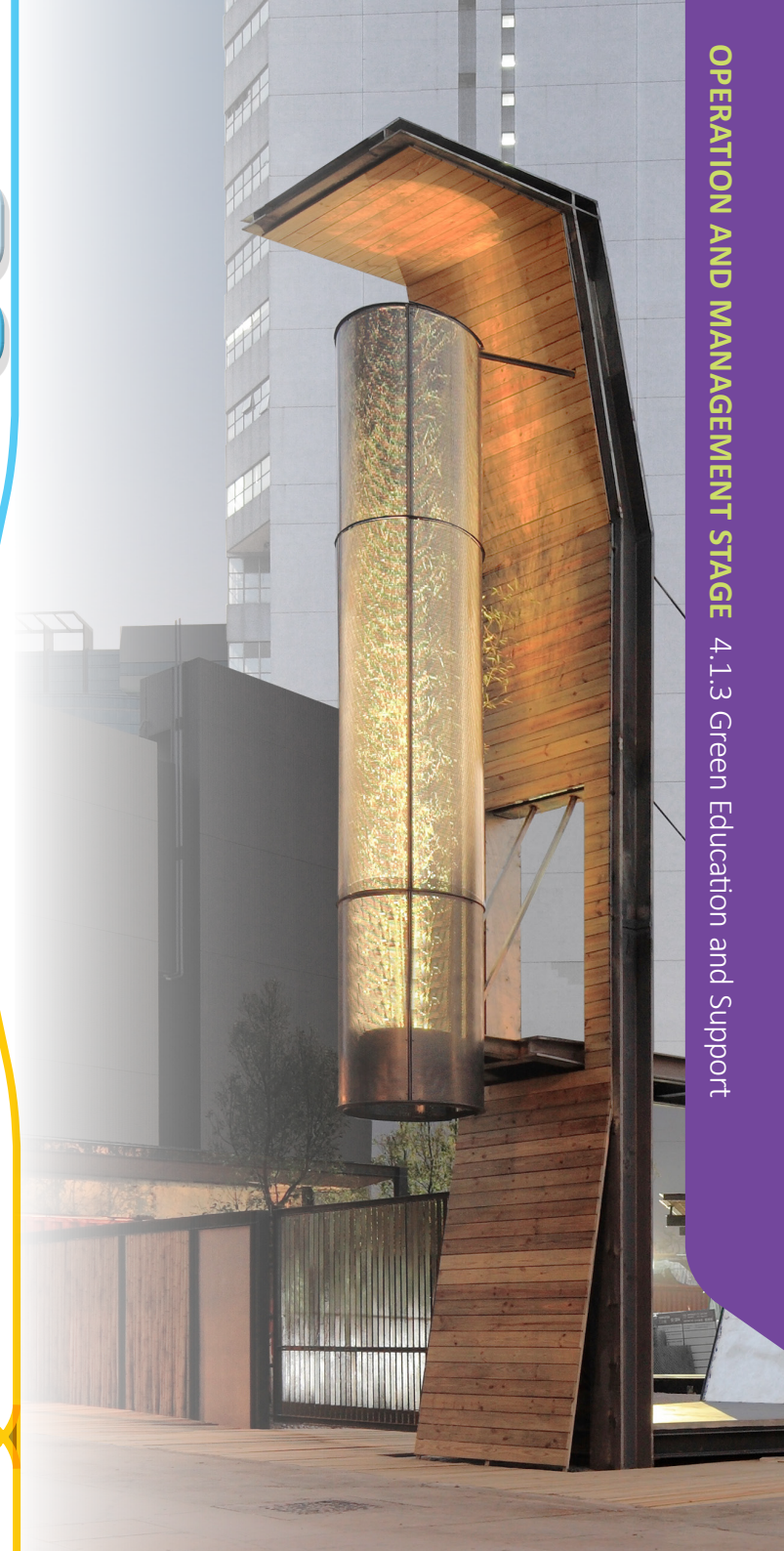
The concept of green management “Recycle, Reuse and Reduce” can be effectively implemented in offices and can contribute to an awareness among both employers and employees in terms of staff-related costs and health in return. Green office design and management can also help to upgrade the indoor green environment, resulting in achieving staffing goals, i.e., reduce costs of staff turnover, improve staff retention rate and increase company revenue due to better staff performance.

### Green Strategies for Office Unit

#### Improve Staff Awareness

1. Education and Training
2. Operation and Maintenance Guidelines
3. Manage paper and office equipment consumption
4. Transport plan to reduce carbon emissions

Office UNIT



## Waste Management

- Managing Paper and Equipment Consumption
- Food Waste Management
- Transport Plan
- Green Purchasing
- Resources Sharing
- Waste Management during Fitting-out
- Measuring and Monitoring



Office  
BUILDING**Benefits for Office Building**

By changing the behaviour of occupants, energy consumption can easily be controlled since how occupants behave accounts for 50% of office energy consumption, a slight change in daily habits can actually make a major difference!

