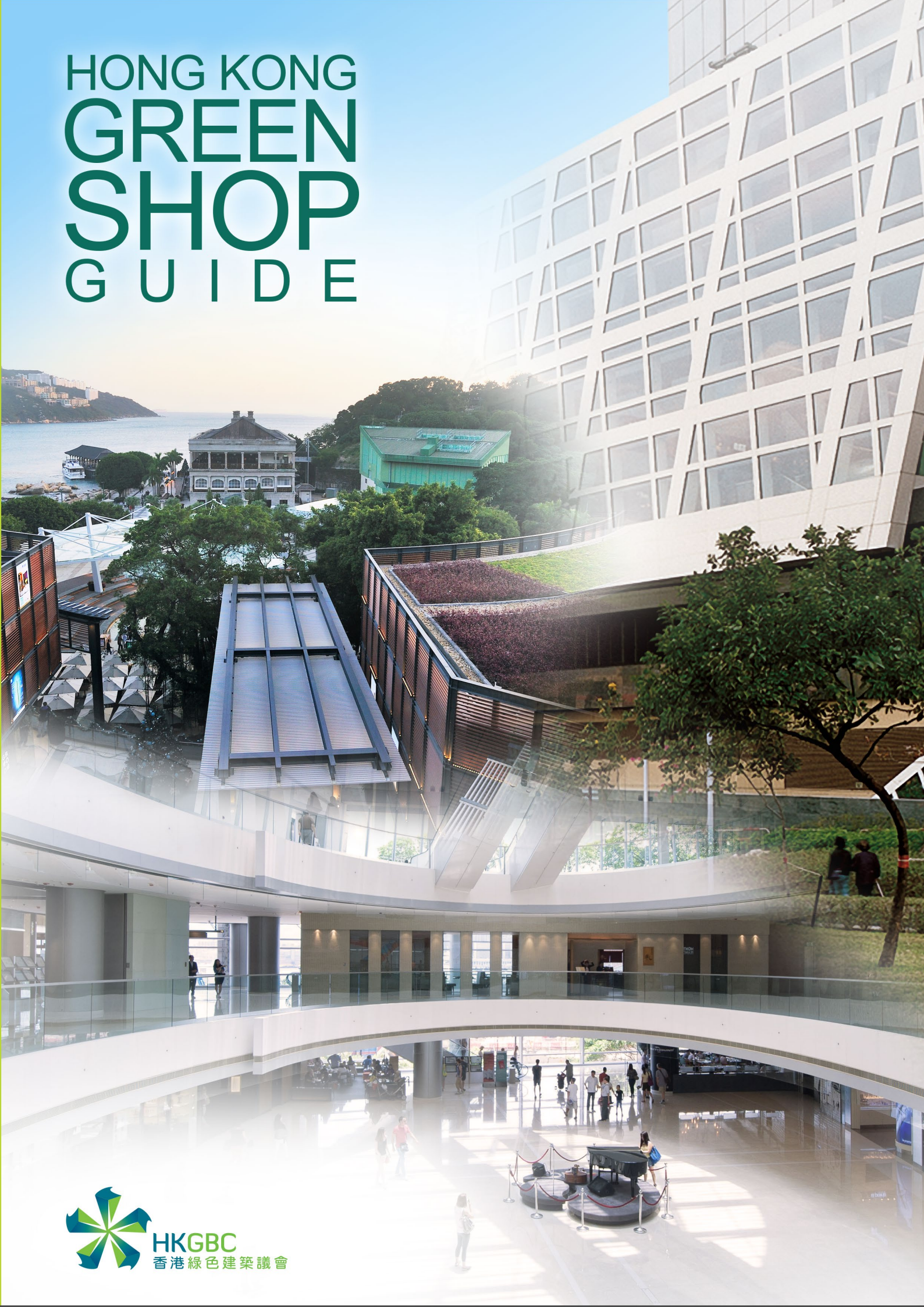
HONG KONG GREEN SHOP GUIDE



HKGBC
香港綠色建築議會

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HONG KONG GREEN SHOP GUIDE

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CONTENT

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About the Hong Kong Green Building Council Limited

The Hong Kong Building Council Limited (HKGBC) is a non-profit, member led organisation established in 2009 with the vision to aspire for quality and sustainability at every stage of the building life cycle and embrace these principles as a mark of excellence. HKGBC engages community, industry and government to create practical solutions for Hong Kong's unique, subtropical built environment. Its mission is to lead the market transformation to a sustainable built environment in Hong Kong by guiding the development of industry standards, best practices, education, and research in green building.

Our vision

To aspire for quality and sustainability at every stage of the building life cycle and embrace these principles as a mark of excellence.

Our mission

To lead the market transformation to a sustainable built environment in Hong Kong by guiding the development of industry standards, best practices, education, and research in green buildings.

Message from Secretary for the Environment

Hong Kong is well-known for its shopping experience, we should engage our shops and shoppers in the green movement by turning our shopping paradise into a green paradise.

Everything we do or purchase affects the environment, but we can learn to make better choices. Better understanding of the environmental implications of our choices can help us reduce carbon emissions, minimise waste and save money.

The Hong Kong Green Shop Guide ('the Guide') introduced by the HKGBC aims to equip shopping mall developers, facility managers, shop owners, shop tenants and even shoppers to go green by promoting the development of green building features in shopping malls and shop spaces. It also provides shoppers with advice on the adoption of green shopping practices which would contribute to the environment. This is no doubt a comprehensive "shopping" guide which not only covers green building design and facility management, but also provides useful tips on how shoppers may base on sustainability considerations to make smart decisions on their purchases.

I wish to express my appreciation to the HKGBC forits admirable effort in engaging developers, professionals and shoppers on ways to develop a more sustainable lifestyle. The Hong Kong Green Shop Guide is indeed a timely complement to the Government's initiatives to promote green living and sustainability, as expressed by the Energy Saving Charter on Indoor Temperature under which participants including over 100 shopping malls and 550 shops pledged to maintain an average indoor temperature of 24 to 26 degrees Celsius in Summer months, as well as the Hong Kong Blueprint for Sustainable Use of Resources 2013 – 2022 promulgated in May this year. I look forward to more opportunities to work with the HKGBC in promoting a more sustainable lifestyle among the people in Hong Kong.

KS Wong
Secretary for the Environment

Foreword

In the capacity of the Chairman of the Hong Kong Green Building Council Limited (HKGBC), it is my pleasure to present the Hong Kong Green Shop Guide published by the Council. This Guide aims to provide step-by-step guidelines to encourage the implementation of environmental improvement projects at shopping malls and retail outlets, as well as inculcating in the public green shopping habits, under the joint effort to develop Hong Kong into an energy-efficient and low carbon city.

Founded in 2009, the HKGBC shoulders the mission to combat rising carbon emission through guiding the development of industry standards, best practices, education and research projects in green buildings. More recently, the HKGBC launched the HK3030 Campaign with the ultimate goal to reduce 30% of Hong Kong's building electricity consumption by the year 2030 (with reference to 2005 electricity consumption levels), via policy initiative, technology advancement and uptake, as well as the gradual change of the entrenched mentality beneath our electricity-reliant society.

Going green in the retail industry is important and urgently-needed. In 2012 alone, the total turnover in the retail industry amounted to approximately 445.4 billion Hong Kong dollars[1] with about 64,000 retail establishments[2] in place. While buildings in Hong Kong accounts for 90% of Hong Kong's annual electricity consumption, commercial buildings make up the bulk. If the electricity-reliant retail industry goes green, a sizable portion of Hong Kong's greenhouse gas emissions will be well on its way to being eliminated.

Furthermore, the reduction of greenhouse gases, while it may sound daunting on paper, actually provides many tangible benefits aside from easing the global warming. The adoption of more energy-efficient technologies, such as energy efficient heating/cooling systems and lighting, would save the owners and tenants of shopping malls and shops a lot of operation cost on the building services systems.

That said, cutting electricity consumption is not the only way of going green. Some other ways such as adoption of passive design, cutting water use, improving indoor environmental quality, using green building materials, as well as proper operation and maintenance of the buildings can also make a contribution. Going green in the retail industry will not only protect the environment, but also save money for the owners and tenants of shopping malls, at the same time create a cozy and pleasant shopping environment for consumers, which contribute to a triple win situation.

This Guide seeks to provide a basic yet thorough guideline for the many shops owners, facility managers and tenants of malls and shops on how to design, construct, renovate and operate a greener space. The road to building the low carbon city is not easy, but with the close collaboration of developers, shop owners, tenants and the public, we would reach this long-term target over time.

Last but not least, this Guide could not have been produced without the leadership and expertise of the HKGBC Hong Kong Green Shop Guide Steering Committee, a team of professionals from the building industry and public utilities. I would like to take this chance to express my gratitude to all the Members of the Steering Committee and all the organisations and individuals who have made invaluable contributions to the development of this guide. Finally, I would like to thank the Construction Industry Council (CIC) for its funding support.

I hope this guide is not only informative to you, but is also something that we can put into practice which can make a difference to our lives, our planet and our next generation. Let's join hands to strive for a sustainable and quality environment for our economy, and for our community.

Ir Conrad TC Wong, BBS, JP
Chairman
Hong Kong Green Building Council

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1 The Government of Hong Kong Special Administrative Region. Census and Statistics Department. (31 Jan 2013). Provisional statistics of retail sales for December 2012 and for the whole year of 2012. Retrieved from 28 August 2013, from http://www.censtatd.gov.hk/press_release/pressReleaseDetail.jsp?charsetID=1&pressRID=3101

2 The Government of Hong Kong Special Administrative Region. Financial Secretary's Office. Economic Analysis and Business Facilitation Unit. Economic Analysis Division. (Feb 2013). 2012 Economic Background and 2013 Prospects. The Performance of Hong Kong's Retail Trade Industry. Retrieved 28 August 2013, from http://www.statistics.gov.hk/pub/B6XX00042013AN13E0100.pdf

Preface

Hong Kong is a shopping paradise. For many of us, shopping is one of the most common weekend activities, especially during rainy days when there are fewer choices. Shops and shopping malls compete for business by advertising, good services, convenience and innovative promotions. However, have you ever thought about choosing shopping malls or shops that are actually environmentally friendly and 'green'?

In this guide, we hope to bring forward issues that affect the energy consumption and environmental impact of shopping malls and shops and put them in perspective with shopping experience, operational costs and investment returns. The guide will be divided into the following chapters:

Chapter 1 – Getting Started to Go Green

Four Quick Start Menus in this chapter provide concise action lists of green practices for shopping mall owners and professionals, shop owners and tenants, and lastly shoppers and the general public. From these menus, the reader will be referred to detailed explanations and references which are provided in subsequent chapters.

Chapter 2 – The Basics

This chapter provides an introduction to the fundamental principles of green design in buildings with a brief description of the laws, guides and green building assessment systems that are relevant to shopping malls and shops. It also dedicates special sections to discussing human comfort perception, which is critical in the design of an indoor environment.

Chapter 3 – Planning for Shopping Malls and Shop Spaces

This chapter discusses various strategies that should be considered in planning a shopping mall project. It covers the opportunities for improvements through renovation of old shopping malls, as well as possible approaches to site planning, zoning, air conditioning, and facilities that can be considered for new shopping mall projects.

Chapter 4 – Green Design for Shopping Malls and Shop Spaces

This chapter goes into the architectural and interior design aspects of shopping mall buildings and shops. It covers various passive designs applicable to the shopping mall environment that save energy, and design for natural lighting, material selection, as well as measures for improvements to the indoor environment.

Chapter 5 – Energy Efficient Building Systems for Shopping Malls and Shop Spaces

Opportunities of energy savings in the design of building systems, including air conditioning and mechanical ventilation, fire services, plumbing and drainage, electricity and lighting, lifts and escalators are to be found in this chapter. More advance approaches such as renewable energy and the latest technologies of energy simulation and evaluation are also discussed.

Chapter 6 – During Renovation or Interior Decoration

This chapter provides information to those planning to carry out renovation works of different scales – it covers the important topics of material reuse, demolition waste management and noise control, as well as the oft-neglected problem of indoor air pollution from chemical emitting materials from new renovations.

Chapter 7 – Operation Maintenance and Management

This chapter focuses on the operation of shopping mall. It covers tips for building services operations, green cleaning, energy saving, water saving and maintaining good indoor air quality. It also discusses the use of waste treatment, with a focus on opportunities for kitchen waste composting in shopping malls.

Chapter 8 – Incentives for Tenants and Shoppers

This chapter discusses how green practices can be encouraged at different levels. Measures for creating incentives and support from tenants, including green lease and other initiatives are discussed. Opportunities to engage the public for green practices and education through shopping malls and events are also explored.

Chapter 9 – Special Topics

Opportunities for energy saving and good environmental practices for different establishments including restaurants, supermarkets, salons, ice rinks and cinemas are discussed in this chapter. The technical aspects of lighting design for shopping malls are also included.

In this Guide, the following boxes will further assist your reading:

Green tips – Success stories and examples of green measures for easy understanding.
Technical note – Reference and technical information for further study for those who are more deeply interested.
Words in blue – Technical terms will have their definitions listed in Appendix F – Glossary.

1 GETTING STARTED TO GO GREEN

1.1 Introduction

1.1.1 Significance of shopping malls and shop spaces

Buildings in Hong Kong currently consume more than 90% of Hong Kong's annual electricity consumption and account for over 60% of greenhouse gas emissions in Hong Kong. Energy use by commercial buildings is 65% of the total energy use of all building types, which far exceeds the energy use of residential (26%) or industrial buildings (7%) [1] .

Hong Kong has the reputation of being a "shopping paradise". Shopping is important for both residents of Hong Kong as well as tourists. As the amount of energy used by shopping areas is so significant, it is important to look into ways of reducing energy use in shopping malls, which will help reduce the cost of energy and the carbon footprint.

The following are some special characteristics of shopping malls:

- Shopping malls usually cater to large numbers of visitors and stay open for long hours.
- There is a great variety of shop types in a shopping mall, each having different functional and operational needs.
- Shopping malls and shop spaces are frequently renovated due to a change of shop tenants, change of seasons or simply change of look for attracting customers.
- Festive or special events often involve large-scale temporary decorative installations that are rendered useless and become waste afterwards.
- A lot of people in Hong Kong complain about shopping malls and shop spaces being too cold which shows that much energy is wasted on running the air-conditioning at a temperature that is too low for human comfort.
- Interiors of shopping malls and shop spaces often rely heavily on artificial lighting. Excessive artificial lighting means more heat is generated. As such, more energy is required to cool down the shopping malls and the shop spaces.

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[1] Hong Kong Energy End-Use Data 2012
Electrical and Mechanical Services Department. (2012). Hong Kong Energy End-Use Data 2012

Statistical facts:

Significance of shopping malls' and shop spaces' energy usage

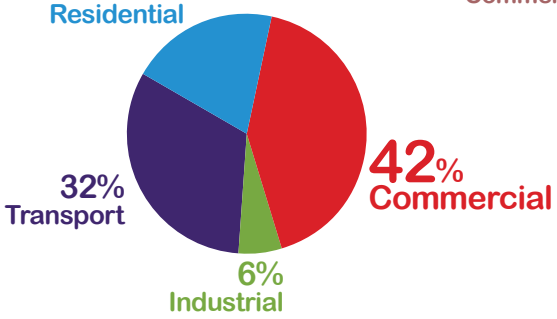


Figure 1
Energy consumption by sectors in 2010
(Source: Hong Kong Energy End-Use Data 2012 published by Electrical and Mechanical Services Department)

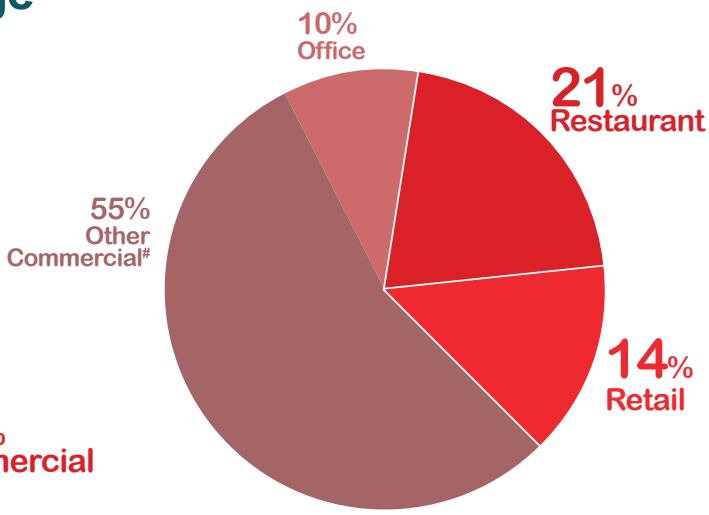


Figure 2
Energy consumption by segments–commercial sector in 2010
#Note: Other commercial section include hotel, education, health, storage and other miscellaneous commercial or public services
(Source: Hong Kong Energy End-Use Data 2012 published by Electrical and Mechanical Services Department)

- Excessive lighting for exterior advertisements, excessive decorative façade lighting and large scale LED screens consume a lot of energy, as well as producing light pollution, which is undesirable for residential units in the neighbourhood.
- Finishing materials may give off gas and affect the indoor environmental quality of the shopping malls and shop spaces. This also affects the health of the shoppers and the staff in the shopping malls and shop spaces.

1.1.2 HKGBC Public Education Committee's objectives in publishing this Hong Kong Green Shop Guide

With a view to promoting the green building concepts and sustainable practice to the retail industry and the shoppers, the HKGBC Public Education Committee published the Hong Kong Green Shop Guide to provide practical guidance to the owners, facility managers and tenants of shopping malls and shops on implementation of green measures at their buildings and facilities. In addition, the Guide aims to inculcate the green shopping habits in the community, and enhance the public's awareness and appreciation of the green measures adopted by the shopping malls and shops.

1.1.3 Why should shopping malls and shop spaces go green?

Situation of retail industry in Hong Kong

- Total retail sales:
  - **HK$445.4 billion**
- Workforce:
  - **About 320,000 persons**
- Number of retail establishments:
  - **64,000**

Source: 1. Economic Analysis and Business Facilitation Unit of Financial Secretary's Office (2013)
2. Census and Statistics Department (2013)

Implementation of green measures for shopping malls and shop spaces will consume less energy, reduce waste and have less impact on the environment. Improved indoor environmental quality will also result in a healthier and more desirable shopping environment which will be more attractive to shoppers.