**Green Strategies for Office Building**

- ✔ Provide guidelines for tenants
- ✔ Involve staff in the contribution of green ideas
- ✔ Organise events that promote green office practices

## Occupants Behaviour

**Benefits for Office Unit**

The well-being of occupants can be improved by engaging staff in green practices such as using the stairs instead of elevators.

**Green Strategies for Office Unit**

- ✔ Green practice reminder
- ✔ Turn off lights when not in use
- ✔ Turn off computers when not in use
- ✔ Double-sided printing, reuse paper
- ✔ Waste sorting bins
- ✔ Encourage staff to dress appropriately for the environment

Office  
UNIT

Office BUILDING

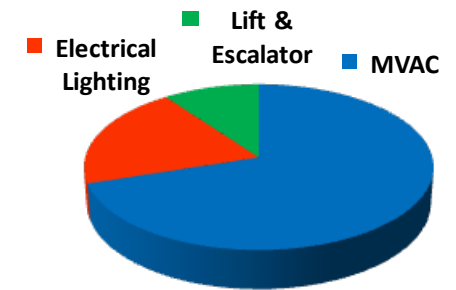
**Benefits for Office Building**

Maintaining the Mechanical & Electrical (M&E) system regularly can retain the building services system's operational efficiency and reduce operational costs.

It can help lower the chances of system failure and increase energy efficiency.

**Green Strategies for Office Building**

- ✔ Proper preventive maintenance of equipment to avoid a loss of operational efficiency
- ✔ Compare the system's efficiency with historical data
- ✔ Clean cooling coils and heat transfer surfaces regularly
- ✔ Replace/clean blocked air filters regularly
- ✔ Carry out re-commissioning of the system regularly or after any renovation work
- ✔ Clean the diffuser of light fittings regularly
- ✔ Implement ISO 50001



Maintain Energy Efficiency

**Benefits for Office Unit**

Maintaining the M&E system regularly can retain the building services system's operational efficiency and reduce operational costs.

It can help lower the chances of system failure and increase energy efficiency.

**Green Strategies for Office Unit**

- ✔ Clean cooling coils and heat transfer surfaces regularly
- ✔ Replace/clean blocked air filters regularly
- ✔ Clean the diffuser of light fittings regularly
- ✔ Implement ISO 50001

Office UNIT

Office BUILDING

**Benefits for Office Building**

An energy audit can encourage the building owner to explore more energy saving strategies.

Building energy audits benefits office buildings in several ways:

- Improvement of energy efficiency
- Improvement of product cost
- Good reputation for customers on environmental sustainability

**Green Strategies for Office Building**

► Proper preventive maintenance of equipment to avoid dropping of operating efficiency

► Compare the system efficiency with historical data and benchmarking

**Energy Audit**

To promote energy saving, the HKSAR Government enacted the Building Energy Efficiency Ordinance (Chapter 610) and all new office building designs need to comply with the Building Energy Codes published by the Electrical and Mechanical Services Department (EMSD). In addition, energy audits for existing buildings also become mandatory.

**Benefits for Office Unit**

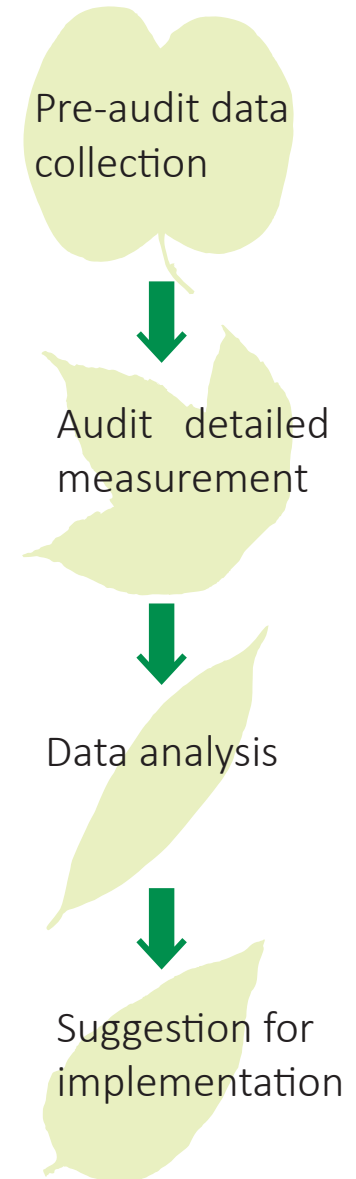
An energy audit can encourage the unit owner to explore more energy saving strategies.