In recent years, there has been a growing amount of new legislation demanding higher environmental standards. Waste charges are also expected to increase. When new shopping malls are under construction or existing shopping malls are being renovated, they need to follow higher environmental standards. The number of new and existing buildings that are adopting green building standards is also increasing.

The World is changing.

1.1.4 Are you green ready when the market demand is for green?

Green lifestyle and green awareness among consumers, shoppers and the general public lead to their growing demand for a shopping experience, products and services that meet their expectations of sustainability in terms of less energy consumption, less waste generation, less impact on the environment as well as a healthier indoor shopping environment.

The new generation of green shoppers will exert pressure on shopping malls and shop spaces to change their way of business. It is important for shopping malls and shop spaces to be Green Ready to respond to this market demand. As Green becomes the new basic standard, every shopping mall and shop space will need to be Green Ready.

Benefit of green is priceless:

Enhance Competitiveness and Corporate Branding

Economic, Social, Environmental Benefits

Healthier Shopping Environment =

Higher Productivity, Better Business

Healthier and Happier Shoppers, Tenants, Staff and Owners

1.1.5 Sustainable design

Shopping malls and shop spaces can be designed to be green by using "passive design" concepts to help reduce energy consumption without relying on expensive equipment. Sustainable design can also help increase efficiency in shopping malls as well as provide a healthier, more desirable and more attractive shopping environment.

The following are examples of sustainable design that can be adopted easily:

- Using the hybrid ventilation concept in shopping mall design will help reduce the energy cost of air-conditioning.
- The design of shopping malls with skylights and windows with proper orientation, low-e glass and shading features can help optimise the benefit of natural lighting and to reduce light energy consumption.

📖 **Continue to read:**
More details about sustainable design in shopping malls and shop spaces will be discussed in:

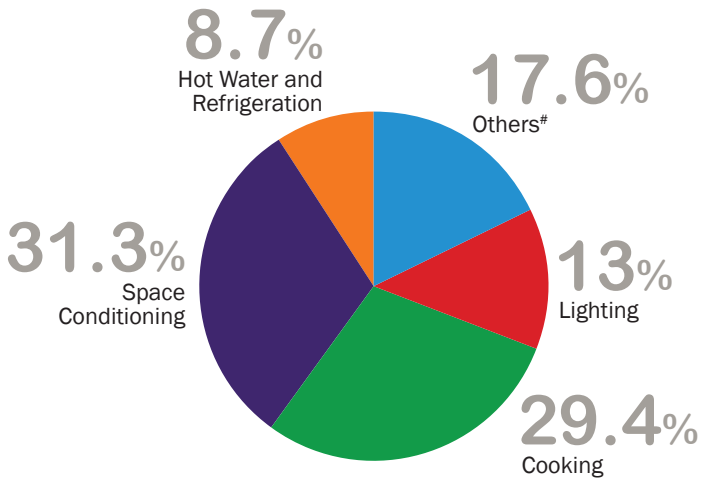
- **Chapter 3 Planning for shopping malls and shop spaces**
- **Chapter 4 Green design for shopping malls and shop spaces**

- Greenery will help reduce the heat island effect and provide better roof insulation which helps reduce the cooling load and energy consumption of air-conditioning.
- Zone division can enhance the efficiency of operations in the shopping malls. Reducing unnecessary and non-functional areas can lower the consumption of energy required for air-conditioning and lighting.
- Different zones with different operational hours avoid the excessive use of air-conditioning and lighting.
- Using materials that do not give off any toxic gas or contain harmful substances will help provide a healthier indoor environment for shoppers and reduce the cost of eliminating them from the air-conditioning system.

1.1.6 Energy consumption

Energy consumption for shopping malls in Hong Kong is about 640kWh/m^2/year. It is relatively high when compared with other types of buildings.

Energy consumption in retail & restaurant segments in 2010



#Note: End-uses under this heading include audio-visual, office equipment and miscellaneous equipment energy uses, etc.

Figure 3 Energy consumption in retail & restaurant segments in 2010
(Source: Hong Kong Energy End-Use Data 2012 published by Electrical and Mechanical Services Department)

Figure 3 shows the energy consumption for retail outlets and restaurants in Hong Kong. The main sources of energy demand in shopping malls can be categorised as follows:

- Space Conditioning – Cooling for shops, foyers, arcades, etc.
- Lighting – Interior lighting, exterior lighting, decorative lighting, etc.
- Food and Beverage – Cooking, hot water for steaming, refrigeration for freezing, etc.

Among the central services operated by landlords, the cooling plant for space conditioning and lighting form the major energy load. To trim down the energy consumption and the electricity bills, attention should be given to these areas.

📖 **Continue to read:**
More details about energy consumption in shopping malls and shops spaces will be discussed in:

- **Chapter 5 Energy efficient building systems for shopping malls and shops spaces**
- **Chapter 7 Operation, maintenance and management**

1.1.7 Green features and measures for energy reduction

Various energy saving practices to reduce the levels of consumption from lighting and space conditioning are further discussed in **Chapter 5** and **Section 9.8** of this Guide.

📖 **Continue to read:**
More details about the potential energy saving from green features and measures in shopping malls and shops will be discussed in:

- **Chapter 5 Energy efficient building systems for shopping mall and shops spaces**
- **Section 9.8 Case study for energy saving**

1.2 Objectives

If you are a shopping mall developer, a building owner or manager, or professional who is interested in sustainable design issues for shopping arcades in Hong Kong……

This guide provides information and resources that can help you create and operate a sustainable and environmentally friendly shopping mall. It encompasses a wide range of building sustainability issues which include reducing energy consumption, waste and water, improving human comfort and health. Discussions about site selection, planning and design of buildings, selection of building systems and also management and lease issues.

Please refer to: **Section 1.3.1 for the Quick Start Menu for new buildings and section 1.3.2 for the Quick Start Menu for existing buildings**

If you are a shop owner or tenant……

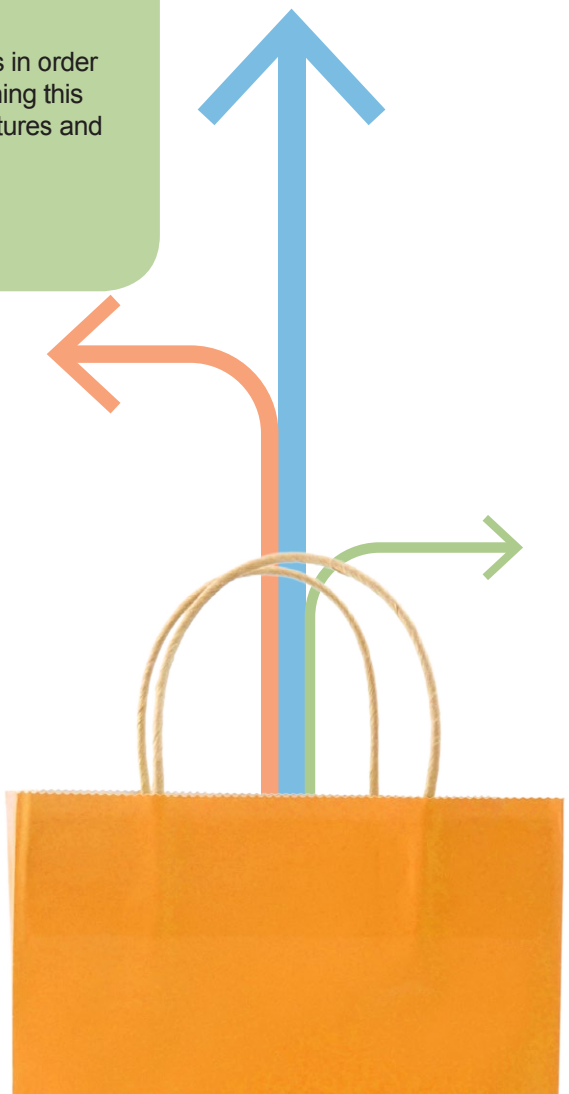
This guide aims to provide holistic guidelines about building design, leasing, operations and maintenance, as well as management aspects of a sustainable and energy efficient shopping mall.

Please refer to: **Section 1.3.3 for the Quick Start Menu**

If you are a shopper who is just interested in green building design and at the same time enjoys shopping……

This guide will help you understand what a shopping mall needs in order to use less energy and be more environmentally friendly. In gaining this knowledge, you will be able to identify and appreciate these features and strategies which create an enriching shopping experience.

Please refer to: **Section 1.3.4 for the Quick Start Menu**



1.3
Quick Start Menu to go green

Quick Start Menus for different users are included in this section to provide simple checklists of the main essential considerations and steps for the development of shopping malls and shop spaces for new and existing buildings based on sustainable principles and practices:

1.3.1 Quick Start Menu for shopping mall developers, building owners and managers, and professionals for new building development

Stage 1
Feasibility stage for new building
- Setting green goals
- Decide to implement green building certification or not
- Forming green team

Stage 2
Design stage
- Site, transportation & parking
- Natural ventilation vs. mechanical ventilation & air-conditioning
- Natural lighting vs. artificial lighting
- Choosing materials
- Greenery
- Energy
- Water

Stage 3
Construction stage
- Construction waste, noise & pollution

Stage 4
Management stage
- Facility management & maintenance

Stage 1: Feasibility stage

Setting green goals

- Review the functional and commercial needs of the shopping malls and shop spaces. Consider engaging a BEAM Professional (BEAM Pro) to review possible green strategies.
- Consider the latest standards – shopping malls and shop spaces are expected to be in line with Hong Kong's most up-to-date green building standards or to make reference to applicable international standards.
- For new buildings, BEAM Plus New Buildings can be used as a reference.
- Consider the budget – the use of design to achieve green goals helps reduce the cost of implementing green strategies.
- Plan ahead – allow adequate time for the design and review of green strategies.
- Consider ways to encourage a change in behaviour of tenants and mall visitors to achieve green goals.
- Adopt a holistic approach by taking all aspects of the building design, site aspects, energy use, water use, indoor environmental quality, materials, construction, operations and maintenance into consideration.
- Consider the life cycle cost.
- Consider how large a carbon footprint is produced.

Note: It is important for design to be green from the start. It is important to encourage your designer to be green from the start. A beautiful design should cover not only aesthetics but should also address the basics of green building design and the need to consider environmental aspects.

Continue to read:
More details will be discussed in:
- **Section 2.3 Introduction to existing environmental assessment standards for buildings and shopping malls**
- **Section 2.5 Carbon emission**

Decide to implement green building certification or not

- Option1:

  Implementation of certification under an established green building certification standard (BEAM Plus) provides the following advantages:

  1) Quality control and quality assurance – Successful certification ensures that the basic aspects of green building for a new construction or major renovation are complied with.
  2) The display of the green building certificate on the premises raises the profile and public image of the shopping mall and shop spaces in terms of their commitment to corporate sustainability.

- Option 2:

  If green building certification cannot be implemented due to limitations of budget or resources, it is important to have a consultant with green building experience to provide advice on how green goals can be achieved.

📖 **Continue to read:**
More details will be discussed in:

- **Section 2.3.1 Local – Hong Kong**

Forming the green team

- Everyone is involved – all work together to achieve the green goal
  1) Developer's or owner's management decision-makers
  2) Consultants
  3) Contractors
  4) Facility management
  5) Tenants (where the tenants' area is involved)

Consultants with green building experience are important:

Consultants with green building experience are preferred.

Professional help:

It is important to engage professional help with the development of a new building for a shopping mall. The following is a list of references for professional help:

1) The Hong Kong Institute of Architects (HKIA)
2) Authorised Persons' Register (AP) & Registered Structural Engineers (RSE)
3) The Hong Kong Institute of Landscape Architects (HKILA)
4) Engineers Registration Board – Registered Professional Engineers (RPE)
5) Registered Architects (RA)
6) Registered Energy Assessors (REA)
7) BEAM Professionals (BEAM Pro)
8) Hong Kong Institute of Acoustics (HKIOA)
9) Surveyors Registration Board – Registered Professional Surveyors (RPS) General Practice
10) The Law Society of Hong Kong

Note: When Hong Kong BEAM Plus standards are adopted, it is important to have a certified BEAM Professional (BEAM Pro) on the team.

📖 **Continue to read:**
More details will be discussed in:

- **Appendix A List of registered professionals**
- **Appendix B Contractors' contact information**

Stage 2: Design stage

Site, transportation and parking

- Choose a site that is close to the public transportation system such as the Mass Transit Railway or a bus terminus.
- Provide shuttle bus services to the shopping mall where public transportation is not nearby.

Note: Convenient public transportation will reduce trips by private vehicles, thus reducing traffic congestion problems at the mall as well as associated customer frustration.

- Where parking for customers is provided:
  1) Provide parking spaces for electric vehicles as well as a charging facility.
  2) Provide a smart parking system to eliminate unnecessary driving of cars in the carpark while looking for empty parking spaces.

Electric vehicles are more environmentally friendly.
Compared to vehicles that depend on fossil fuel, electric vehicles are more energy efficient and will cause less air pollution.

- Sites with substantial coverage of vegetation/numbers of significant and valuable trees should be avoided for conservation.
- Allow proper tree protection measures for the preserved trees on site.

📖 **Continue to read:**
More details will be discussed in:
- **Section 3.3 Neighbourhood**
- **Section 3.4 Connectivity and transport interface**
- **Section 3.6 Outdoor green space**
- **Section 3.8 Amenities for shopping malls and shop spaces**

Natural ventilation vs. mechanical ventilation and air-conditioning

- Considerations for natural ventilation:
  1) Review the functional and commercial needs of the shopping mall and shop spaces.
  2) Identify opportunities for using natural ventilation or hybrid ventilation where it is possible to reduce energy use and energy cost.
- Where air-conditioning is used:
  1) It is important to use energy efficient air-conditioning systems (e.g. a water-cooled system for central air-conditioning).
  2) Consider adopting the Hong Kong Energy Saving Charter. The commitment of both landlord and tenants is important.
  3) Individual tenant's sub-metering of air-conditioning usage should be implemented where it is possible to encourage a tenant's positive support for reducing energy use.

📖 **Continue to read:**
More details will be discussed in:
- **Section 3.7 Between air-conditioning and no air-conditioning**
- **Section 5.1 Heating, ventilation and air-conditioning (HVAC)**

Natural lighting vs. artificial lighting

- Considerations for natural lighting:
  1) Review the functional and commercial needs of the shopping mall and shop spaces.
  2) Identify opportunities for using natural lighting to reduce reliance on artificial lighting.
  3) Skylights and windows or glass walls in exterior walls bring in natural light. This helps reduce energy use for lighting and at the same time it provides a more healthy and pleasurable shopping environment for customers.
  4) Where skylights, windows and glass walls are used to bring in natural lighting, it is important to consider double glazing for windows and the orientation of skylights, windows and glass walls to avoid glare and excessive solar heat gain.
  5) Shading screens or fitted low-e glass can also be added to reduce glare and excessive heat gain where necessary.

- Considerations for artificial lighting:
  1) Consider the use of light coloured décor to provide a brighter interior requiring less artificial lighting.
  2) Avoid the use of high intensity lighting throughout the entire area to reduce energy use and glare. Special areas can be provided with accent lighting to create a theme and reduce lighting energy use.
  3) Consider the use of reflective surfaces to amplify brightness and to reduce energy use for lighting.
  4) Use energy efficient light fittings. Consider the use of LED lights where possible. Where fluorescent lighting is used – use T5 fluorescent tubes with daylight colour rendition.

Continue to read:
More details will be discussed in:
- **Section 3.5 Orientation**
- **Section 4.3 Natural lighting in shopping malls and shop spaces**
- **Section 5.4 Electricity and lighting**
- **Section 9.7 Lighting levels for different uses**

Choosing materials

- Consider the use of green labelled materials.

Note: Avoid green washing
Read more at – Evaluating Environmental Marketing Claims
The U.S. Government. U.S. Government Printing Office. Electronic Code of Federal Regulations. Part 260-Guides for the Use of Environmental Marketing Claims. Retrieved 30 May 2013, from http://www.ftc.gov/sites/default/files/attachments/press-releases/ftc-issues-revised-green-guides/greenguides.pdf

- Consider the life cycle cost of materials.
- Choose regional materials to reduce the carbon footprint by reducing energy consumption caused by transportation.
- Where wood products are used, select wood from sustainable sources such as Forest Stewardship Council (FSC) certified wood. Avoid using any endangered wood species.
- Choose materials that provide a healthy shopping environment.
- Avoid using vinyl products.
- Avoid using volatile organic compound (VOC) products. Choose products which specify “No VOC” or “low VOC”.
- Avoid using any products with formaldehyde.

Note: Formaldehyde is a type of VOC which is present in many building materials, adhesives, fabrics, carpets, etc. Formaldehyde is a suspected human carcinogen.

Continue to read:
More details will be discussed in:
- **Section 2.3.3 B2.1 Indoor Air Quality (IAQ) Certification Scheme**
- **Section 3.8.3 Making shopping malls family friendly – provision of childcare and children’s playrooms**
- **Section 4.5 Material selection**

- Use water-based adhesives for carpentry work where possible.
- Where stone finishes are used, carry out a radon test to check if a harmful level of radon exists. Exposure to harmful levels of radon may increase the risk of having lung cancer.

Note: Radon is a colourless radioactive gas that exhibits no taste or smell. Radon is mainly emitted from granite and marble.

- Where carpet is used, check for the emission of gas that reduces indoor air quality.
- Carry out an Indoor Air Quality (IAQ) test that aims at having an excellent standard.

Greenery

- Planting in the external areas of the shopping mall and shop spaces:
  1) Trees can provide shade to buildings and pedestrians.
  2) Exterior planting can reduce the heat island effect.
  3) Greenery also mitigates noise and air pollution in general.
- Consider the use of green roofs – this reduces the heat island effect, the heat load and energy consumption for air-conditioning.
- Interior plants provide a healthy indoor environment. Choose plants that help to reduce pollution and increase oxygen supply.
- Consider the use of a green wall.
- Maintaining existing vegetation and tree preservation for the merits of instant green coverage of the development.
- Where unhealthy plants are incompatible to new development, removal and replacement planting are advisable.

📖 **Continue to read:**
More details will be discussed in:
- **Section 3.6 Outdoor green space**
- **Section 4.4 Indoor landscaping**

Energy

- Consider a passive design which will reduce energy use and energy costs with less expenditure on equipment.

Note: Passive design is where the design of a building optimises the use of the environment, such as natural lighting and natural ventilation, which reduces the energy required by artificial lighting, mechanical ventilation and air-conditioning.

- Review the need to comply with the Building Energy Code and the need for an energy audit.
- Use energy efficient equipment.
- Consider the use of a water cooled chiller for air conditioning.
- Consider heat recovery, which captures waste heat for re-use.
  (e.g. waste heat from the air-conditioning system may be used to heat water).
- Consider using Energy Label Grade 1 air-conditioning units.

📖 **Continue to read:**
More details will be discussed in:
- **Section 5.1 Heating, ventilation and air-conditioning (HVAC)**
- **Section 5.6 Renewable energy opportunities**
- **Section 5.8 Energy simulation and evaluation**

Water

- Water sampling, as described in Quality Water Recognition Scheme for Buildings by the Water Supplies Department, can be carried out to ensure that the quality of water that is delivered to shopping mall users is acceptable.

Note: Quality of water may be affected by the condition of the plumbing such as rusty pipes.

- Water reduction measures to be considered – rainwater recycling and use of grey water where appropriate.
- Use of water efficient appliances and fittings.

📖 **Continue to read:**
More details will be discussed in:
- **Section 5.3 Plumbing and drainage**
- **Section 7.1 Water-saving strategies**

Stage 3: Construction stage

Construction waste, noise and pollution

- Minimise construction waste – reduce, recycle and reuse.
- Minimise construction noise –
  1) Consider prefabrication to reduce the amount of on-site work.
  2) Consider the time of construction outside the shopping malls and shop spaces.
- Minimise pollution –
  1) Consider the use of construction methods and materials that minimise the cause of pollution. Avoid use of products that contain:
     - Formaldehyde
     - VOC
     - Vinyl
     - Carpet and underlay that gives off gas
  2) Provide a proper fresh air supply and screens to prevent pollutants affecting the neighbours.
  3) Provide proper ventilation in the construction area to provide a healthy working environment for workers.
- Ensure proper tree protection for the preserved trees on site.

Note: How to encourage your contractor to be green:
- When you issue a tender, specify the green objectives of your project and ask the tenderer to submit their job references for green building projects.
- In your tender specification, discuss with your consultants how to provide incentive clauses for the contractor such as allowing the contractor to submit proposals for cost saving alternatives that can reduce construction and demolition waste.
- During the construction stage, engage the consultant and contractor in discussions to review construction methods that can reduce construction noise and pollution. If possible, create an incentive structure that recognises and rewards the contractor for achieving green targets set by you and your consultants.

📖 **Continue to read:**
More details will be discussed in:
- **Chapter 6 During renovation or interior decoration**

Stage 4: Management stage

Facility management and maintenance

- Get all parties involved:
  1) Facility management
  2) Tenants
  3) Maintenance staff
- Green Lease – adopt lease terms that encourage tenants to be green.
- Consider adopting the relevant ISO standard where possible – ISO 14001-2004 Environmental Management System.
- Continue the promotion of green awareness to tenants and shopping mall visitors.
- Provide support and space for waste sorting and recycling.
- Adopt green cleaning practices and encourage the use of green cleaning products.
- Review building facility management and operating practices to identify areas which can make the management and operation of the shopping mall go greener.
- Allow resources for future horticultural maintenance and management, including fertilising, pruning, pest control, regular tree inspection and risk assessments, etc.

Educating tenants and the public about the green features of your shopping mall is important as this can help tenants and the public appreciate your green features and enhance your shopping mall's profile and corporate social responsibility.

Note: How to educate tenants and the public about the green features of the shopping mall:

- Organising green tours of the shopping mall will help educate the tenants and the public about the green features of the shopping mall.
- Producing videos about green features, including the design, technical aspects and green strategies adopted for the shopping mall, will help the tenants and the public understand and appreciate the green features of the shopping mall.
- Placing labels and signage around the shopping mall to highlight the green features and green materials used will help the tenants and the public recognise and appreciate the green features in the shopping mall.

Continue to read:
More details will be discussed in:

- **Section 7.5 Facility management and operations**
- **Chapter 8 Incentives for tenants and shoppers**

1.3.2 Quick Start Menu for shopping mall developers, building owners and managers, and professionals for existing building development

Stage 1
Feasibility stage for existing building
- Setting green goals
- Decide to implement green building certification or not
- Forming green team

Stage 2
Design stage
- Existing building – reuse and enhancement
- Natural ventilation vs. mechanical ventilation & air-conditioning
- Natural lighting vs. artificial lighting
- Choosing materials
- Greenery
- Energy
- Water

Stage 3
Construction stage
- Construction waste, noise & pollution

Stage 4
Management stage
- Facility management & maintenance

Stage 1: Feasibility stage

Setting green goals

- Review the functional and commercial needs of the shopping malls and shop spaces. Consider engaging a BEAM Professional (BEAM Pro) to review possible green strategies.
- Consider the latest standards – shopping malls and shop spaces are expected to be in line with Hong Kong's most up-to-date green building standards or to make reference to applicable international standards.
- For existing buildings, BEAM Plus Existing Buildings can be used as reference.
- Consider the budget – the use of design to achieve green goals helps reduce the cost of implementing green strategies.
- Plan ahead – allow adequate time for the design and review of green strategies.
- Consider ways to encourage a change in behaviour of tenants and mall visitors to achieve green goals.
- Adopt a holistic approach, by taking all aspects of the building design, site aspects, energy and water use, indoor environmental quality, materials, construction, operations and maintenance into consideration.
- Consider the life cycle cost.
- Consider how large a carbon footprint is produced.

Note: It is important for design to be green from the start.
It is important to encourage your designer to be green from the start. A beautiful design should cover not only aesthetics but should also address the basics of green building design and the need to consider environmental aspects.

Continue to read:
More details will be discussed in:
- **Section 2.3 Introduction to existing environmental assessment standards for buildings and shopping malls**
- **Section 2.5 Carbon emission**
- **Chapter 2 The basics**

Decide to implement green building certification or not

- Option1:

  Implementation of certification under an established green building certification standard (BEAM Plus) provides the following advantages:

  1) Quality control and quality assurance – Successful certification ensures that the basic aspects of green building for a new construction or major renovation are complied with.
  2) The display of the green building certificate on the premises raises the profile and public image of the shopping malls and shop spaces in terms of their commitment to corporate sustainability.

- Option 2:

  If green building certification cannot be implemented due to limitations of budget or resources, it is important to have a consultant with green building experience to provide advice on how green goals can be achieved.

Continue to read:
More details will be discussed in:

- **Section 2.3.1 Local – Hong Kong**

Forming the green team

- Everyone is involved – all work together to achieve the green goal
  1) Developer's or owner's management decision makers
  2) Consultants
  3) Contractors
  4) Facility Management
  5) Tenants (where the tenants' area is involved)

Consultants with green building experience are important:

Consultants with green building experience are preferred.

Professional help:

It is important to engage professional help with the development of a shopping mall in an existing building. The following is a list of references for professional help:

1) The Hong Kong Institute of Architects (HKIA)
2) Authorised Persons' Register (AP) & Registered Structural Engineers (RSE)
3) The Hong Kong Institute of Landscape Architects (HKILA)
4) Engineers Registration Board – Registered Professional Engineer (RPE)
5) Registered Architects (RA)
6) Registered Energy Assessors (REA)
7) BEAM Professionals (BEAM Pro)
8) Hong Kong Institute of Acoustics (HKIOA)
9) Surveyors Registration Board – Registered Professional Surveyors (RPS) General Practice
10) The Law Society of Hong Kong

Note: When Hong Kong BEAM Plus standards are adopted, it is important to have a certified BEAM Professional (BEAM Pro) on the team.

Continue to read:
More details will be discussed in:

- **Appendix A List of registered professionals**
- **Appendix B Contractors' contact information**

Stage 2: Design stage

Existing building – reuse and enhancement

- Review the possibility of using the existing building structure, including the existing foundation, structural columns, walls, beams, floor slabs and roof structure which will help reduce demolition waste and save costs in redevelopment of the existing building into a new shopping mall, as well as reducing the carbon footprint.
- Review the possibility of re-using existing materials, finishes, decoration and furniture which will reduce demolition waste and save costs in redevelopment of the existing building into a new shopping mall as well as reduce the carbon footprint.
- Review the condition and efficiency of existing building services systems and installations, and plan replacements with more efficient systems for more savings on energy use and water use.
- Review transportation, connectivity and parking in respect of the existing building:
  1) Review the possibility of designing a new covered walkway or bridge connection to any nearby public transportation system such as the Mass Transit Railway or a bus terminus.
  2) Review the possibility of providing shuttle bus services to the shopping mall where public transportation is not nearby.

Note: Convenient public transportation will reduce trips by private vehicles, thus reducing traffic congestion problems at the mall as well as associated customer frustration.

  3) Review the possibility of the following upgrading of parking for customers:
     - Provide parking spaces for electric vehicles as well as a charging facility for electric vehicles.
     - Provide a smart parking system to eliminate unnecessary driving of cars in the carpark while looking for empty parking spaces.

Electric vehicles are more environmentally friendly.
Compared to vehicles that depend on fossil fuel, electric vehicles are more energy efficient and will cause less air pollution.

- Review the possibility of preserving the existing vegetation conditions for maximising preservation of trees on the site.
- Allow proper tree protection measures for the preserved trees on site.

Continue to read:
More details will be discussed in:
- **Section 3.3 Neighbourhood**
- **Section 3.4 Connectivity and transport interface**
- **Section 3.6 Outdoor green space**
- **Section 3.8 Amenities for shopping malls and shop spaces**

Natural ventilation vs. mechanical ventilation and air-conditioning

- Considerations for natural ventilation:
  1) Review the functional and commercial needs of the shopping malls and shop spaces.
  2) Identify opportunities for introducing natural ventilation or hybrid ventilation to the existing building to reduce energy use and energy cost.
- Where air-conditioning is used:
  1) Review the possibility of replacing the existing air-conditioning system with a more energy efficient air-conditioning system (e.g. water-cooled system for central air-conditioning).
  2) Consider adopting the Hong Kong Energy Saving Charter. The commitment of both the landlord and the tenants is important.
  3) Individual tenants' sub-metering of air-conditioning usage should be implemented where it is possible to encourage a tenant's positive support for reducing energy use.

Continue to read:
More details will be discussed in:
- **Section 3.7 Between air-conditioning and no air-conditioning**
- **Section 5.1 Heating, ventilation and air-conditioning (HVAC)**

Natural lighting vs. artificial lighting

- Considerations for natural lighting:
  1) Review the functional and commercial needs of the shopping malls and shop spaces.
  2) Identify opportunities for introducing more natural lighting to the existing building to reduce reliance on artificial lighting.
  3) Review the possibility of introducing skylights and windows or glass walls in exterior walls to bring in natural light. This helps reduce energy use for lighting and at the same time it provides a more healthy and pleasurable shopping environment for customers.
  4) Where skylights, windows and glass walls are used to bring in natural lighting, it is important to consider double glazing for windows and the orientation of skylights, windows and glass walls to avoid glare and excessive solar heat gain.
  5) Shading screens or fitted low-e glass can also be added to reduce glare and excessive heat gain where necessary.

- Considerations for artificial lighting:
  1) Consider the use of light coloured décor to provide a brighter interior requiring less artificial lighting.
  2) Avoid the use of high intensity lighting throughout the entire area to reduce energy use and glare. Special areas can be provided with accent lighting to create a theme and reduce lighting energy use.
  3) Consider the use of reflective surfaces to amplify brightness and to reduce energy use for lighting.
  4) Use energy efficient light fittings. Consider the use of LED lights where possible. Where fluorescent lighting is used – use T5 fluorescent tubes with daylight colour rendition.

Continue to read:
More details will be discussed in:
- **Section 3.5 Orientation**
- **Section 4.3 Natural lighting in shopping malls and shop spaces**
- **Section 5.4 Electricity and lighting**
- **Section 9.7 Lighting levels for different uses**

Choosing materials

- Review the possibility of reusing existing materials and finishes. This will help to reduce demolition waste, save on costs and reduce the carbon footprint.
- Consider the use of green labelled materials.

Note: Avoid green washing
Read more at – Evaluating Environmental Marketing Claims
The U.S. Government. U.S. Government Printing Office. Electronic Code of Federal Regulations. Part 260-Guides for the Use of Environmental Marketing Claims. Retrieved 30 May 2013, from http://www.ftc.gov/sites/default/files/attachments/press-releases/ftc-issues-revised-green-guides/greenguides.pdf

- Consider the life cycle cost of materials.
- Choose regional materials to reduce the carbon footprint by reducing energy consumption caused by transportation.
- Where wood products are used, select wood from sustainable sources such as Forest Stewardship Council (FSC) certified wood. Avoid using any endangered wood species.
- Choose materials that provide a healthy shopping environment.
- Avoid using vinyl products.
- Avoid using volatile organic compound (VOC) products. Choose the products which specify “No VOC” or “low VOC”.
- Avoid using any products with formaldehyde.

Continue to read:
More details will be discussed in:
- **Section 3.8.3 Making shopping malls family friendly – provision of childcare and children playrooms**
- **Section 4.5 Material selection**

Note: Formaldehyde is a type of VOC which is present in many building materials, adhesives, fabrics, carpets, etc. Formaldehyde is a suspected human carcinogen.

- Use water-based adhesives for carpentry work where possible.
- Where stone finishes are used, carry out a radon test to check if a harmful level of radon exists. Exposure to harmful levels of radon may increase the risk of having lung cancer.

Note: Radon is a colourless radioactive gas that exhibits no taste or smell. Radon is mainly emitted from granite and marble.

- Where carpet is used, check for the emission of gas that reduces indoor air quality.
- Carry out an indoor air quality (IAQ) test that aims at having an excellent standard.

📖 **Continue to read:**
More details will be discussed in:
- **Section 2.3.3 B2.1 Indoor Air Quality (IAQ) Certification Scheme**

Greenery

- Review the possibility of introducing plants to the external areas of the existing building of the shopping malls:
  - Trees can provide shade to the buildings and pedestrians.
  - Exterior planting can reduce the heat island effect.
  - Greenery also mitigates noise and air pollution in general.
- Review the possibility of introducing a green roof to the existing building of the shopping mall – this reduces the heat island effect, the heat load and energy consumption for air-conditioning.
- Review the possibility of introducing interior plants to help provide a healthy indoor environment. Choose plants that help reduce pollution and increase oxygen supply.
- Review the possibility of introducing a green wall.
- Maintaining existing vegetation and tree preservation for the merits of instant green coverage of the development.
- Where unhealthy plants are incompatible to new development, removal and replacement planting are advisable.

📖 **Continue to read:**
More details will be discussed in:
- **Section 3.6 Outdoor green space**
- **Section 4.4 Indoor landscaping**

Energy

- Review the possibility of introducing passive design features which will reduce energy use and energy costs with less expenditure on equipment. The following are some simple examples of passive design that can be considered for an existing building:
  1) Reviewing the existing location of windows and check whether these have the right orientation to minimise solar heat gain and glare. Relocate windows to the most suitable orientation to reduce solar heat gain and glare.
  2) Introducing windows, louvers and doors that can be opened in the direction of the prevailing wind to enhance natural ventilation and reduce reliance on air-conditioning.
  3) Checking skylight glass orientation to review whether it is correctly oriented to minimise solar heat gain and glare. Modify the skylights if necessary to reduce solar heat gain and glare.

Note: Passive design is the design of the building that optimises the use of the environment such as the use of natural lighting and natural ventilation which reduce the energy use by artificial lighting, mechanical ventilation and air-conditioning.

📖 **Continue to read:**
More details will be discussed in:
- **Section 5.1 Heating, ventilation and air-conditioning (HVAC)**
- **Section 5.6 Renewable energy opportunities**
- **Section 5.8 Energy simulation and evaluation**

- Review the need to comply with the Building Energy Code and the need for an energy audit.
- Use energy efficient equipment.
- Consider the use of a water cooled chiller for air conditioning.
- Consider heat recovery, which captures waste heat for re-use.
  (e.g. waste heat from the air-conditioning system may be used to heat water).
- Consider using Energy Label Grade 1 air-conditioning units.

Water

- Water sampling, as described in Quality Water Recognition Scheme for Buildings by the Water Supplies Department, can be carried out to ensure that the quality of water that is delivered to the shopping mall users is acceptable.

Note: Quality of water may be affected by the condition of the plumbing such as rusty pipes.

- Water reduction measures to be considered – rainwater recycling and use of grey water where appropriate.
- Use of water efficient appliances and fittings.

📖 **Continue to read:**
More details will be discussed in:
- **Section 5.3 Plumbing and drainage**
- **Section 7.1 Water-saving strategies**

Stage 3: Construction Stage

Construction waste, noise and pollution

- Minimise construction waste – reduce, recycle and reuse.
- Minimise construction noise –
  1) Consider prefabrication to reduce the amount of on-site work.
  2) Consider the time of construction outside the shopping malls and shop spaces.
  3) Consider the use of construction methods and materials that minimise the cause of pollution. Avoid use of products that contain:
     - Formaldehyde
     - VOC
     - Vinyl
     - Carpet and underlay that gives off gas
  4) Provide a proper fresh air supply and screens to prevent pollutants affecting the neighbours.
  5) Provide proper ventilation in the construction area to provide a healthy working environment for workers.
- Ensure proper tree protection for the preserved trees on site.

Note: How to encourage your contractor to be green:
- When you issue a tender, specify the green objectives of your project and ask the tenderer to submit their job references for green building projects.
- In your tender specification, discuss with your consultants how to provide incentive clauses for the contractor such as allowing the contractor to submit proposals for cost saving alternatives that can reduce construction and demolition waste.
- During the construction stage, engage the consultant and contractor in discussions to review construction methods that can reduce construction noise and pollution. If possible, create an incentive structure that recognises and rewards the contractor for achieving green targets set by you and your consultants.

📖 **Continue to read:**
More details will be discussed in:
- **Chapter 6 During renovation or interior decoration**

Stage 4: Management stage

Facility management and maintenance

- Get all parties involved:
  1) Facility management
  2) Tenants
  3) Maintenance staff
- Green Lease – adopt lease terms that encourage tenants to be green.
- Consider adopting the relevant ISO standard where possible – ISO 14001-2004 Environmental Management System.
- Continue the promotion of green awareness to tenants and shopping mall visitors.
- Provide support and space for waste sorting and recycling.
- Adopt green cleaning practices and encourage the use of green cleaning products.
- Review building facility management and operating practices to identify areas which can make the management and operation of the shopping mall go greener.
- Allow resources for future horticultural maintenance and management, including fertilising, pruning, pest control, regular tree inspection and risk assessments, etc.