**Green Strategies for Office Unit**

► Compare the utility usage with historical data and benchmarking

► Regular preventive maintenance of equipment to increase system efficiency

Office UNIT



## Office BUILDING

### Benefits for Office Building

An office building with a good energy index has a better reputation for the owner.

The benefits of monitoring and benchmarking are as below:

- Improvement of overall operational efficiency.
- Achieve long-term sustainability.

### Green Strategies for Office Building

- Proper preventive maintenance of equipment to avoid loss of operating efficiency
- Compare the system efficiency with historical data and benchmarking

## Monitoring and Benchmarking

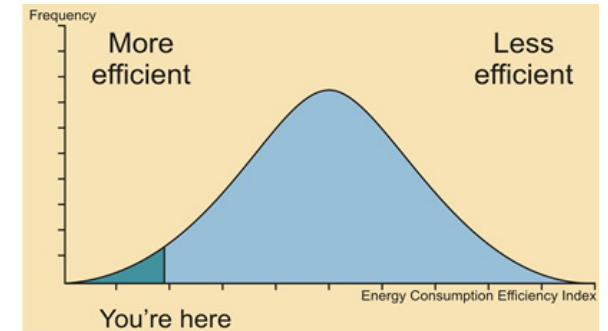
Sufficient metering provisions are required to facilitate continuous monitoring of the energy consumption for office buildings. Nowadays, the electronic/smart metering devices are less expensive and an owner can set up an automatic monitoring platform to record the energy use pattern of the office.

### Benefits for Office Unit

Reduce utility costs.

### Green Strategies for Office Unit

- Compare the utility usage with historical data and benchmarking
- Regular maintenance of office equipment



Office  
BUILDING**Benefits for Office Building**

Proper pest control not only creates a healthy working environment within the building but also minimises damage to the structural components and landscaped areas caused by pests and therefore eliminates the maintenance cost.

Good pest control benefits the marketing of the building and increases the competitiveness of the building.

**Green Strategies for Office Building**

- Develop, implement and maintain an indoor integrated pest management plan
- Arrange regular pest control inspections
- Educate building occupants on integrated pest management

## Pest Control

**Benefits for Office Unit**

It creates a good and healthy indoor environment for staff through a reduction of the exposure to potentially hazardous chemical, biological and particulate contaminants.

**Green Strategies for Office Unit**

- Carefully source appropriate office buildings with good pest control
- Encourage staff to participate in pest control educational training provided by building management
- Prepare the area for pest control services

Office  
UNIT

### Benefits for Office Building

It encourages the use of occupants' feedback to improve building operation and maintenance.

Post occupancy surveys also keep the management team up to date with how buildings perform in practice.

## Post Occupancy Surveys

### Sample of a Post Occupancy Survey

1<sup>st</sup> reference : HKQAA SBI reference guide

2<sup>nd</sup> reference: LEED reference guide O+M Version 4

Appendix 2:

HKQAA SBI Survey Questions for Measuring the Building Users' Satisfaction

Note:

- Areas of concern are the 'Common Area' of the building.

**Question 1. Lighting condition**

Poor	Acceptable	Good
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

**Question 2. Thermal condition**

Poor	Acceptable	Good
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

**Question 3. Noise control**

Poor	Acceptable	Good
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

**Question 4. Indoor air quality**

Poor	Acceptable	Good
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

**Question 5. Accessibility of transportation**

Poor	Acceptable	Good
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

**FURTHER EXPLANATION**

EXAMPLE FOLLOW-UP QUESTIONS FOR DISSATISFACTION

The survey should ask respondents who indicate dissatisfaction to identify the nature and cause of the problem. Specific follow-up questions are not prescribed by the credit; the following are examples that illustrate some possibilities.

For the following statements and questions, please indicate yes or no.

1. In warm or hot weather, the temperature in my workspace is
  - Often too hot \_\_\_
  - Often too cold \_\_\_
2. In warm or hot weather,
  - My hands are too cold \_\_\_
  - My feet are too cold \_\_\_
3. In cool or cold weather, the temperature in my workspace is
  - Often too hot \_\_\_
  - Often too cold \_\_\_
4. In cool or cold weather,
  - My hands are too cold \_\_\_
  - My feet are too cold \_\_\_
5. When is this most often the problem?
  - Morning \_\_\_
  - Midday \_\_\_
  - Afternoon \_\_\_
  - Evening \_\_\_
6. How would you best describe the source of the problem?
  - Humidity is too high (damp) \_\_\_
  - Humidity is too low (dry) \_\_\_
  - Air movement is too high \_\_\_
  - Air movement is too low \_\_\_
  - Sun heats my workspace \_\_\_
  - Surfaces (wall, floor, etc.) are hot or cold \_\_\_
  - Heat is coming from office equipment \_\_\_
  - Drafts are coming from vents \_\_\_
  - Thermostat is inaccessible \_\_\_
  - Thermostat is adjusted by others \_\_\_
  - Heating or cooling system is not responsive \_\_\_

Alternatively, provide an open-ended format to solicit feedback on specific sources of thermal discomfort.