Educating tenants and the public about the green features of your shopping mall is important as this can help tenants and the public appreciate your green features and enhance your shopping mall's profile and corporate social responsibility.

Note: How to educate tenants and the public about the green features of the shopping mall:

- Organising green tours of the shopping mall will help educate the tenants and the public about the green features of the shopping mall.
- Producing videos about green features, including the design, technical aspects and green strategies adopted for the shopping mall will help the tenants and the public understand and appreciate the green features of the shopping mall.
- Placing labels and signage around the shopping mall to highlight the green features and green materials used will help the tenants and the public recognise and appreciate the green features in the shopping mall.

Continue to read:
More details will be discussed in:

- **Section 7.5 Facility management and operations**
- **Chapter 8 Incentives for tenants and shoppers**

1.3.3 Quick Start Menu for shop owners and tenants

Stage 1
Feasibility stage for shop spaces
- Setting green goals
- Decide to implement green building certification or not
- Forming green team

Stage 2
Design stage
- Choosing shopping malls
- Natural ventilation vs. mechanical ventilation & air-conditioning
- Natural lighting vs. artificial lighting
- Reuse materials and new materials
- Greenery
- Energy
- Water

Stage 3
Construction stage
- Construction waste, noise & pollution

Stage 4
Management stage
- Facility management & maintenance

Stage 1: Feasibility stage

Setting green goals

- Review the functional and commercial needs of the shop spaces. Consider engaging a BEAM Professional (BEAM Pro) to review any possible green strategies.
- Consider green procurement practice – adopt a green purchase policy so that the products being displayed, sold or served to customers are green products (e.g. products from sustainable sources, organic products, products containing no harmful chemicals, products which do not cause pollution to the environment).
- Consider ways to encourage changes in the behaviour of shoppers and employees to achieve green goals (e.g. avoid using excessive wrapping and plastic bags; however, promote the use of paper products from sustainable sources or the use of recycled paper, and encourage customers to bring their own bags).
- Consider using BEAM Plus Interiors as a reference.
- Consider the budget – the use of design to achieve green goals helps reduce the cost of implementing of green strategies.
- Plan ahead – allow adequate time for the design and review of green strategies.
- Adopt a holistic approach where possible.
- Consider the life cycle cost.
- Consider the carbon footprint.

Note: It is important for design to be green from the start.
It is important to encourage your designer to be green from the start. A beautiful design should cover not only aesthetics but should also address the basics of green building design and the need to consider environmental aspects.
Avoiding unnecessary large-scale renovation will help save costs and minimise waste generation.
When you are moving to a new shop location, review with your designer the possibility of reusing existing decoration and furniture to save on cost and minimise waste generation.

Continue to read:
More details will be discussed in:
- **Section 2.3 Introduction to existing environmental assessment standards for buildings and shopping malls**
- **Section 2.5 Carbon emission**
- **Chapter 2 The basics**

Decide to implement green building certification or not

- Option1:

  Implementation of certification under an established green building certification standard (BEAM Plus) provides the following advantages:

  1) Quality control and quality assurance – Successful certification ensures that the basic aspects of green building for a new construction or major renovation are complied with.
  2) The display of the green building certificate on the premise raises the profile and public image of the shopping mall and shop spaces in terms of their commitment to corporate sustainability.

- Option 2:

  If green building certification cannot be implemented due to the limitations of budget or resources, it is important to have a consultant with green building experience to provide advices on how green goals can be achieved.

Continue to read:
More details will be discussed in:
- **Section 2.3.1 Local – Hong Kong**

Forming the green team

- Everyone is involved – all work together to achieve the green goal
  1) Shop owners and tenants
  2) Consultants
  3) Contractors
  4) Employees

Consultants with green building experience are important:

Consultants with Green Building experience are preferred.

Professional help:

It is important to engage professional help with the development of a new shopping mall. The following is a list of references for professional help:

1) The Hong Kong Institute of Architects (HKIA)
2) Authorised Persons' Register (AP) & Registered Structural Engineers (RSE)
3) The Hong Kong Institute of Landscape Architects (HKILA)
4) Engineers Registration Board – Registered Professional Engineer (RPE)
5) Registered Architects (RA)
6) Registered Energy Assessors (REA)
7) BEAM Professionals (BEAM Pro)
8) Hong Kong Institute of Acoustics (HKIOA)
9) Surveyors Registration Board – Registered Professional Surveyors (RPS) General Practice
10) The Law Society of Hong Kong

Note: When the BEAM Plus Interiors standard is adopted, it is important to have a certified BEAM Professional (BEAM Pro) on the team.

Continue to read:
More details will be discussed in:
- **Appendix A List of registered professionals**
- **Appendix B Contractors' contact information**

Stage 2: Design stage

Choosing the shopping mall

- Choose a shopping mall that is close to the public transportation system such as the Mass Transit Railway or a bus terminus.
- Talk to the shopping mall owner/facility manager to ask for the provision of shuttle bus services where public transportation is not nearby.

Note: Convenient public transportation will reduce trips by private vehicles, thus reducing traffic congestion at the mall as well as associated customer frustration.

- Where parking for customer is provided:

  Ask the shopping mall owner/facility manger whether parking spaces for electric vehicles as well as a charging facility for electric vehicles are provided.

Continue to read:
More details will be discussed in:
- **Section 3.3 Neighbourhood**
- **Section 3.4 Connectivity and transport interface**
- **Section 3.8 Amenities for shopping malls and shop spaces**

Natural ventilation vs. mechanical ventilation and air-conditioning

- Considerations for natural ventilation:
  1) Review the functional and commercial needs of the shop spaces.
  2) When renting or purchasing a shop space, select a shop space where there are external windows or doors or ventilation louvers which provide the option for the shop space to use natural ventilation when the weather allows it in order to reduce energy use and costs.
- Where air-conditioning is used:
  1) Check with the shopping mall owner or facility manager whether the shopping mall is using an energy efficient air-conditioning system (e.g. a water-cooled system for central air-conditioning).
  2) Check with the shopping mall owner or facility manager whether they have supported the Hong Kong Energy Charter launched by the Government.

     It is important for shop tenants to adopt and support the Hong Kong Energy Charter by setting the air-conditioning temperature to the standard required by the Hong Kong Energy Charter.
  3) Check with the shopping mall owner or facility manager whether the shopping mall provides the individual tenant with sub-metering of air-conditioning usage so that shop tenants can track energy use. In this way, shop tenants can identify operational changes that may reduce energy use.

Continue to read:
More details will be discussed in:
- **Section 5.1 Heating, ventilation and air-conditioning (HVAC)**
- **Chapter 9 Special topics**

Natural lighting vs. artificial lighting

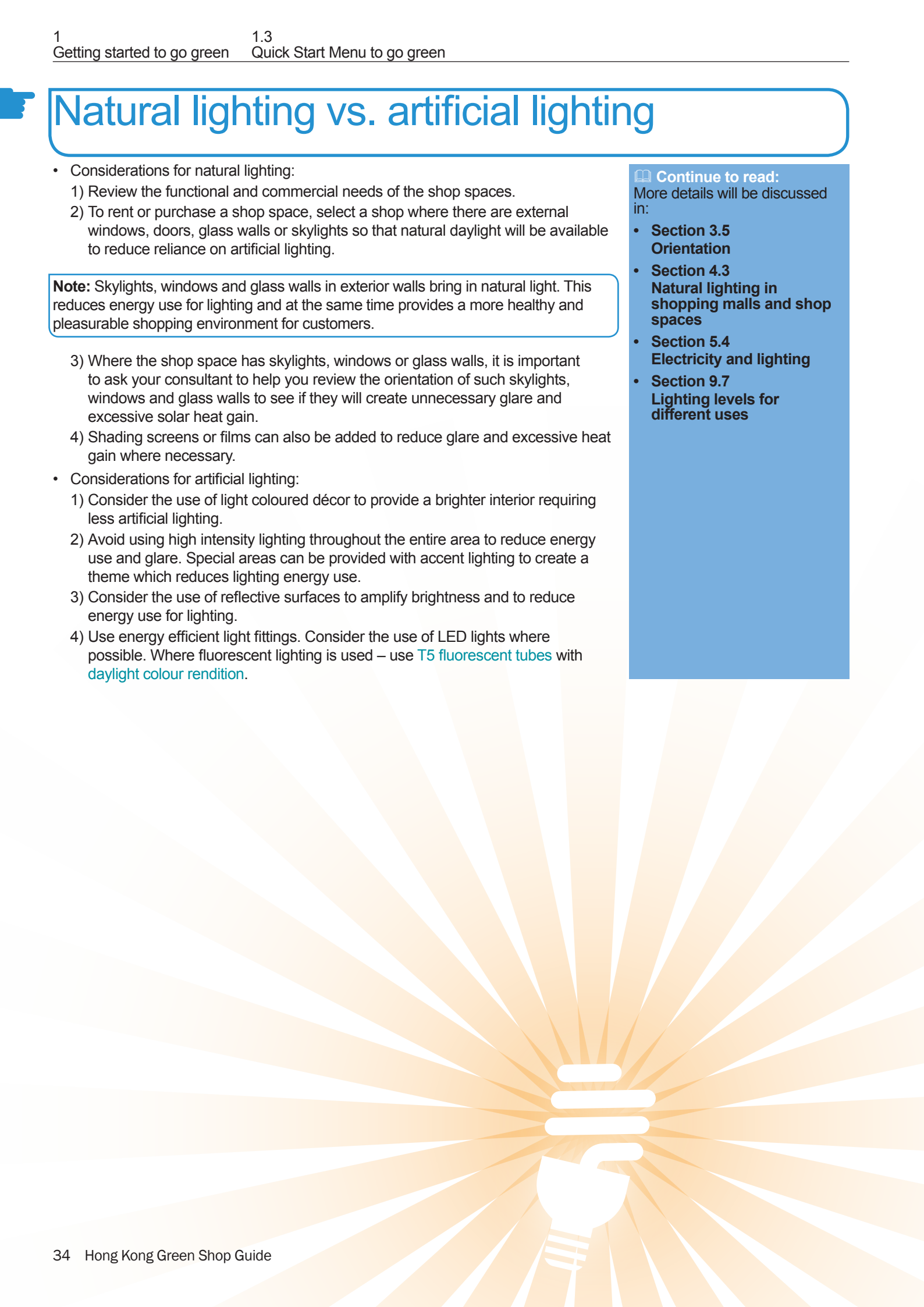
- Considerations for natural lighting:
  1) Review the functional and commercial needs of the shop spaces.
  2) To rent or purchase a shop space, select a shop where there are external windows, doors, glass walls or skylights so that natural daylight will be available to reduce reliance on artificial lighting.

Note: Skylights, windows and glass walls in exterior walls bring in natural light. This reduces energy use for lighting and at the same time provides a more healthy and pleasurable shopping environment for customers.

  3) Where the shop space has skylights, windows or glass walls, it is important to ask your consultant to help you review the orientation of such skylights, windows and glass walls to see if they will create unnecessary glare and excessive solar heat gain.
  4) Shading screens or films can also be added to reduce glare and excessive heat gain where necessary.
- Considerations for artificial lighting:
  1) Consider the use of light coloured décor to provide a brighter interior requiring less artificial lighting.
  2) Avoid using high intensity lighting throughout the entire area to reduce energy use and glare. Special areas can be provided with accent lighting to create a theme which reduces lighting energy use.
  3) Consider the use of reflective surfaces to amplify brightness and to reduce energy use for lighting.
  4) Use energy efficient light fittings. Consider the use of LED lights where possible. Where fluorescent lighting is used – use T5 fluorescent tubes with daylight colour rendition.

Continue to read:
More details will be discussed in:

- **Section 3.5 Orientation**
- **Section 4.3 Natural lighting in shopping malls and shop spaces**
- **Section 5.4 Electricity and lighting**
- **Section 9.7 Lighting levels for different uses**



Reuse materials and new materials

- Consider the reuse of existing decoration materials and furniture when moving to a new shop location to help minimise waste generation.
- Consider taking up previous tenants' decoration and furniture if their condition and usage suit your operational and functional needs to help minimise waste generation.
- When renovation of an existing shop space is needed, try to minimise the scale of renovation to save cost and minimise waste generation.

Note: Avoid green washing
Read more at – Evaluating Environmental Marketing Claims
The U.S. Government. U.S. Government Printing Office. Electronic Code of Federal Regulations. Part 260-Guides for the Use of Environmental Marketing Claims. Retrieved 30 May 2013, from
http://www.ftc.gov/sites/default/files/attachments/press-releases/ftc-issues-revised-green-guides/greenguides.pdf

- When new materials are used, consider the use of green labelled materials.
- When new materials are used, consider the life cycle cost of materials.
- When new materials are used, choose regional materials to reduce the carbon footprint by reducing energy consumption resulting from transportation of materials.
- Where new wood products are used, select wood from sustainable sources such as Forest Stewardship Council (FSC) certified wood. Avoid using any endangered wood species.
- Choose materials that provide a healthy shopping environment.
- Avoid using vinyl products.
- Avoid using volatile organic compound (VOC) products. Choose the products which specify "No VOC" or "low VOC".
- Avoid using any products with formaldehyde.

Note: Formaldehyde is a type of VOC which is present in many building materials, adhesives, fabrics, carpet, etc. Formaldehyde is a suspected human carcinogen.

- Use water-based adhesives for carpentry work where possible.
- Where stone finishes are used, carry out a radon test to check if a harmful level of radon exists. Exposure to harmful levels of radon may increase the risk of having lung cancer.

Note: Radon is a colourless radioactive gas that exhibits no taste or smell. Radon is mainly emitted from granite and marble.

- Where carpet is used, check for the emission of gas that reduces indoor air quality.
- Carry out an indoor air quality (IAQ) test that aims at having an excellent standard.

Continue to read:
More details will be discussed in:
- **Section 4.5 Material selection**
- **Section 2.3.3 B2.1 Indoor Air Quality (IAQ) Certification Scheme**

Greenery

- Review the possibility of introducing plants to the external area of the shop space where the shop space is rented together with an adjacent exterior open area:
  - Review the possibility of introducing trees into the exterior open area or the possibility of preserving the existing good and healthy trees to help provide shade to the adjacent shop space, to reduce heat gain by the shop interiors, and to save on energy consumption for air-conditioning.
  - As exterior planting can reduce the heat island effect and mitigates noise and air pollution in general, this will help make the exterior area more pleasant for customers to enjoy, which is beneficial for the outdoor seating areas of restaurants and cafés.
- Review the possibility of introducing interior plants which can help to provide a healthy indoor environment. Choose plants that help to reduce pollution and increase oxygen supply.
- Review the possibility of introducing a green wall.
- Meet the green goal of greening ratio.
- Allow space for sustainable tree planting.
- Allow structural loading for skyrise greenery.

Continue to read:
More details will be discussed in:
- **Section 3.6 Outdoor green space**
- **Section 4.4 Indoor landscaping**

Energy

- Consider a passive design which will reduce energy use and energy costs with less expenditure on equipment. The following are some simple examples of passive design that can be considered for an existing building:
  1) Reviewing the existing location of windows and check whether these have the right orientation to minimise solar heat gain and glare. Check with the landlord to see if windows can be relocated to provide the most suitable orientation to reduce solar heat gain and glare.
  2) Check with the landlord to see if it is possible to introduce windows, louvers and doors that can be opened in the direction of the prevailing wind to enhance natural ventilation and reduce reliance on air-conditioning.
  3) Where possible, use interior finishing materials that are light coloured and which will help reflect heat instead of absorb heat. Similarly, dark colour materials will generally absorb more heat than light colour materials.
  4) Minimise the use of internal finishing materials that will absorb and retain heat, such as carpets, where possible so as to avoid the heat being retained within the building and increase the need for air-conditioning.

Note: Passive design is the design of the shop space that optimises the use of the environment such as the use of natural lighting and natural ventilation which reduce the energy use by artificial lighting, mechanical ventilation and air-conditioning.

- Review the need to comply with the Building Energy Code and the need for an energy audit.
- Use energy efficient equipment.
- Consider heat recovery, which captures waste heat for re-use (e.g. waste heat from the air-conditioning system may be used to heat water).
- Consider using Energy Label Grade 1 air-conditioning units.

Continue to read:
More details will be discussed in:
- **Section 5.1 Heating, ventilation and air-conditioning (HVAC)**
- **Section 5.8 Energy simulation and evaluation**

Water

- Water sampling as described in Quality Water Recognition Scheme for Buildings by the Water Supplies Department can be carried out to ensure that the quality of water that is delivered to the shopping mall users is acceptable.

Note: Quality of water may be affected by the condition of the plumbing, such as rusty pipes.

- Water reduction measures to be considered – use of grey water where appropriate.
- Use of water efficient appliances and fittings.

📖 **Continue to read:**
More details will be discussed in:
- **Section 2.3.3 B2.2 Quality Water Recognition Scheme for Buildings**
- **Section 7.1 Water-saving strategies**

Stage 3: Construction stage

Construction waste, noise and pollution

- Minimise construction waste – reduce, recycle and reuse.
- Minimise construction noise –
  1) Consider prefabrication to reduce the amount of on-site work.
  2) Where permitted by the Noise Control Ordinance, consider construction outside normal shopping mall and shop space operating hours.
- Minimise pollution –
  1) Consider the use of construction methods and materials that minimise the cause of pollution. Avoid using products that contain:
     - Formaldehyde
     - VOC
     - Vinyl
     - Carpet and underlay that gives off gas
  2) Provide a proper fresh air supply and screens to prevent pollutants affecting the neighbours.
  3) Provide proper ventilation in the construction area to provide healthy working environment for workers.

Note: How to encourage your contractor to be green:
- When you issue a tender, specify the green objectives of your project and ask the tenderer to submit their job references for green building projects.
- In your tender specification, discuss with your consultants how to provide incentive clauses for the contractor such as allowing the contractor to submit proposals for cost saving alternatives that can reduce construction and demolition waste.
- During the construction stage, engage the consultant and contractor in discussions to review construction methods that can reduce construction noise and pollution. If possible, create an incentive structure that recognises and rewards the contractor for achieving green targets set by you and your consultants.