1. Please describe the specific issues that you have experienced related to thermal comfort in your workspace.

Figure 4.1.35 Sample of a post occupancy survey



# LANDLORD AND TENANT

4.2.1  
Landlord and Tenant Consideration

4.2.2  
Incentive for Landlord and Tenant

4.2.3  
Landlord Support

4.2.4  
Green Lease – Green Tenancy Driver

4.2.5  
Guidelines for Tenants

4.2.6  
Collective Bargaining for Green Products

4.2.7  
Performance Monitoring and Review

## Landlord and Tenant Considerations

### Landlord Considerations

Preliminary Landlord Considerations	
Budget	<ul style="list-style-type: none"> <li>Increase initial capital cost and cost savings expected as economic payback after implementing green practices</li> </ul>
Effective and Transparent Communication	<ul style="list-style-type: none"> <li>Improve collaboration with tenant about green fitting-out works, green lease, promotional campaign and performance evaluation</li> <li>Good communication among staff members</li> </ul>
Proper maintenance and assessment	<ul style="list-style-type: none"> <li>Lifecycle of building system and facility</li> <li>Proper preventive maintenance plan to reduce waste and maintain smooth green operation</li> </ul>
Human resources management	<ul style="list-style-type: none"> <li>Train staff to become green-conscious</li> <li>Recognise capability of staff in implementing green practices</li> <li>Obtain effective decision-making</li> </ul>
Others	<ul style="list-style-type: none"> <li>Utilise recycling program and cooperate with recycling contractors to reduce construction and disposal waste generated by replacement of old system and facilities</li> </ul>

### Tenant Considerations

Preliminary Tenant Considerations	
Budget	<ul style="list-style-type: none"> <li>Increase initial capital cost and cost savings expected as economic payback after implementing green practices</li> </ul>
Effective and Transparent Communication	<ul style="list-style-type: none"> <li>Good communication with landlord/property agent and employees for long-term implementation of green practices and conflict mitigation</li> </ul>
Proper maintenance and assessment	<ul style="list-style-type: none"> <li>Lifecycle of control system and electrical appliances</li> <li>Proper preventive maintenance plan to reduce waste and maintain smooth green operation</li> </ul>
Human resources management	<ul style="list-style-type: none"> <li>Train staff to become green-conscious</li> <li>Promote a view of confidence about the change</li> </ul>
Others	<ul style="list-style-type: none"> <li>Renovation or relocation of office area to build a green environment would involve fixture re-selection and office layout design</li> </ul>

### Benefits of Green Office Building and Unit

- Both landlord and tenants have to take different considerations into account to achieve green benefits
- According to the Hong Kong Green Building Council, green buildings with a BEAM certificate can achieve an average annual energy reduction of 13-30%

### Green Strategies

▾ Preliminary considerations of landlord and tenant

• Budget

• Effective and transparent communication

• Proper maintenance and assessment

• Human resources management

• Others

- Waste management (landlord)
- Fixture selection and layout plan (tenant)

Source: Prof John Ng (2014) "Compact Sustainability and Liveability in Hong Kong", available at <https://www.hkgbc.org.hk/eng/BPRef-others.aspx#papers>

## Office BUILDING

### Benefits for Office Building

The benefits from implementing “green” in return become an incentive for the landlord:

- Waste saving and improve green awareness
- Improve reputation. More investment opportunities and tenancy occupancy
- Financial advantages: lower operational costs and economic payback

- Improve corporate social responsibility
- Permanent green strategy developed. Reduce regulatory risk, market risk and weather-related risk

Example of a successful landlord: MTR Corporation Limited (MTR) has taken a leading role in the property industry to implement environmental criteria of BEAM Plus in 2010. The environmental campaign has led to energy savings of approximately \$4 million annually and the achievement

of BEAM Plus certification has resulted in an improved reputation of the Corporation and its managed buildings.

(Source: MTR Sustainability Report, 2013 and 2014)

## Incentive for Landlord and Tenant

### Benefits for Office Unit

The benefits of implementing “green” in return become an incentive for the tenant:

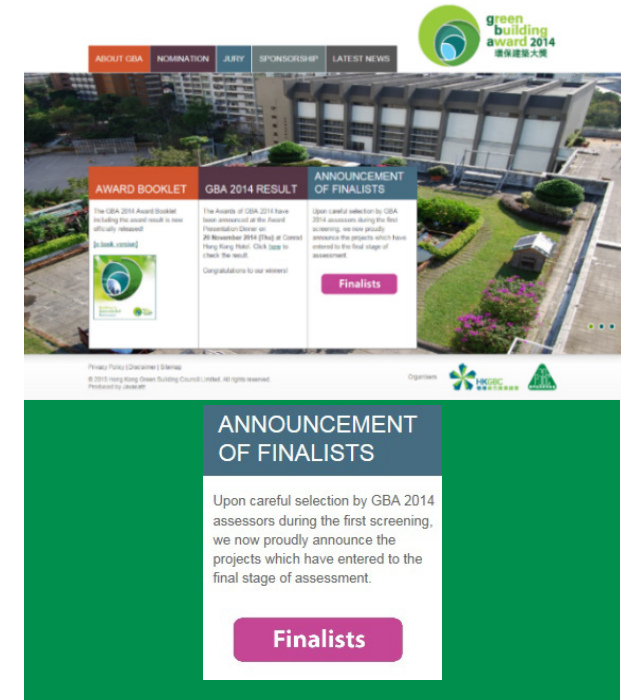
- Waste saving and improved green awareness
- Higher staff productivity. Fewer physical complaints and lower staff costs
- Financial advantages: lower operational costs and economic payback

- Green culture incorporated. Reduced regulatory risk and tenancy risk
- Improved corporate social responsibility. Increased market value and improved public relations

Example of successful tenant: Red Smith, an international law firm in the United States, looked for a sustainable floor plan and thus moved office to Three Logon located in Philadelphia in 2014 (a building with ENERGYSTAR certification). With support from senior management, a high-quality

and sustainable workspace has been offered to staff members and 35% annual energy saving has been projected.

(Source: Environmental Protection Agency of United States)



## Landlord's Support

### Benefits of Green Office Building

The landlord's provision for green policies is highly important to improve tenants' incentives for green implementation. The landlord can offer value-added services to tenants as a way of providing support.

### Green Strategies for Office Building

- Environmental programs and green activities
- Advice, guidelines and tips on environmental protection
- Engagement in green Lease
- Posting and publication of green plan and practices
- Formation of green team allowing tenants' participation
- Certificate for recognition
- Waste Management initiatives
- Bulk green purchasing and provision of a list of green suppliers
- Green system, facilities and services for tenants



## Green Lease

### Benefits for Office Building and Office Unit

Green lease is a lease that involves sustainability as part of a landlord-tenant agreement. It encourages landlord-tenant collaboration in agreeing and implementing green goals. "Green leases have the potential to provide the leased US office market up to \$3.3 billion in annual cost saving, reducing energy consumption by up to 22% and reduction in utility expenditure by \$0.51 per sq.ft." (The Institute for Market Transformation, 2015).

(Source: Jones Lang LaSalle, "Green Leasing", 2015)

### Green Strategies for Office Building and Office Unit

#### Common terms of green lease

- The purpose of the lease
- Participation in green team
- Information on waste audits if being practiced
- Meeting for reporting and reviewing purpose
- Installation of measuring devices and submission of consumption record

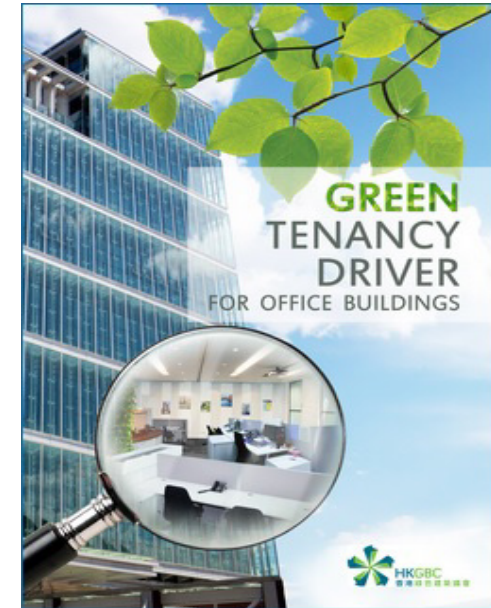
- Form and methodology

- Bulk purchasing if implemented

- Cost and profit sharing

- Leasing term initiatives

- Relevant timeframe



## Guidelines for Tenants

### Benefits for Office Building and Office Unit

- Educate tenants during implementation of sustainable design and green improvement plan
- Raise awareness among tenants of the importance and benefits of developing a green environment
- Assist in success of the building by participating in green campaigns
- Attract tenants who are looking for a green prospect