📖 **Continue to read:**
More details will be discussed in:
- **Chapter 6 During renovation or interior decoration**

Stage 4: Management stage

Facility management and maintenance

- Get all parties involved:
  1) Shopping mall facility management and maintenance staff
  2) Shop owners and tenants
  3) Employees
- Green Lease – check with the shopping mall owner whether green lease terms can be adopted.
- Consider adopting the relevant ISO standard where possible – ISO 14001-2004 Environmental Management System.
- Continue the promotion of green awareness to employees and customers such as a Bring Your Own Bag Campaign, Recycling Campaign, Green Dress Code.
- Provide support and space for waste sorting and recycling.
- Adopt green cleaning practices and encourage the use of green cleaning products.
- Consider operational changes that can help to reduce energy use, reduce waste and improve indoor environmental quality.
- Allow maintenance and management commitment for the plant life cycle, including fertilising, pruning, pest control, regular tree inspection and risk assessments, etc.

Continue to read:
More details will be discussed in:
- **Section 7.5 Facility management and operations**
- **Chapter 8 Incentives for tenants and shoppers**

GREEN TIPS

Operational changes that can help the shop to go greener

- **Electronic Shops:** Do not have all television sets and computers turned on all the time. Only turn on selected models for customers to view and choose from when requested. This will help save electricity and energy use for air-conditioning.
- **Refer to the special topics in Chapter 9 of this Guide for further green tips for the following shop types:**
  1. Restaurants and food courts
  2. Supermarkets
  3. Hair salons
  4. Cinemas
  5. Ice rinks
  6. Wet markets

1.3.4 Quick start menu for shoppers

Shopping in a green shopping mall means you support the shopping mall's effort in adopting green measures that reduce energy consumption, carbon emissions and waste, and reduce the impact of the shopping mall on the environment. Shopping malls and shop spaces that adopt appropriate green measures can also help provide a healthier indoor environment for you to enjoy while shopping by providing natural light, natural ventilation and greenery for your enjoyment. A green shopping mall or shop space should also use materials that do not emit harmful substances that may affect your health.

Shoppers can understand what helps a shopping mall or shop to use less energy and be more environmentally friendly. In gaining this knowledge, shoppers will be able to identify and appreciate these features and strategies.

Stage 1

Be a green smart shopper

- Support green measures adopted by shopping malls and shop spaces

Stage 2

Be involved: Make your opinion count

- Provide feedback to the shopping malls and shop spaces

Stage 3

Walk the talk: Act green

- Get the whole family involved
- Share your green experience with others
- Be a green advocate
- Reduce your carbon footprint while shopping

How shoppers can help to make the shopping malls and shop spaces greener:

Step 1: Be a green smart shopper

Support green measures adopted by shopping malls and shops:

Step 1.1

Check if the shopping mall or shop space has received a Green Building Certificate from a recognised authority such as a BEAM Plus certificate from the Hong Kong Green Building Council.

HKGBC 香港綠色建築議會

GREEN TIPS

About green building certification

BEAM stands for Building Environmental Assessment Method. It is the Green Building certification standard developed in Hong Kong by the BEAM Society Limited. New and Existing Buildings as well as Interior Renovation Projects can apply to the Hong Kong Green Building Council for BEAM certification under three categories. The projects will be assessed by BEAM Society Limited and the certificate will be issued by the Hong Kong Green Building Council.

📖 **Continue to read:**
More details will be discussed in:
- **Section 2.3.1 Local – Hong Kong**

A list of all green buildings certified under the BEAM certification standard is available at the following websites:

1. **BEAM 4/04 & 5/04 certified building**
   BEAM Society Limited. (2012). BEAM Assessment Tool. Certified building. Retrieved 9 April, 2013, from http://www.beamsociety.org.hk/en_beam_assessment_project_4_detail.php
2. **BEAM Plus project directory**
   Hong Kong Green Building Council. (2013). BEAM Assessment Tool. Certified building. Retrieved 9 April, 2013, from http://www.hkgbc.org.hk/eng/BeamPlusDirectory.aspx

Examples of shopping malls with green building certification

Figure 4 Stanley Plaza, BEAM 4/04 new building project – platinum rating (Source: The Link Management Limited)

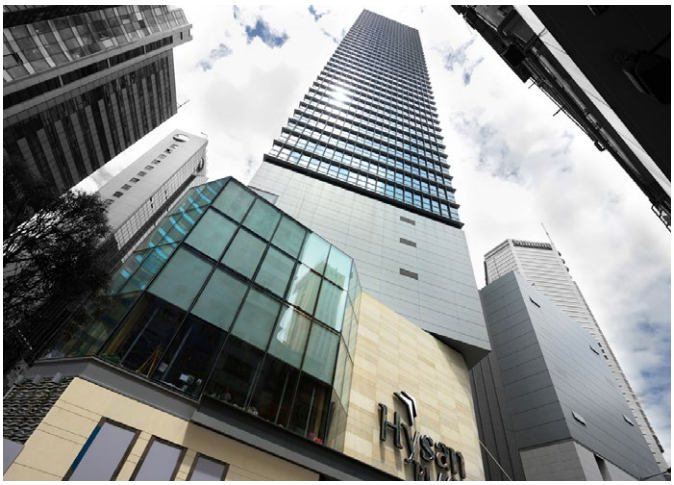


Figure 5 Hysan Place, BEAM Plus V1.1 new building project – platinum rating

Step 1.2

Check if the shopping mall or shop space has adopted the Hong Kong Energy Saving Charter.

GREEN TIPS

About Hong Kong Energy Saving Charter

To encourage community-wide participation in energy saving, the Hong Kong SAR Government has launched an Energy Saving Charter Scheme in 2013. More than 120 shopping malls with 550 retail shop spaces have committed to maintain an average indoor temperature of between 24°C and 26°C from June to September so as to reduce energy consumption due to air-conditioning.

Details of the Energy Saving Charter are available at:
http://www.energyland.emsd.gov.hk/en/home/popup.html

A list of shopping malls that have adopted the Energy Saving Charter is available at:
http://www.energyland.emsd.gov.hk/en/home/energy_saving_charter_malls_district.html

Figure 6 Energy Saving Charter (Source: Electrical and Mechanical Services Department)

Step 1.3

Select buildings awarded with Indoor Air Quality (IAQ) Certificates.

GREEN TIPS

Premises awarded the IAQ Certificates

The Government of Hong Kong Special Administrative Region, Environmental Protection Department. (n.d.). Indoor Air Quality Information Centre. Premises awarded IAQ certificate. Retrieved 5 April 2013, from
http://www.iaq.gov.hk/second.asp?page=scheme&sub=list_top

Continue to read:
More details will be discussed in:

- **Section 2.3.3 B2.1 Indoor Air Quality (IAQ) Certification Scheme**

Figure 7 Citygate, IAQ Certification Scheme – excellent class (Source: Swire Properties Limited)

Figure 8 Good class & excellent class IAQ label (Source: Environmental Protection Department)

Step 1.4

Select buildings awarded with Quality Water Recognition Certificates

GREEN TIPS

About Quality Water Recognition Certificates

Names of buildings awarded the Quality Water Recognition Scheme for Buildings Certificate:

The Government of Hong Kong Special Administrative Region. Water Supplies Department. (n.d.). Names of Buildings awarded the Quality Water Recognition Scheme for Buildings certificate. Retrieved 5 April 2013, from http://www.wsd.gov.hk/filemanager/en/share/pdf/list.pdf

Continue to read:
More details will be discussed in:

- **Section 2.3.3 B2.2 Quality Water Recognition Scheme for Buildings**

Step 1.5

Identifying shopping malls with Carbon "Less" Certificates

GREEN TIPS

About Carbon "Less" Certificates

Check if the shopping mall has been awarded a Carbon "Less" Certificate in the Carbon "Less" Certification Scheme organised by the Hong Kong Awards for Environmental Excellence at:

1. **List of Carbon "Less" Certificates awarded organisations**
   The Hong Kong Productivity Council. (2013). Hong Kong Awards for Environmental Excellence (HKAEE). Carbon "Less" Certificates Awarded Organisations. Retrieved 5 April 2013 from http://www.hkaee.org.hk/english/category/carbonless_cert/carbon.html
2. **List of qualified service providers (QSP)**
   The Hong Kong Productivity Council. (2012). Hong Kong Awards for Environmental Excellence (HKAEE). Qualified service providers. Retrieved 5 April 2013, from http://www.hkaee.org.hk/english/category/carbonless_cert/qsp/qsp.html

Continue to read:
More details will be discussed in:

- **Section 2.5.2F Getting recognition for your carbon reduction commitment**

Step 1.6

Support green campaigns and green measures adopted by shopping malls and shops spaces

GREEN TIPS

Examples of how shoppers can support green campaigns and green measures

- Remember to "Bring Your Own Bag" for shopping.
- Say "No" to plastic bags.
- Say "No" to excessive packaging and excessive wrapping.
- Only buy what you really need. Avoid excessive consumption to reduce waste.
- Only order food in amounts that you can eat to avoid waste.
- Reduce, reuse and recycle.
- Take public transportation.
- Wear light clothing (in terms of texture and colour) in summer to avoid the need for shopping malls or shop spaces to set indoor temperatures too low.

📖 **Continue to read:**
More details will be discussed in:
- **Section 8.3 Customer incentive schemes**

Step 2: Be involved – make your opinion count

Provide feedback to the shopping malls and shops

Your feedback to shopping malls and shop spaces is important and highly valued by the shopping mall owners, facility managers and shop owners and operators.

As the shopping malls and shop spaces depend on your patronage to be successful in their business, your opinions and feedback will help them to realise your support for green measures to be adopted in the shopping malls and shop spaces.

Your feedback can include the following:

1. Whether you feel the shopping malls or shop spaces are too cold (temperature of the air-conditioning is too low) or too hot (air-conditioning temperature is too high) when you are wearing clothing appropriate for the season.
2. Whether you feel the shopping malls or shop spaces are too stuffy (insufficient ventilation or humidity is too high) or too breezy (excess ventilation).
3. Whether you got sick after visiting the shopping malls or shop spaces, for example:
   - You suffered from cold or flu symptoms as a result of feeling too cold in the shopping malls or shop spaces.
   - You coughed frequently while visiting the shopping malls or shop spaces even though you were physically healthy on that day, which may have been caused by poor indoor environment quality, such as insufficient oxygen or the presence of VOC.
   - You experienced unexplainable discomfort such as a headache, itchy eyes or other allergy symptoms while visiting the shopping malls or shop spaces although you were physically healthy on that day, which may have been caused by poor indoor environment quality such as presence of VOC or gas emitted from finishing materials.
4. Whether you feel the lighting in the shopping malls or shop spaces are too bright or too glaring which means that the lighting level of the shop spaces may be too high for your comfort.

Step 3: Walk the talk – act green

Step 3.1

Get your whole family involved

- Shopping should be an enjoyable experience for your whole family. Everyone in your family needs to understand the importance of being a green-smart shopper.
- Educate your children to empower them with the knowledge of being green-smart.
- Ask everyone in your family to provide feedback about their shopping experiences during and after visiting each shopping mall and shop space. Your feedback to the shopping malls and shop spaces can help them to improve and go greener.

Step 3.2

Share your experience with others

- Share your experience with others so that more people will be aware of the importance of being a green-smart shopper.
- Encourage others to share their experience and to provide feedback to the shopping malls and shop spaces to help them to improve and go greener.

Step 3.3

Be a green advocate

- Learn more about the importance of green building and how it will benefit you as a shopper by reading this Guide for a better understanding.
- To make Hong Kong's shopping malls and shop spaces go greener, everyone must support and participate in this approach. So, it is important that you be involved as a Green Advocate as well. Every little step taken by you, your family members, your children, your relatives, your friends and others you know will help make Hong Kong's shopping malls and shop spaces go greener.

Step 3.4

Reduce your carbon footprint while shopping

An individual's carbon footprint is the direct effect one's actions and lifestyle have on the environment in terms of carbon dioxide emissions. In Hong Kong, almost all of our electricity is generated from burning coal. Cars, buses and aeroplanes use fossil fuels. From our use of electricity at home, travel, our diet to the clothes we wear, all our actions involve emission of carbon dioxide and have a direct or indirect impact on accelerating climate change.

📖 **Continue to read:**
More details will be discussed in:
- **Section 2.5 Carbon emission**

GREEN TIPS

"Every small step counts"

Step 3.4.1 When you travel to a shop

- Go on foot or ride your bike: if the shopping malls and shop spaces are close to your home, simply walk or cycle.
- Go public: public transport is cheap and convenient in Hong Kong. Use it and reduce your carbon footprint.
- Be a low-carbon driver: if you must drive, keep your tyres fully inflated. This can save up to 460 kg of carbon dioxide emissions per year. When you want to replace your car, look for a lightweight model or go hybrid.

Figure 9 Public Transport
(Source: Environmental Protection Department)

Figure 10 MTR connection ientrance, directly connected to the shopping mall in Pacific Place, Admiralty
(Source: Swire Properties Limited)

Step 3.4.2 When you buy in a shop

- Buy smart: Think twice before you buy something. Avoid purchasing redundant or unnecessary items. Shopping with the environment in mind will conserve resources, prevent waste, and save money.
- Avoid excess packaging: Look for products that have less packaging or buy in bulk. You can also buy items with packaging that can be reused or recycled.
- Buy durable products: Instead of buying disposable products, which are wasteful, buy things that will last a long time, such as rechargeable batteries and reusable plastic mugs for drinks.
- Repair the product when it breaks: Give a second life to the product you bought, before deciding to buy a new one.

Figure 11 Avoid bulk purchase

Step 3.4.3 When you go food shopping

- Support local produce: Try to buy fresh locally grown food when you can, which requires little packaging and reduces energy consumption and pollution because no long-distance transportation is required.
- Eat green: Choose organic food if available to lessen the harm caused by chemical pesticides and fertilisers to both the environment and your health.
- Eat less red meat: Reduce the percentage of red meat in your meals.
- Bring your own bag/cup/container: Bring your own shopping bag rather than using plastic bags each time you make a purchase. Try to bring along with you a cup or container for your take-away food.

Figure 12 Bring a reusable shopping bag when shopping

GREEN TIPS

Sustainability fact of global animal-raising industry

Greenhouse gas emissions by the global animal-raising industry account for about 18% of total world emissions. Cattle, sheep and goats emit greenhouse gases such as methane. Eating meat-free meals every other day can help to save about 200 kg of carbon dioxide per year.

Step 3.4.4 When you shop in a shop

- Recycle any recyclables: Locate the recycling bins in the shopping areas and make good use of them when you dispose of any recyclable materials.
- Participate in green education programmes: Spend some time in supporting the green programme to acquire knowledge of how to go green while you go shopping.

Step 3.4.5 Calculate your own carbon footprint: Carbon calculators

There is no direct to way to trim your carbon emissions in one day; go step by step and lead a low-carbon lifestyle. Try using a carbon calculator to estimate your carbon footprint, of either a single person or a household, and review it regularly.

Two useful tools are recommended here:

Organisation	Calculation tool	Website
World Wide Fund for Nature (WWF)	Carbon Calculator Version 2.0	World Wide Fund for Nature. (n.d.). Carbon Calculator Version 2.0. Retrieved 5 April 2013, from http://www.climateers.org/eng/contents/carbon_calculator.php
CLP Power Hong Kong Limited	Carbon Calculator	CLP Power Hong Kong Limited. (2010). Carbon Calculator. Retrieved 5 April 2013, from https://www.clponline.com.hk/ourEnvironment/MeasureOurImpact/Pages/Default.aspx

Read more at:
Climate Change
The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Climate Change. Retrieved 4 June 2013, from
http://www.epd.gov.hk/epd/english/climate_change/resources.html

GREEN TIPS

How can you tell whether the shopping mall or shop space is green?

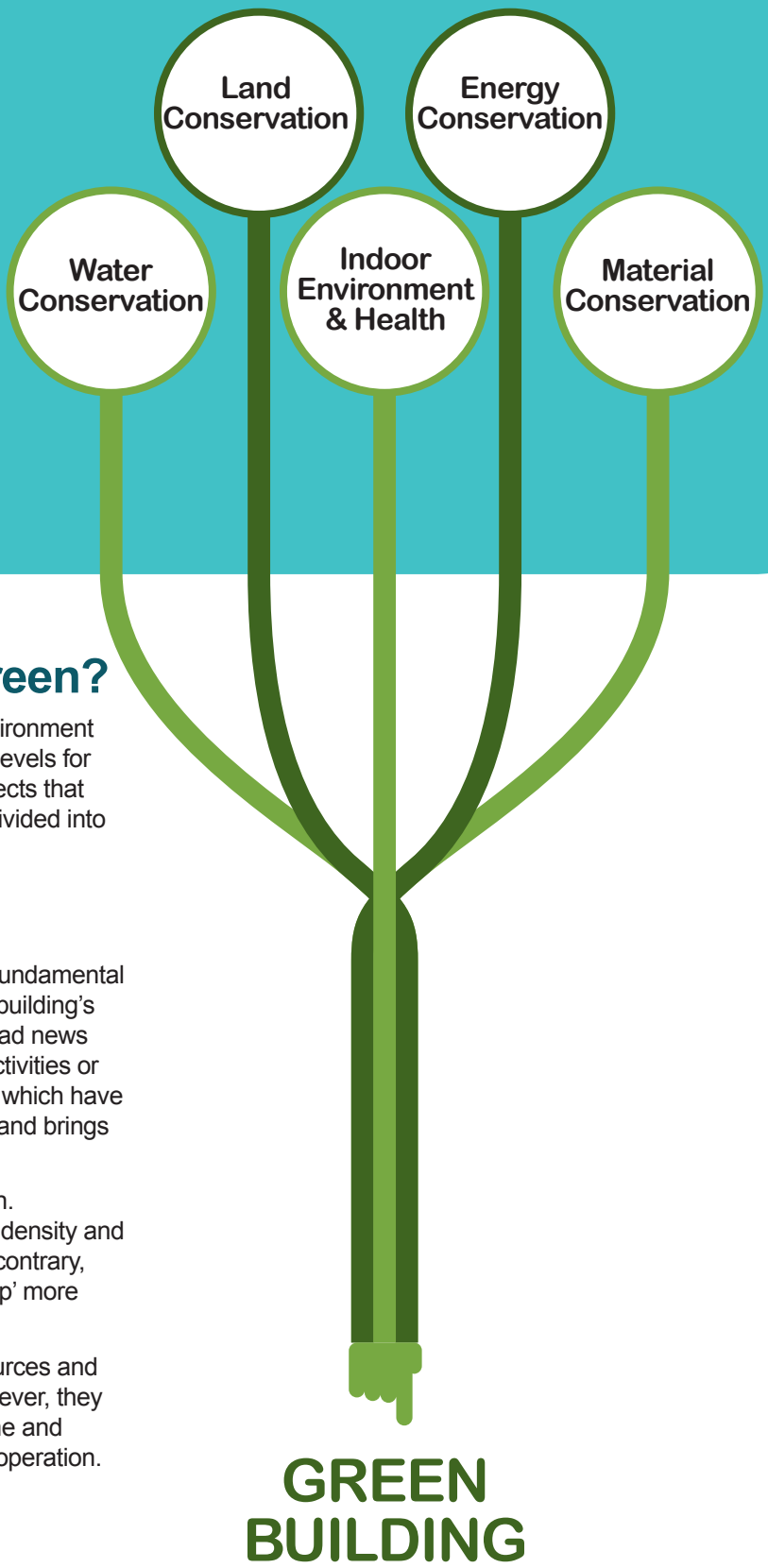
What you see or feel	What is the problem?	Is this green?
You need to wear extra clothing when entering a shopping mall or shop space on a hot day.	Temperature inside the mall or shop space is set too low and is too cold for normal comfort.	NO. Energy is wasted on excessive air-conditioning.
People wearing eye glasses find their glasses fogged up when leaving the shopping mall or shop space.	Temperature inside the mall or shop space is set too low and causes condensation on cold eye glasses.	NO. Energy is wasted on excessive air-conditioning.
When you are inside the shopping mall or shop space, you experience inexplicable discomfort such as coughing, sneezing, headache even when you are not physically ill.	Your body may have detected harmful substances (such as gas, particles, radiation) in the shopping mall or shop space causing allergic reactions which are actually giving you a warning signal.	NO. Products and materials in the shopping mall or shop space may contain or emit harmful substances which may create an unhealthy indoor environment.
You feel tired, sleepy or yawn even though you had enough sleep the night before.	There is not enough oxygen supply inside the shopping mall or shop. The amount of carbon dioxide inside the shopping mall or shop space is too high.	NO. Ventilation inside the shopping mall or shop space is not adequate to supply enough oxygen and eliminate excessive carbon dioxide.
The shopping mall or shop space is having renovations and you notice a paint smell that is irritating.	The paint used for renovation contains volatile organic compound.	NO. Volatile organic compound is harmful to humans.