### Green Strategies for Office Unit

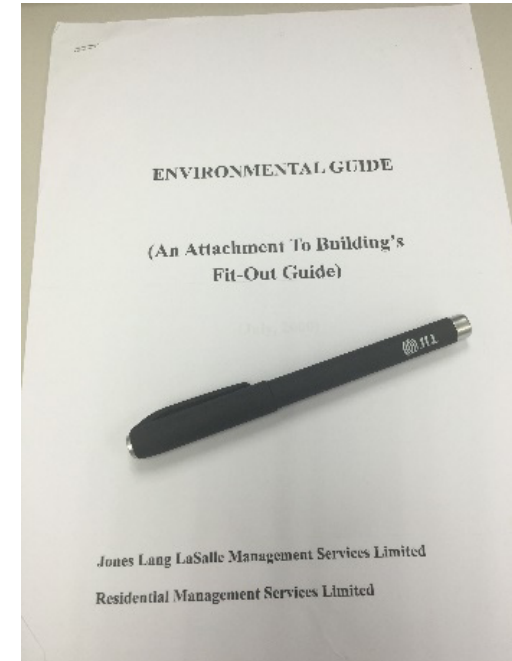
#### Guidelines for Tenants - Building User Guide

- Green Goals
- Building Services
- Energy Saving Policies
- Monitoring and Targeting
- Transportation Facilities

### Green Strategies for Office Building and Office Unit

#### Guidelines for Tenants – Green Fitting-Out Guide

- Control of pollution
- Control of construction methods and work periods
- Encourage choosing green materials and products
- Provide professional advice on green office design
- Waste management during fitting-out



## Guidelines for Tenants – Green Fitting Out Guide

- Control of pollution, e.g.:
  - Control of pollution during cleaning and pest control. Use natural, solvent free and hydrocarbon free cleaning products
  - Isolate working areas by installing partitions or sheeting
  - Control of smoking activities of the fitting-out contractor and provide a smoking area for smokers
  - Vacuum cleaning wherever paint and dust emission occur
- Control of construction methods and work periods, e.g.:
  - Set noisy work periods during non-peak hours
  - Install fresh air supply and proper ventilation devices such as fans and blowers
  - Control use of toxic chemicals
  - Protect air conditioning system during carrying out of works
- Encourage choice of green materials and products, e.g.:
  - Recommend choosing green materials and products with a lower level of harmful emissions to minimise pollution (detail is available in “Collective Bargaining for Green Products” in section 4.2.6)
  - Provide a list of suppliers for sourcing green materials and products
- Provide professional advice on green office design, e.g.:
  - Light colored decorative design and more glass windows for natural light so as to allow brighter indoor and use less artificial lighting
  - Planting indoors to create a green working environment
  - (\*If the landlord practices pre-vetting to fitting-out plans, suggestions for green office design can be provided in vetting comments.)
- Waste management during fitting-out, e.g.:
  - Do not allow contractors to discharge waste water and associated effluent or dissolved materials into any drains without installation of proper sediment traps
  - Control on water consumption. To ensure the existing water-consuming equipment works effectively, check for any leakage and monitor consumption by installing sub-meters or new water-consuming equipment or by inspection

## Guidelines for Tenants – Green Interior Certification

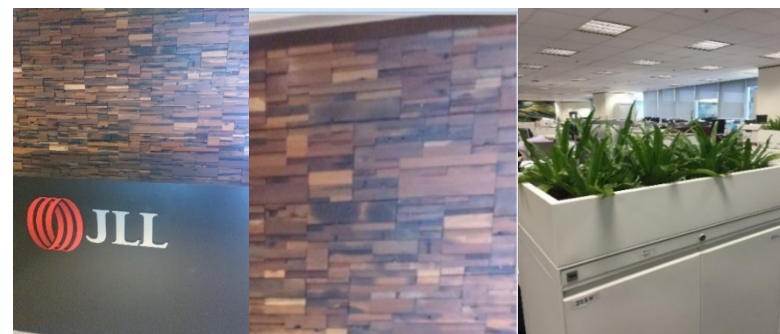
This is an effective tool to encourage tenants to practice green strategies. It allows the publication of certificated tenants in public places or on websites/apps, which can attract visitors and occupants to the credit of the tenants while their company image will be improved. The landlord can make use of this tool for recognising green efforts by tenants and encouraging renewal of the certificate.

- Provide practical green standards/ criteria for self-evaluation, e.g., indoor air quality, paper consumption, water saving and energy saving
- Provide training focusing on the green office
- Use the certification program in conjunction with other support provided to tenants, e.g., professional advice and green facilities
- The tenant will learn how to apply green concepts to daily business practices

\*For procedures and terms related to the certification scheme refer to “The Hong Kong Green Building Council Benchmarking and Energy Saving Tool- Office Occupants (BESTOO)” of Hong Kong Green Building Council, available at:

<http://bestoo.hkgbc.org.hk/greenbuilding/index.aspx>

[http://bestoo.hkgbc.org.hk/greenbuilding/files/Applicant\\_Guide.pdf](http://bestoo.hkgbc.org.hk/greenbuilding/files/Applicant_Guide.pdf)



### Guidelines for Tenants – Building User Guide

A building user guide can provide information on:-

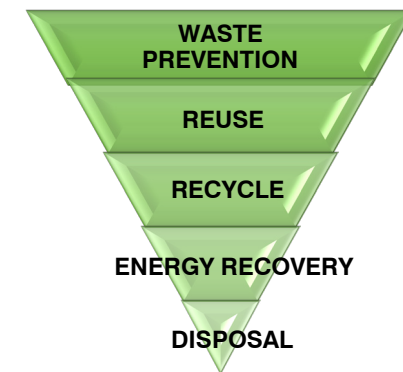
- Green Goals  
Set clear green goals and share successful green practices in the guide, e.g., promote LED lighting and participation in recycling activities etc.
- Building Services  
This refers to provisions by the landlord, such as green services, green facilities, green programs and building system. The landlord has to provide an operating manual for the building management system
- Waste Saving Policies  
Provide several waste recycling and reduction tips and introduce the hierarchical concept of waste management
- Monitoring and Targeting  
It is recommended to consider forming a green team and encourage participation by different parties aiming to:
  - ensure compliance with relevant legislation and target corporate social responsibility requirements
  - provide administrative support, such as evaluation forms to facilitate tenants to record energy and water performance and green practices
  - measure and record energy and water consumption for review and set target based on analysis
  - conduct waste audit periodically; - report relevant findings for motivating energy efficiency
- Transportation Facilities  
Reduce carbon emissions by:
  - providing information on public transport which connects the building and different districts in order to encourage use of public transport
  - providing shuttle bus for occupants
  - allowing parking spaces for bicycles and providing bicycle facilities

### Guidelines for Tenants – Other General Guidelines

- Legislation and Certification Program for Green Buildings

Note references to green-related legislation and certification programs:

Water Pollution Control Ordinance (Cap. 358)	Building Energy Efficiency Ordinance (Cap. 610)
Noise Control Ordinance (Cap. 400)	Indoor Air Quality Certification Scheme
Hazardous Chemicals Control Ordinance (Cap. 595)	Motor Vehicle Idling (Fixed Penalty) Ordinance (Cap. 611)
Ozone Layer Protection Ordinance (Cap. 403)	Air Pollution Control Ordinance (Cap. 311)
Waste Disposal Ordinance (Cap. 354)	Forests and Countryside Ordinance (Cap. 96)
Product Eco-responsibility Ordinance (Cap. 603)	Environmental Impact Assessment Ordinance (Cap. 499)
Quality Water Recognition Scheme	Water Services Department
Flushing Water Plumbing Quality Maintenance Recognition Scheme	ISO 14001 – audit of Environmental Management Systems
Environment and Conservation Fund	





## Collective Bargaining for Green Products

### Benefits for Office Building and Office Unit

Both landlord and tenant will gain in the long term :

- Lower product packaging costs
- Lower delivery and transportation costs
- Green product have a longer life span
- Less trouble in disposing non-green materials
- Higher incentive to buy green products and thus contribute to creating a green environment

### Green Strategies for Office Building and Office Unit

► Cooperate with green contractors to offer discounts so as to encourage tenants to use green products

► Five main steps for implementing green procurement from Green Council "Green Purchasing Best Practices Guidebook"

• Research and formulate relevant policies

• Set procedure and criteria

• Communicate with parties involved, such as partner, participant, and supplier

• Improve staff awareness

• Monitor initiatives and review result



## Performance Monitoring and Review

### Benefits for Office Building and Office Unit

Performance evaluation is conducive to motivating the implementation and development of permanent green strategies among staff, tenants, business partners and investors. It allows both landlord and tenants to evaluate their progress and achievements in maintaining a green environment.