What you see or feel	What is the problem?	Is this green?
You see skylights or windows which let in natural light.	---	YES. Skylights and windows are good green features which can enhance the use of natural light and can reduce reliance on artificial lighting.
You see plastic plants or other artificial plants with plastic parts inside the shopping mall or shop space.	Plastics are not considered as green materials. They are not easily degradable and may also contain chemicals that have harmful effects on human health. During the production of plastic, emission of toxic chemicals from the production process can be harmful to the workers. (See Section "Read more at" Item 1 for more details.) Artificial plants can also collect dust which is difficult to be removed properly. Use of blowers to remove dust will only blow the dust into the air which is even more problematic.	NO. Plastic plants are for visual enhancement only.
You see natural plants inside the shopping mall or shop space.	---	YES. Natural plants can help to improve indoor environmental quality. (See **Section 4.4.3 – Plants** of this Guide for more details.)
You see lots of artificial lights inside the shopping mall or shop space.	More artificial light means more energy consumption.	NO.
Colour of the decoration in the shopping mall or shop space is very dark.	More artificial lights may be needed to achieve acceptable lighting environment. More artificial light means more energy consumption.	NO.
The carpet on the floor has very thick pile.	Carpet pile can trap dust and dirt. The longer the pile, the more difficult it is to clean the carpet. Cleaning of carpets may involve chemicals that may be harmful to humans. (See Section "Read more at" Item 2 for more details.) Carpet may off gas which may affect human health. (See Section "Read more at" Item 3 for more details.)	NO.
There are lots of stone surfaces inside the shopping mall or shop space.	Stone may emit radon which is a colourless radioactive gas. The emitted radon may become trapped and accumulate if the shopping mall is not well ventilated. Long term exposure to radon may increase the risk of lung cancer.	It is necessary to carry out a radon test to check if a harmful level of radon exists.
There are recycling bins/ facilities at convenient locations within the shopping mall or shop space.	---	YES.
There are lots of large advertising screens which are playing videos over and over again all the time.	Each large LED screen is made up from many small LED lights. The larger the screen, the larger the number of LED lights required and the more energy used to keep the screen illuminated.	LED screens may be a functional preference to meet advertising needs for business operation. However, a reduction in size and in the hours of use can help reduce energy use.

Read more at:

1. For more details on harmful effects of plastic on humans, please refer to the following:
   - Environment and Human Health, Inc. (2008). Plastics that may be harmful to children and reproductive health. Retrieved 26 November 2013, from http://www.ehhi.org/reports/plastics/ehhi_plastics_report_2008.pdf
   - National Network on Environments and Women's Health. (2011). Chemical exposure and plastics production. Retrieved 26 November 2013, from http://www.nnewh.org/images/upload/attach/2502NNEWH%20Lit%20Review%20-%20Chem%20Exp%20and%20Plastics%20Production.pdf
2. For more details on toxic chemicals in carpet cleaners and less toxic alternatives, please refer to the following: Environmental Association of Nova Scotia. (2004). Guide to Less Toxic Product. Retrieved 26 November 2013, from http://www.lesstoxicguide.ca/index.asp?fetch=household#carp2
3. For more details on carpet off gas, please refer to the following: Carpet and Rug Institute. (n.d.). Frequently Asked Questions. Retrieved 26 November 2013, from http://www.carpet-rug.org/about-cri/what-is-cri/frequently-asked-questions.cfm

2 THE BASICS



2.1 What makes a building green?

GREEN BUILDING minimises its impact on the environment while achieving the required purposes and comfort levels for which the building is intended. There are many aspects that need to be considered, and generally they can be divided into five main considerations for green buildings:

2.1.1 Land conservation

Deciding where to build is actually one of the most fundamental decisions in the development process affecting the building's impact on the Earth. It is not unusual that we hear sad news about natural habitats being destroyed by human activities or city expansion. On the other hand, building on sites which have been deserted or abandoned improves land usage and brings life back to the area.

Density is another issue related to land conservation. Typical malls in North America are of extremely low density and 'spread-out'. Shopping malls in Hong Kong, on the contrary, are of much higher density and are often 'stacked-up' more than 5-6 floors.

High-density developments use up fewer land resources and reduce energy consumption for transportation. However, they also bring problems, including crowdedness, hygiene and comfort issues, as well as higher energy use for its operation.

TECHNICAL NOTE

Greenfield sites and brownfield sites

Greenfield sites refer to land which has not been developed before. They include valuable natural land resources like wetlands, forests, farmland, etc. or other types of land in its natural form. When a shopping mall is to be developed on a greenfield site, care must be taken to ensure that the development will not harm any of the natural wetlands or habitats. Social and ecological factors should also be considered, as well as the economic gains, when agricultural land is involved.

Brownfield sites refer to land that was once developed but is now wasteland. The old Kai Tak airport is a good example of a brownfield site. Developing brownfield sites optimises land use and brings improvement to the neighbourhood and is therefore to be encouraged.

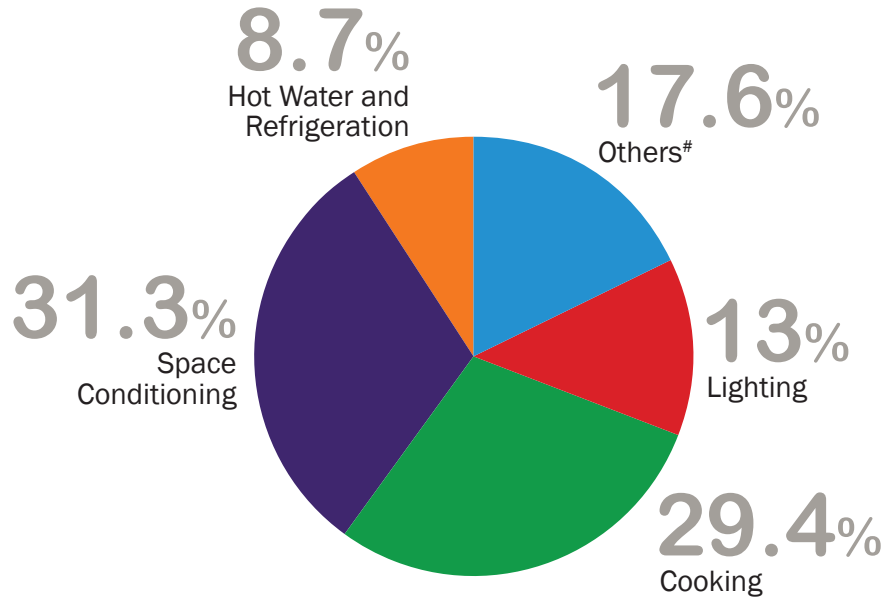
2.1.2 Energy conservation

Energy consumption in shopping malls is mainly electricity consumption. Gas is another energy source when laundries or restaurants are involved.

Of the electricity generated in Hong Kong, 77% comes from fossil fuels and the remaining 23% comes from nuclear sources [1]. For every kWh of electricity consumed, 0.7 kg of carbon dioxide is emitted into the atmosphere [2].

Statistical facts:

Energy consumption in retail & restaurant segments in 2010



#Note: End-uses under this heading include audio-visual, office equipment and miscellaneous equipment energy uses, etc.

Figure 13 Energy consumption in retail & restaurant segments in 2010
(Source: Hong Kong Energy End-use Data 2012 published by Electrical and Mechanical Services Department)

[1] The Government of the Hong Kong Special Administrative Region. Electrical and Mechanical Services Department.
[2] Guidelines to Account on Green House Gas Emission and Removal from Buildings (Commercial, Residential or Institutional Purposes) in Hong Kong, 2010 Edition.

From the chart on the previous page, it is easily seen that more than one-third of the electricity cost in a shopping mall is spent in connection with food and beverage (e.g. cooking, hot water for steaming, refrigeration for freezing, etc). Another one-third of the electricity is expended on cooling and heating for shops, foyers, arcades and indoor seating spaces. The remaining major element of electricity expense is internal lighting. Concrete ways of energy savings will be specifically discussed in detail in **Chapter 5 – Energy efficient building systems for shopping malls and shop spaces**.

Energy saving in a shopping mall

Stanley Plaza

The project focuses on the air-conditioning system and lighting system in order to achieve energy savings:

Air-conditioning system

- Implementation of variable speed drives (VSDs) for the chilled water pump to provide control of the primary variable flow chiller system.
- A thermal wheel is adopted to pre-cool the fresh air supplied to shop owners (tenants).
- Primary air handling units (PAUs) are equipped with two-speed control.
- Adequate metering is installed for energy audit purposes.

Lighting system

- PLC-tube and T5 tubes.
- Solar hybrid and wind turbine light poles.
- LED façade lighting.
- Solar sensors and automatic controls.

Energy efficiency in typical shopping malls (kWh/m²/year)

(Source: The Link Management Limited)

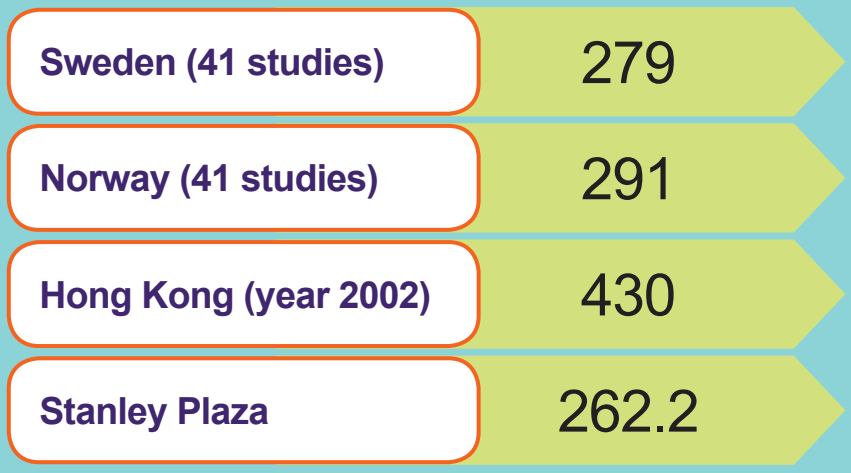


Figure 14 Energy efficiency in typical shopping malls

Source: The Link Management Limited

2.1.3 Water conservation

Water resources are being depleted world-wide. In Hong Kong we are lucky with our ample rainfall and back-up from the Mainland for the supply of potable water. Nevertheless, using less water will mean less energy for cleaning, filtering and pumping the water to the building. It will also mean less energy being used for waste water treatment before the water can return to the sea and begin its new cycle through the atmosphere.

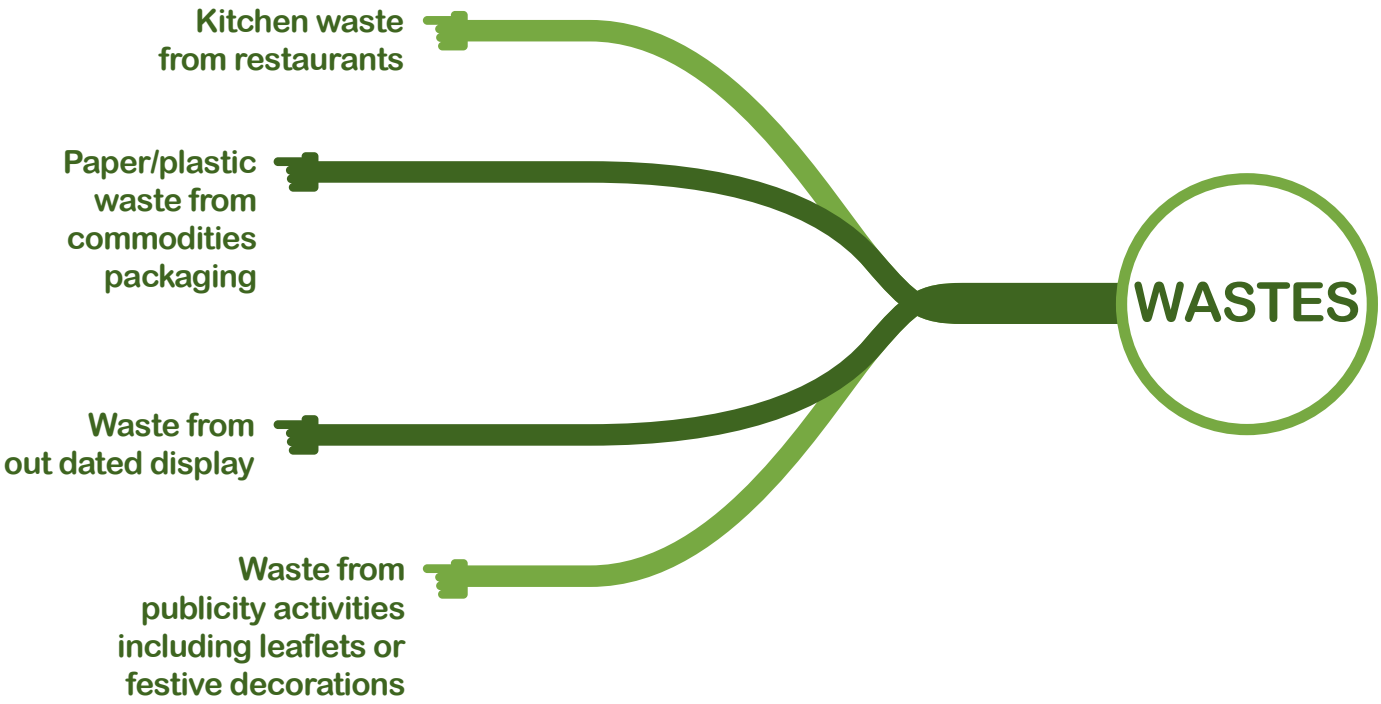
Toilet facilities, cleaning and irrigation for plants are the main forms of water consumption for the landlord's area of the shopping mall. Restaurants, hair salons and laundries on the other hand are shops that use the most water.

2.1.4 Material conservation

During construction, renovations and fitting out, building materials are used. Conservation can be achieved by the proper selection of building materials, including choosing materials manufactured from recycled sources, or using components/ materials that can themselves be recycled and reused later after the building is demolished or renovated.

One of the benefits of material conservation is waste reduction. As in any other metropolis, Hong Kong faces the problem of diminishing landfill sites for its rubbish.

For shopping malls, waste is mainly generated from:



2.1.5 Indoor environment and health

Legionnaires' disease and allergens from building materials are two of the main health concerns in shopping malls. Other concerns will be the management and maintenance of the building to ensure that the building systems are functioning properly and that the interior space is kept clean and hygienic.

Comfort level is another very important aspect for any building. Temperature, humidity and air movement all affect the human perception of comfort level. A building which uses very little energy but is too hot cannot be considered a good building. On the other hand, a building that uses a lot of energy to keep the interior space comfortable is also not acceptable. Green buildings, including green shopping malls, provide the same level of comfort by using less energy.

Comfort level is also affected by lighting (glare) and noise (reverberation time and background noise level).

2.2 Scope of the guide

The discussion in this guide includes designing of new shopping malls as well as retrofitting of existing shopping malls. It generally covers the landlord's areas in a shopping mall but also includes some specific shop categories such as restaurants, supermarkets and cinemas.

2.3 Introduction to existing environmental assessment standards for buildings and shopping malls

Nowadays, it is a global trend to pursue developments through sustainability, emphasising energy and resource conservation, energy and water efficiency, sustainable design, environmentally friendly construction methods and effective property management and maintenance. Many green building assessment tools have been established in developed countries and regions in order to encourage those who want to build green and maximise both economic and environmental performance. Green labelling schemes also act as a driving force and provide recognition for better performing buildings.

Several local and international green building certification bodies have developed assessment tools to cater for the unique nature of shopping malls and shop spaces. Each of the guidebooks list up-to-date architectural and building services design criteria and management ideas for planners, future and existing owners, and tenants and operators. The general public worldwide is able to distinguish between a green shopping mall (or shop space) and a conventional one by looking at the green building ratings..