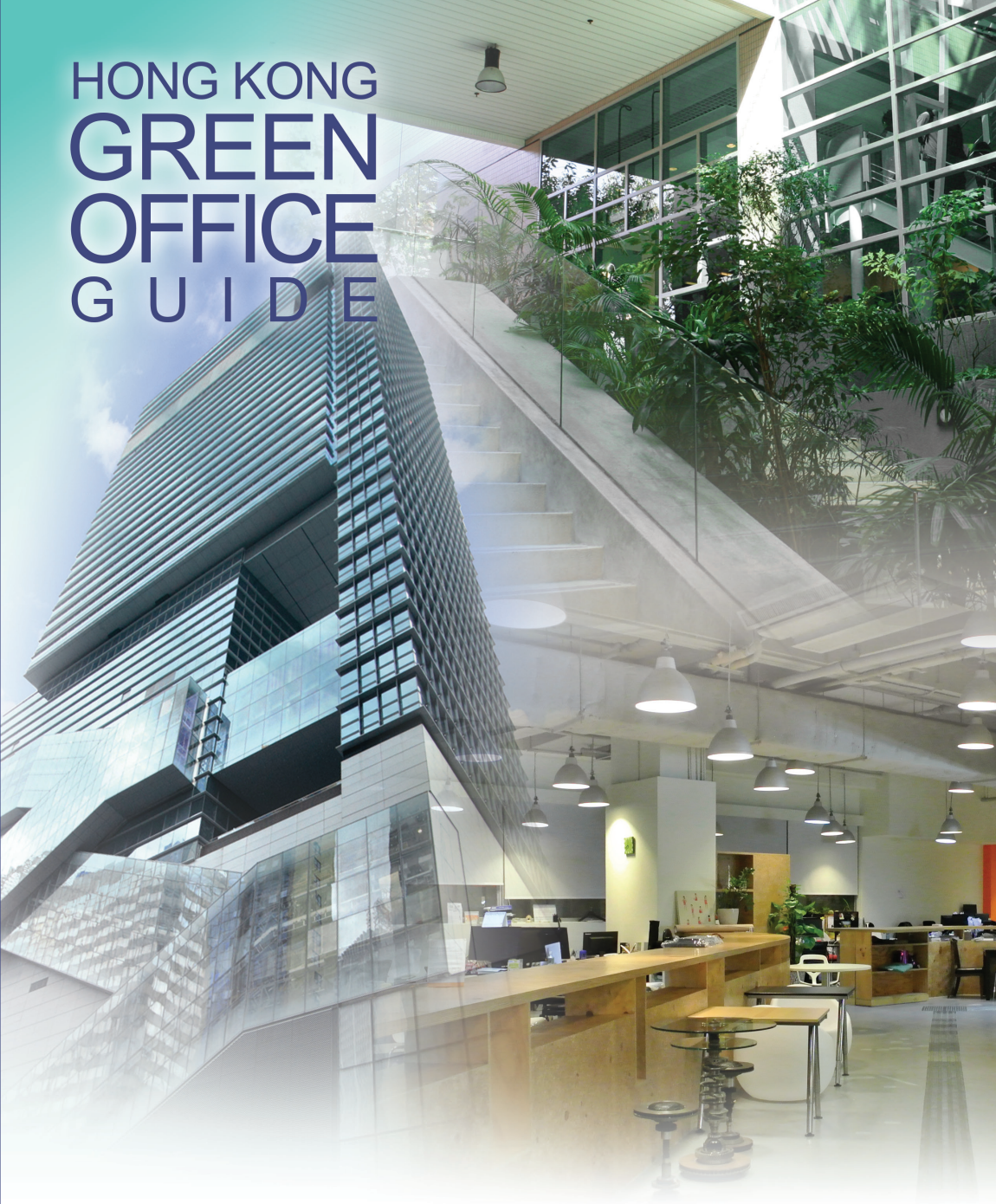
### Green Strategies for Office Building and Office Unit

- ▶ A green team is generally formed for the purpose of performance evaluation. At the first stage, it has to decide its organisation and duties - promoting green concepts and maintaining effective communication to ensure the best green practices are feasibly implemented
- ▶ A green team can consist of tenant, landlord, property agent and business partner, etc
- ▶ At the preliminary stage of implementing effective performance evaluation, development of standard documents (e.g. evaluation form and guidelines), measurements, procedures and timeframe will be required
- ▶ To understand the level of resources consumption, key performance indicators (e.g. the average amount of water used per occupant and the average amount of paper used per user) should be established
- ▶ Benchmarking (e.g. recycling, consumption of paper and water, level of emissions, etc.) is also recommended in the early stage

# CASE STUDY FACT SHEET

Hysan Place	H Queen's
18 King Wah Road	International Commerce Centre
Hong Kong Green Building Council Office	Jones Lang LaSalle Pacific Place Office
Business Environment Council Office	Conservation International Hong Kong: Green Sky
The Good Lab	blueprint
Swire Properties Limited	Hong Kong Science and Technology Park Phase 3
China Resources Building	The Genesis
Energizing Kowloon East Office	Zero Carbon Building
Office of Dennis Lau & Ng Chun Man Architects & Engineers (HK) Ltd	Office of Ronald Lu & Partners (Hong Kong) Ltd

# HONG KONG GREEN OFFICE GUIDE



## SEMINAR HONG KONG GREEN OFFICE GUIDE

# Q & A

# HONG KONG GREEN OFFICE GUIDE



## SEMINAR HONG KONG GREEN OFFICE GUIDE

**THANK YOU**