Worldwide green building rating tools related to retail developments

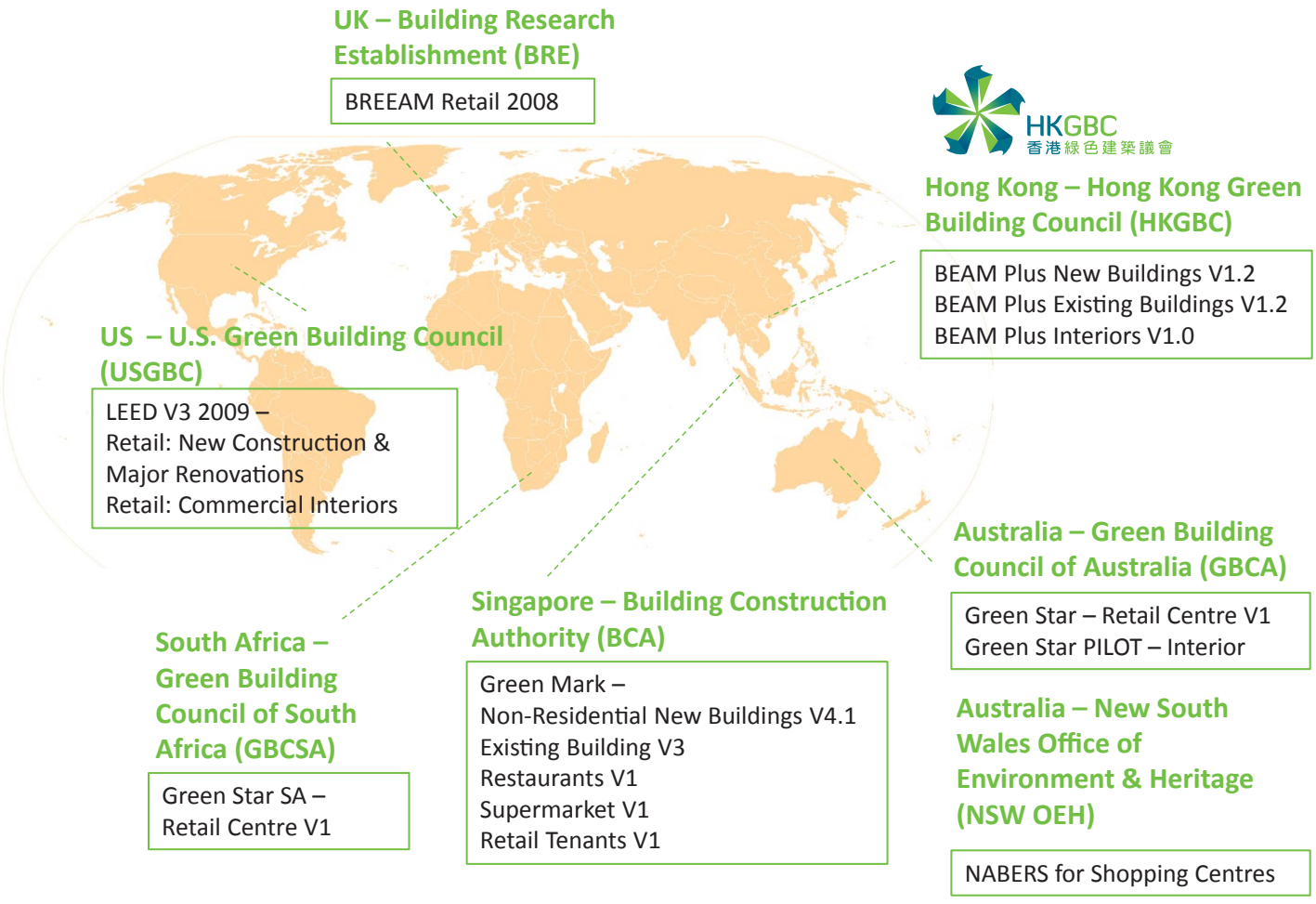


Figure 15 Worldwide green building rating tools related to retail developments

2.3.1 Local – Hong Kong

HKGBC 香港綠色建築議會 **BEAM Plus (New Buildings & Existing Buildings)**

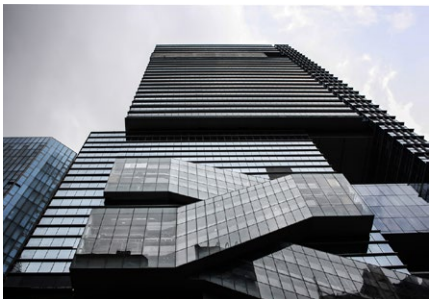


Figure 16 Hysan Place, BEAM Plus V1.1 New building project – platinum rating

Figure 17 Stanley Plaza, BEAM 4/04 New building project – platinum rating (Source: The Link Management Limited)

Figure 18 Festival Walk, HK BEAM 5/04 Existing building project – platinum rating

The Hong Kong Building Environmental Assessment Method (HK-BEAM) is one of the oldest schemes, first launched in 1996. Since then it has gone through various stages of evolution to reflect changes in the industry.

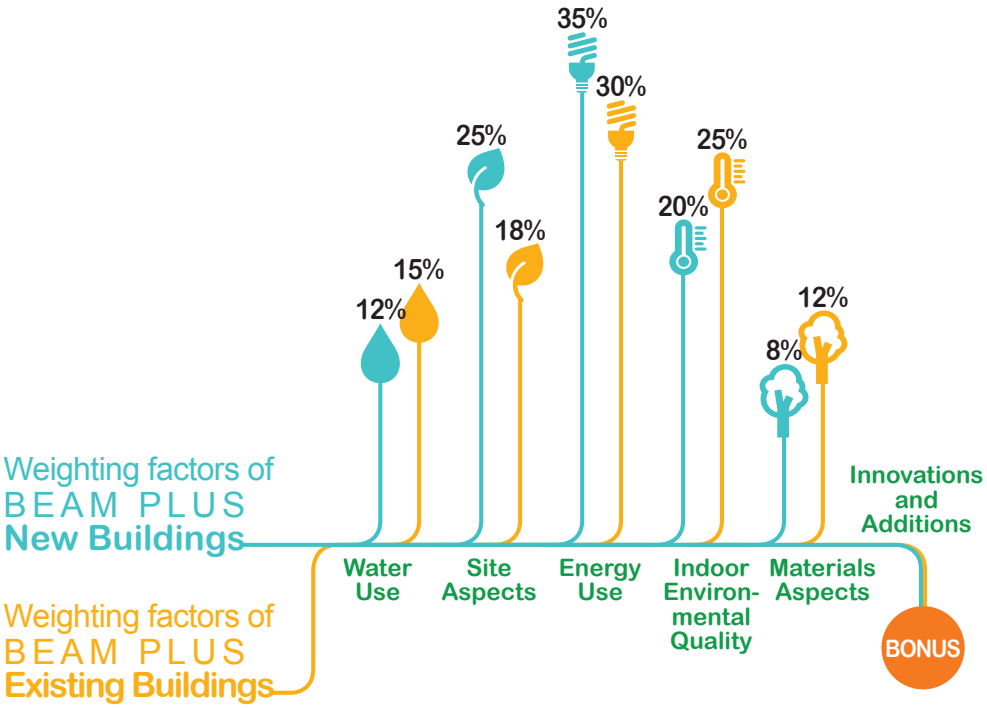
In April 2010, a new version known as the "BEAM Plus" system was issued for "New Buildings" and "Existing Buildings" by the HKGBC and BEAM Society Limited, namely Version 1.1. The most updated version, BEAM Plus Version 1.2, was launched in July 2012, covering passive design and amendments to Version 1.1.

Figure 19 ifc mall, BEAM 5/04 existing buildings – platinum rating (Source: Photographer, William Furniss)

Figure 20 Citygate, BEAM 5/04 existing building project – platinum rating (Source: Swire Properties Limited)

Six environmental categories of BEAM Plus (New & Existing Buildings)

BEAM Plus is a credit-based voluntary scheme which consists of six major environmental categories with corresponding weighting factors in relation to green building performance of both "New Buildings" and "Existing Buildings":



BEAM Plus (Interiors)

Following the BEAM Plus assessment tools for "New Buildings" and "Existing Buildings" in 2013, the newly developed BEAM Plus "Interiors" was launched for non-domestic interiors and fitting-out work including retail, office and commercial interiors projects in Hong Kong.

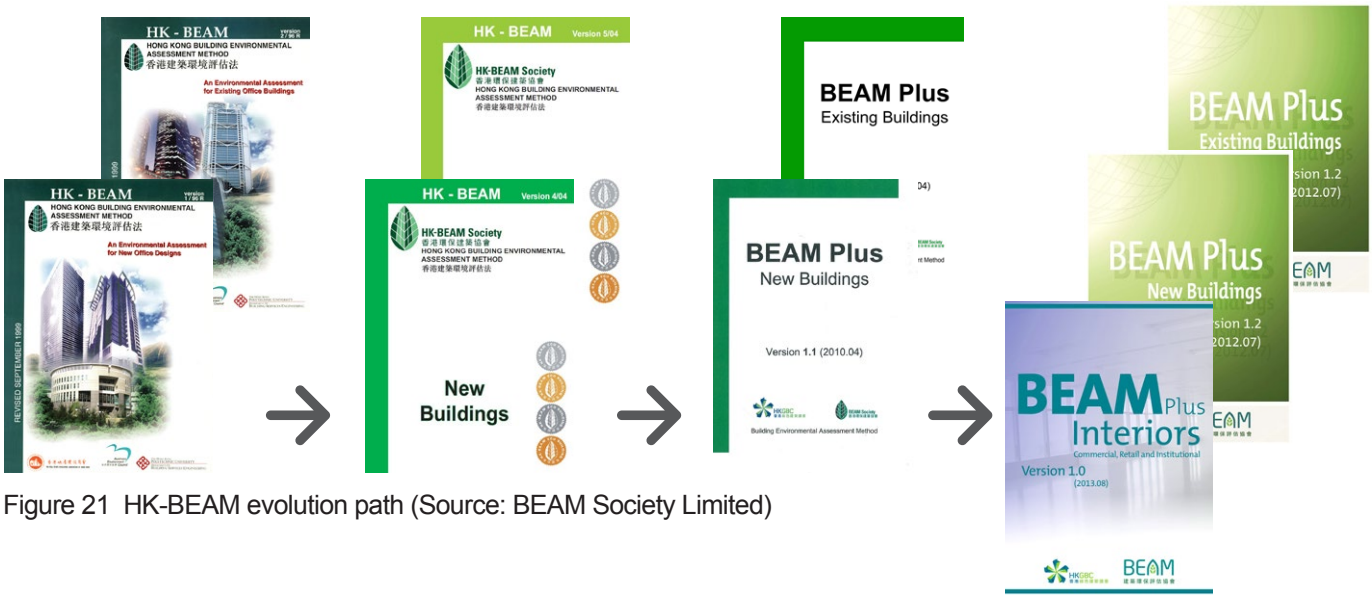


Figure 21 HK-BEAM evolution path (Source: BEAM Society Limited)

Seven performance categories of BEAM Plus (Interiors)

There are seven major environmental categories in relation to green building performance of "Interiors":

Figure 22 Performance categories for BEAM Plus (Interiors)

TECHNICAL NOTE

BEAM Plus certification tools

In all existing BEAM Plus rating systems, ratings are classified into Platinum, Gold, Silver and Bronze. To learn more, BEAM Plus certification tools with credit requirements are available free online.

Read more at:
BEAM Plus certification tools
Hong Kong Green Building Council. (2013). BEAM Plus certification tools. Retrieved 30 May 2013, from http://www.hkgbc.org.hk/eng/beamplus-main.aspx

BEAM Plus selection guidance

Practitioners can choose an assessment tool that best suits their development based on their type of development and space usage. Various examples of retail development projects and their applicable BEAM Plus rating systems are categorised in the table below.

BEAM Plus New Buildings (BEAM Plus NB)	BEAM Plus Existing Buildings (BEAM Plus EB)	BEAM Plus Interiors
For building owners: - New construction - Major renovation to existing retail buildings - Expansion of a building	For building owners and property management: - Existing retail building	For tenants/occupiers: - New office fitting-out and interior projects such as a restaurant, hair salon, supermarket, retail shop, etc. - Renovation of office fitting out and interior projects

Figure 23 BEAM Plus certification selection for retail projects (Source: BEAM Society Limited)

2.3.2 International – UK, US, South Africa, Australia and Singapore

Apart from Hong Kong, practitioners can also review best practices and experiences from overseas that could potentially be implemented successfully in Hong Kong.

To learn more, please refer to the following overseas rating systems:

Overseas System	Origin	Ownership	Website
BREEAM	United Kingdom	Building Research Establishment (BRE)	www.breeam.org
LEED	United States	U.S. Green Building Council (USGBC)	new.usgbc.org/leed
Green Star SA	South Africa	Green Building Council of South Africa (GBCSA)	www.gbcsa.org.za
Green Star	Australia	Green Building Council of Australia (GBCA)	www.gbca.org.au/green-star
NABERS	Australia	New South Wales, Office of Environment and Heritage (NSW OEH)	www.nabers.com.au
Green Mark	Singapore	Building and Construction Authority (BCA)	www.bca.gov.sg/greenmark/green_mark_buildings.html

Figure 24 Different overseas green building rating systems

GREEN TIPS

Engagement of professionals

- Try to engage BEAM Professionals (BEAM Pro), authorised persons, registered professional engineers in structural/building services disciplines to identify sustainable aspects which can be incorporated into the shopping malls and shop spaces at the early planning and design stage when most significant benefits can be obtained.
- Consider implementing green building certification such as BEAM Plus. Where green building certification is not pursued, it is important to use green building certification standards as a reference for better quality control and quality assurance for the implementation of green measures for shopping malls and shop spaces.

2.3.3 Hong Kong ordinances and guidelines

The following section aims to provide an overview and useful references on statutory environmental regulations and non-statutory green guidelines in Hong Kong. Industries and trades as well as the general public are welcome to read through to grasp some ideas of governmental requirements.

A. Green related ordinances in Hong Kong

A1. Overview of Hong Kong environmental legislation

Below summarises the existing environmental pollution control ordinances and other requirements relevant to the demolition, construction, renovation, retrofitting, operation and maintenance activities of shopping malls and shop spaces.

- Air Pollution Control Ordinance (Chapter 311)
- Waste Disposal Ordinance (Chapter 354)
- Water Pollution Control Ordinance (Chapter 358)
- Noise Control Ordinance (Chapter 400)
- Ozone Layer Protection Ordinance (Chapter 403)
- Dumping at Sea Ordinance (Chapter 466)
- Environmental Impact Assessment Ordinance (Chapter 499)
- Hazardous Chemicals Control Ordinance (Chapter 595)
- Product Eco-responsibility Ordinance (Chapter 603)
- Motor Vehicle Idling (Fixed Penalty) Ordinance (Chapter 611)

A2. Useful references for green related ordinances in Hong Kong

Readers may also refer to **Appendix C** with useful references from the Environmental Protection Department on the most up-to-date information on statutory environmental requirements.

B. Green guidelines in Hong Kong

Besides complying with the compulsory ordinances and regulations, it is recommended that shopping malls and shop spaces meet the requirements of the green guidelines in Hong Kong. Although it is not a statutory obligation, meeting the requirements is beneficial to both malls and shops:

- Cost savings through more efficient use of energy and resources
- Increased occupant satisfaction from healthy and productive accommodation
- Assurance that best practice management is achieved and liabilities reduced
- Enhancement of corporate profile and marketability to potential building users
- Improvement of purchaser's choice and information

B1. Overview of environmental guidelines in Hong Kong

The section below highlights the existing environmental guidelines which are highly relevant to the environmental design of shopping malls and shop spaces.

- **Indoor Air Quality (IAQ) Certification Scheme**

Figure 25 Good class & excellent class IAQ label (Source: Environmental Protection Department)

- **Quality Water Recognition Scheme for Buildings**

- **Environmental Management System and Audit**

TECHNICAL NOTE

Non-statutory environmental standards and guidelines

There are many non-statutory environmental standards and guidelines in Hong Kong. For more information, readers may refer to a list of non-statutory environmental standards and guidelines of the Environmental Protection Department.

Read more at:
List of non-statutory environmental standards and guidelines
The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (n.d.). Environmental Standards and Guidelines-Non-statutory. Retrieved 27 May 2013, from http://www.epd.gov.hk/epd/english/envir_standards/non_statutory/esg_non_stat.html

B2. Useful references for green guidelines in Hong Kong

B2.1 Indoor Air Quality (IAQ) Certification Scheme

The IAQ Certification Scheme is a voluntary programme launched by the Environmental Protection Department and is managed by the IAQ Information Centre. The increasing number of IAQ certificates reflects the greater awareness by the public towards good indoor air quality.

Statistical facts:

Number of valid IAQ certificates between 2008 and 2012

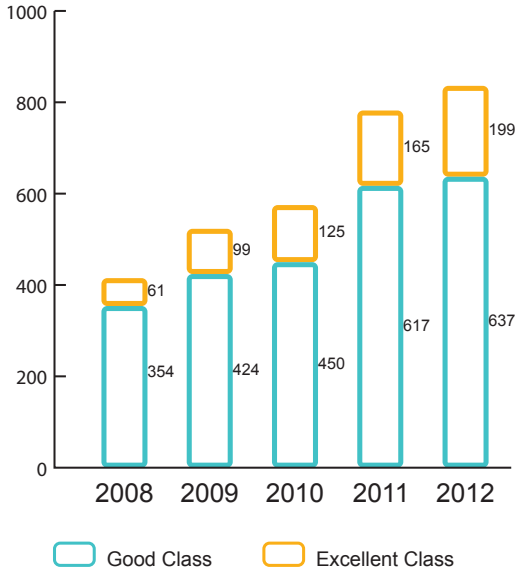


Figure 26 Number of valid IAQ certificates between 2008 and 2012
(Source: Environmental Protection Department)

TECHNICAL NOTE

Engagement of a certificate issuing body (CIB)

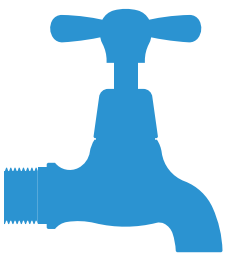
Indoor air quality certificate issuing bodies (IAQ CIB)

The issuance of IAQ certificates under the scheme is restricted to accredited IAQ certificate issuing bodies (CIB).

Shopping mall owners or building managers should approach IAQ CIBs by themselves. CIBs can issue Hong Kong Inspection Body Accreditation Scheme (HKIAS) endorsed IAQ reports and certificates which serve as a proof of quality work.

B2.2 Quality Water Recognition Scheme for Buildings

A Quality Water Recognition Scheme for Buildings was launched by the Water Supplies Department to help operators to maintain their plumbing systems properly and to ensure a good water quality at taps.



B2.3 Environmental management system and audit

Green and sustainable management systems enable continuous improvement in reducing and offsetting carbon emissions arising from buildings in order to achieve the company's goals.

Common voluntary environmental management systems and audits are:

1. Carbon Audit

2. ISO 14000 Series – Environmental Management

3. ISO 14064-1 – Greenhouse Gases - Part 1: Specification with Guidance at the Organisation Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals

4. Life Cycle Energy Analysis (LCEA) of Building Construction

Readers may also refer to the useful references at **Appendix D** for the latest information on non-statutory environmental requirements.

2.3.4 Professional help

It is important to engage professionals for detailed consultation about the implementation of environmental assessment standards, green related ordinances and guidelines at shopping malls and shop spaces. The following is a list of references for getting professional help:

- Authorised persons (AP) – Appendix A (2)
- Landscape architects – Appendix A (3)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Registered architects (RA) – Appendix A (5)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

2.4 Comfort level

Have you ever walked into a freezing cold shopping mall or shop space which made you put on an extra piece of clothing to keep warm? For those who wear glasses, have you ever walked out of a cold shopping mall or shop space with your glasses all fogged up in summer? Some shopping malls and shop spaces set their air conditioning at very low temperatures (often below 20°C) with the intention of providing a comfortably cool indoor environment for their customers. However, a decrease in indoor temperature is not the only factor ensuring a comfortable environment. Humidity, air speed, clothing and nature of the activity are also factors that affect human comfort.

Comfort is an expression of satisfaction with the environment in terms of thermal, lighting and acoustic factors. After reading this section, you will understand more about the suitability of each comfort parameter.

2.4.1 Thermal comfort

"Thermal comfort" means that a person wearing a normal amount of clothing feels neither too cold nor too warm. It is important for both one's well-being and productivity.

Statistical facts:

Seven-point thermal sensation scale

Thermal comfort can be understood as follows:

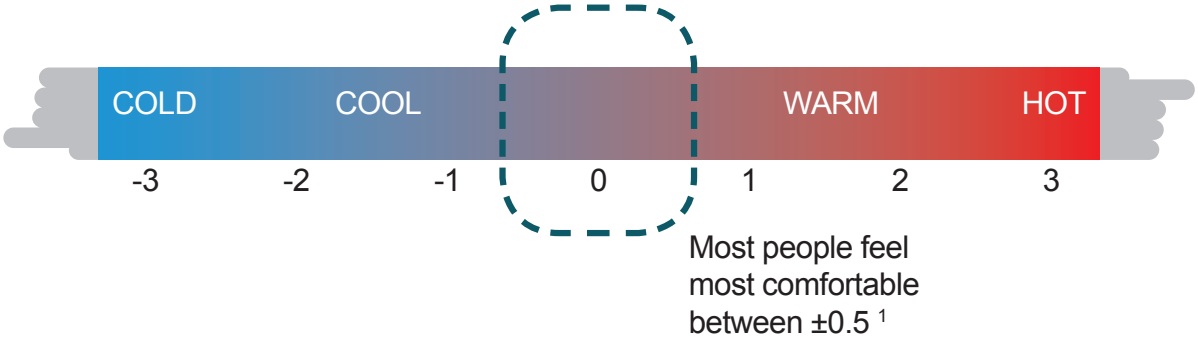


Figure 27 Thermal comfort diagram elaborating "seven-point thermal sensation scale" developed by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

[1] American Society of Heating, Refrigerating and Air Conditioning Engineers. (2010). Standard 55 - Thermal environmental conditions for human occupancy. (2010). ASHRAE Standard 55-2010. Seven-point sensation scale.

TECHNICAL NOTE

Thermal comfort

There are six major factors that determine thermal comfort [1]:

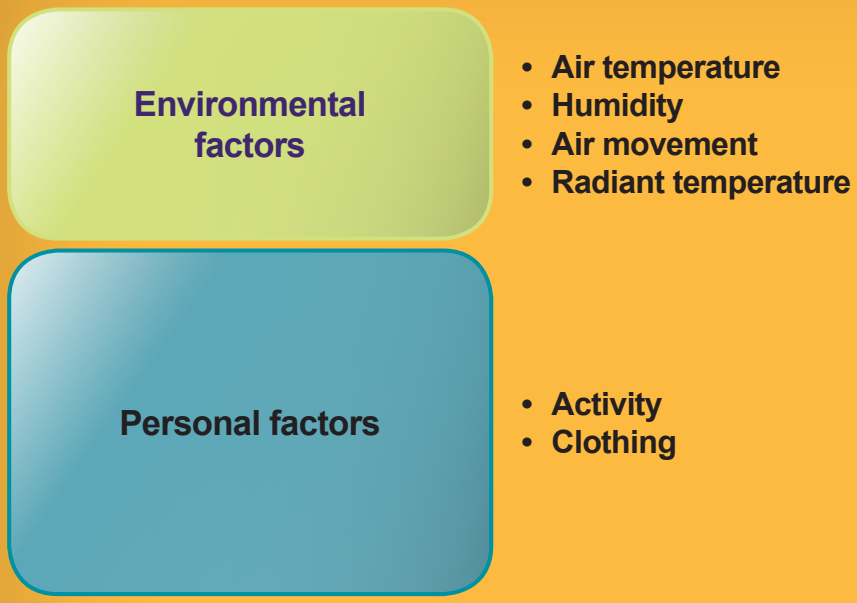


Figure 28 Six factors determining thermal comfort

Read more at:
Online thermal comfort calculator
Healthy heating educational resource site. Online thermal comfort calculator. Retrieved 5 April 2013, from http://www.healthyheating.com/solutions.htm

A. Air temperature

Air temperature has the most direct effect on thermal comfort. The temperature level at which people feel comfortable depends on activity levels, clothing, age and natural body temperature, which varies from one individual to another, and on seasonal temperatures.

B. Humidity level

Relative humidity (RH) refers to the moisture content in the air, expressed as a "%". Buildings with low RH can lead to dryness and throat irritations. RH below 40% is acceptable for short periods only. Conversely, high humidity makes the environment "stuffy". More importantly, it can contribute to the development of bacterial and fungal growth, especially in sealed buildings.

C. Air movement

A certain amount of air movement around the human body is essential for thermal comfort for a light level of activity such as bowling. The required level of airflow depends on the air temperature and humidity. Typically, it is recommended that the air movement rate be maintained at 0.2 to 0.3 m/s.

[1] Healthy heating educational resource site. (2013). Human comfort and health requirement. Retrieved 5 April 2013, from http://www.healthyheating.com/Page%2055/Humidty/prep/prep2.html

TECHNICAL NOTE

Internationally recommended ranges of temperature and relative humidity in air-conditioned shop spaces

Comfort in an indoor environment is, in fact, complex and involves the interaction of different environmental and personal factors. Hence, consideration of all these factors together is important to design operative criteria that best suits the unique operation and climatic condition of an indoor space in a shopping mall.

There are some local and international standards stating the recommended design criteria with consideration of the complex interactions between different factors. Careful design of the operative criteria will enhance energy-saving without sacrificing occupants' desire for a comfortable and healthy indoor environment. Below are some recommended operative relative humidity and temperature ranges that are considered acceptable by the majority of people for a given set of conditions.

International standard recommendation on relative humidity [1]:

Condition	Relative humidity (RH)
General	40% – 70%

Figure 29 Recommended ranges of relative humidity

ASHRAE standard recommendation on temperature/relative humidity ranges:

Temperature/relative humidity ranges (with still air) [2]		
Condition	Relative humidity	Acceptable operating temperatures (°C)
Summer (light clothing)	If 40%, then	22.5 – 25.5
	If 70%, then	22.0 – 25.0
Winter (warm clothing)	If 40%, then	15.5 – 20.0
	If 70%, then	15.0 – 20.0

Figure 30 International recommended ranges of temperature and relative humidity in air-conditioned shop spaces

Read more at:

1. **ASHRAE Standard 55-2010**
   The American Society of Heating, Refrigerating, and Air Conditioning Engineers. (2010). American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 55. Thermal environment conditions for human occupancy.
2. **Guidance notes for the management of indoor air quality in offices and public places**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2003). Indoor Air Quality Information Centre. Guidance notes for the management of indoor air quality in offices and public places. Retrieved 5 April 2013, from http://www.iaq.gov.hk/second.asp?page=scheme&sub=form

[1] Indoor Air Quality Guideline Value for Japan (Law of Maintenance of Sanitation in Building) and South Korea (Public Sanitary Law)
[2] American Society of Heating, Refrigerating and Air Conditioning Engineers. (2010). Standard 55 – Thermal environmental conditions for human occupancy. ASHRAE Standard 55-2010.

2.4.2 Lighting comfort

Different activities require different intensities of light. In general, the more detailed the task, the greater the light requirements. When designing the lighting systems, try to consider maximising the use of daylight by referring to The Chartered Institution of Building Services Engineers (CIBSE) Lighting Guide.

A. Distribution/uniformity

The distribution of illuminance and luminance is a measure of how lighting varies from point to point across a plane or surface. For good visibility, some degree of uniformity across the task-related plane is desirable. Poor visibility and visual discomfort may result if the eye is forced to adapt too quickly to high light levels. Sudden contrasts in light intensity, for example, coming out of a well-lit area into a dim area or vice versa, can be a problem because it takes the eye several seconds to adapt to new lighting conditions. The change in the light intensity should be made gradually where possible.

B. Illuminance

Guidelines for electric lighting have defined ranges of maintained illuminance levels based on different specific applications. Different areas in the shopping mall require different lighting intensities. More examples will be discussed in detail at **Section 9.7 – Lighting levels for different uses** of this Guide.

C. Glare

Discomfort glare is a sensation of annoyance caused by high or non-uniform distribution of brightness in the field of view. It occurs when the brightness of a surface or luminaries is higher than recommended, such as the reflection of sunlight. Glare can be eliminated by a design giving consideration to the facing angle of the spotlights, use of shielding fixtures or a reduction of the lux level of lighting fixtures.

D. Daylight

People prefer daylight, therefore it is recommended that the design should provide daylight where reasonable and practical. Daylight availability can be described in terms of the daylight factor (DF). Careful consideration of the building orientation and the building envelope during the design stage can optimise daylight availability as well as energy performance. Design criteria for DF% are listed in Figure 31 and more details are presented in **Section 4.3 – Natural lighting in shopping malls and shop spaces**.

Average daylight factor (%)	Details
<2	• An interior not well lit by daylight • Full electric lighting often needed during daytime
2 – 5	• Windows give a predominantly day-lit appearance but supplementary electric lighting needed • Usually the optimum range for daylight and for overall energy use
>5	• An interior cheerfully lit by daylight • Daytime electric lighting rarely needed • Major thermal problems from large windows

Figure 31 Design criteria in terms of daylight factor [1]

[1] British Standard Institution. (2008). British Standard BS 8206-2:2008. Lighting for buildings – Part 2: Code of practice for daylighting.

Figure 32 Use of daylight at Hysan Place, BEAM Plus V1.1 new building project – platinum rating

GREEN TIPS

Maximising daylight access:

Building design making use of natural lighting can save energy for interior lighting in shopping malls and shop spaces, the following are some suggestions:

- Building design that makes use of natural lighting through careful window design and building orientation. The higher the window, the deeper the daylight zone that is obtained.
- The larger the window, the more important the glazing selection and shading effectiveness need to be considered to control glare and heat gain.
- For good distribution, use higher ceilings and higher windows. Keep the ceiling smooth and light-colored.
- Use clear or translucent materials in the upper portion of full-height partitions. When this approach is used in corridor walls, corridors may be adequately lit up by this spill light.

More concrete ways of natural lighting design will be specifically discussed in detail in **Section 4.3 – Natural lighting in shopping malls and shop spaces**.

2.4.3 Acoustics

Shopping malls typically have a high volume of ambient sound. Often, assorted services are provided in such places and various events such as performances or parties are frequently held. A loud volume generally has a long echo, and a long reverberation amplifies noise and reduces speech intelligibility. In order to minimise this effect, the space should be designed with better sound absorption. In this connection, noise reduction can make a more pleasant atmosphere. Designers are recommended to follow the design criteria for unoccupied rooms, which are tabulated in Figure 33.

Type of area	Unoccupied room	Recommended design sound level (dB(A))[1] Satisfactory	Maximum	Reverberation time (s)[2] (500Hz octave)
Stores	Department store - Main floor - Upper floor	 50 45	 55 50	0.3 – 0.8
	Small retail store (general)	45	50	
	Supermarket	50	55	
	Show room	45	50	
	Enclosed car park	55	65	
Restaurants	Restaurant	40	45	0.3 – 0.8
	Coffee bars	40	50	
	Cafeteria	45	55	

Figure 33 Recommended acoustic design criteria in typical shopping mall areas

2.4.4 Professional help

It is important to engage professionals for detailed consultation about the implementation of green measures for comfort levels in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) – Appendix A (2)
- Acoustic consultants – Appendix A (8)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Registered architects (RA) – Appendix A (5)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

[1] Standards Australia. (1987). Australian/ New Zealand Standard AS/ NZS 2107:1987 Acoustics - Recommended design sound levels and reverberation times for building interiors.
[2] Michael Rettinger. (1977). Acoustic design and noise control volume II noise control. Chemical Publishing Company.

2.5 Carbon emission

2.5.1 What is carbon footprint?

An individual's carbon footprint is the direct effect of one's actions and lifestyle on the environment in terms of carbon dioxide emissions. In Hong Kong, about 75% of our electricity is generated from burning coal and natural gas. Cars, buses and aeroplanes use fossil fuels. From our home electricity use, travel and diet to the clothes we wear, all our actions involve emission of carbon dioxide and have a direct or indirect contribution to climate change.

TECHNICAL NOTE

Consequence of increase in carbon emissions – long hot summer, no winter

The weather is becoming hotter and winter will disappear in Hong Kong. The prediction is that by the year of 2100, there will be less than 1 cold day (12°C or below) per year. For the latest projected annual mean temperature anomaly for Hong Kong, please refer to the webpage of Hong Kong Observatory below.

Temperatures go up with the increased emissions of carbon dioxide into our atmosphere, one of the many consequences of climate change encountered in Hong Kong. In addition, heavier rainfalls, more tropical typhoons, a hotter and wetter climate and a higher potential for landslides are all to be expected. Climate change is not just the business of others. Every single person should take steps towards low-carbon living and trim their carbon emissions

Read more at:

1. **Climate change**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Climate change. Retrieved 4 June 2013, from
   http://www.epd.gov.hk/epd/english/climate_change/resources.html
2. **Latest projected annual mean temperature anomaly for Hong Kong**
   The Government of Hong Kong Special Administrative Region. Hong Kong Observatory. (2013). Projections of Hong Kong climate for the 21st century. Temperature projection. Retrieved 1 August 2013, from
   http://www.hko.gov.hk/climate_change/proj_hk_temp_e.htm

2.5.2 Corporate supports

Corporate bodies always have an influential role that drives employees' motivation and behaviour. Managers of shopping malls and shop spaces can set environmentally friendly policies to get the staff involved and help reduce carbon emissions.

A. Be ready for a sustainable business

Hong Kong's greenhouse gas emissions amounted to the equivalent of 42 million tonnes of carbon dioxide in 2008. Around 90% of our city's electricity is consumed in buildings, or, in other words, buildings account for some 60% of total greenhouse gas emissions [1]. Retail industry in commercial buildings can in fact trim back a lot of sources of carbon emissions.

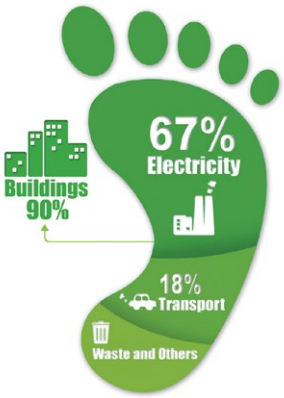


Figure 34 Hong Kong's greenhouse gases emissions (Source: Hong Kong Productivity Council)

Implement the following and see how they benefit our Earth:

Strategies	Benefits of equivalent CO_2 emission	No. of trees of intake CO_2 amount per year
Recycle used paper	- 5 kg per kg of paper	0.21
Offer a low carbon diet	- 36 kg per kg beef	1.6
Use a refrigerator with Energy Efficiency Grade 1 instead of Grade 3	- about 109 kg per year	4.7
Avoid using plastic bags	- 6 kg per kg of plastic bag	0.3
Reduce garbage by 10%	- 454 kg per year	19.7
Save water	- 42 kg per $100m^3$	1.8

B. Energy consumption indicators

Energy consumption indicators allow practitioners to understand their energy consumption levels and performance with respect to their corresponding peers.

The Electrical and Mechanical Services Department has an energy consumption indicator to indicate the energy consumption level and energy use intensity of different operating entities. Energy consumption of related retail businesses are revealed in **Figure 35**.

Restaurant and retail	Annual energy consumption per area (MJ/m^2/annum)
Chinese restaurant	4636
Non-chinese restaurant	4060
Fast food shop	6622
Bar	1536
Other eating and drinking places	5729
Arcade/basement/upper floor shop	1479
Street front/ground floor shop	1778
Central services for shopping arcade	2302

Figure 35 Energy consumption indicator (Source: Electrical and Mechanical Services Department)

Note: Businesses in the same group may be operating under different economic, environmental and operational constraints, resulting in different energy performance. Practitioners are encouraged to consider the indicator as one of the ways, but not the only one, of comparing and improving their energy performance with respect to the past.

[1] Council for Sustainable Development. (n.d.). Carbon manager. Retrieved 5 April 2013, from http://carbon-manager.hkpc.org/website/eng/intro.asp

C. Online energy benchmarking tools

Online energy benchmarking tools contain sets of statistical data and compare users' information with the most recent survey statistics. Shopping mall developers, shop owners and tenants can make good use of online energy benchmarking tools to see where they are compared with other shopping malls and shop spaces.

C1. Electrical and Mechanical Services Department online benchmarking tools

Organisation	Services/tools	Reference Website	Features
Electrical and Mechanical Services Department	Online benchmarking tools	http://ecib.emsd.gov.hk/en/subgroup_cmc.asp	A platform to benchmark the energy consumption performance of your commercial premises, with respect to different end-use equipment and forms of energy among selected groups in the commercial sector.

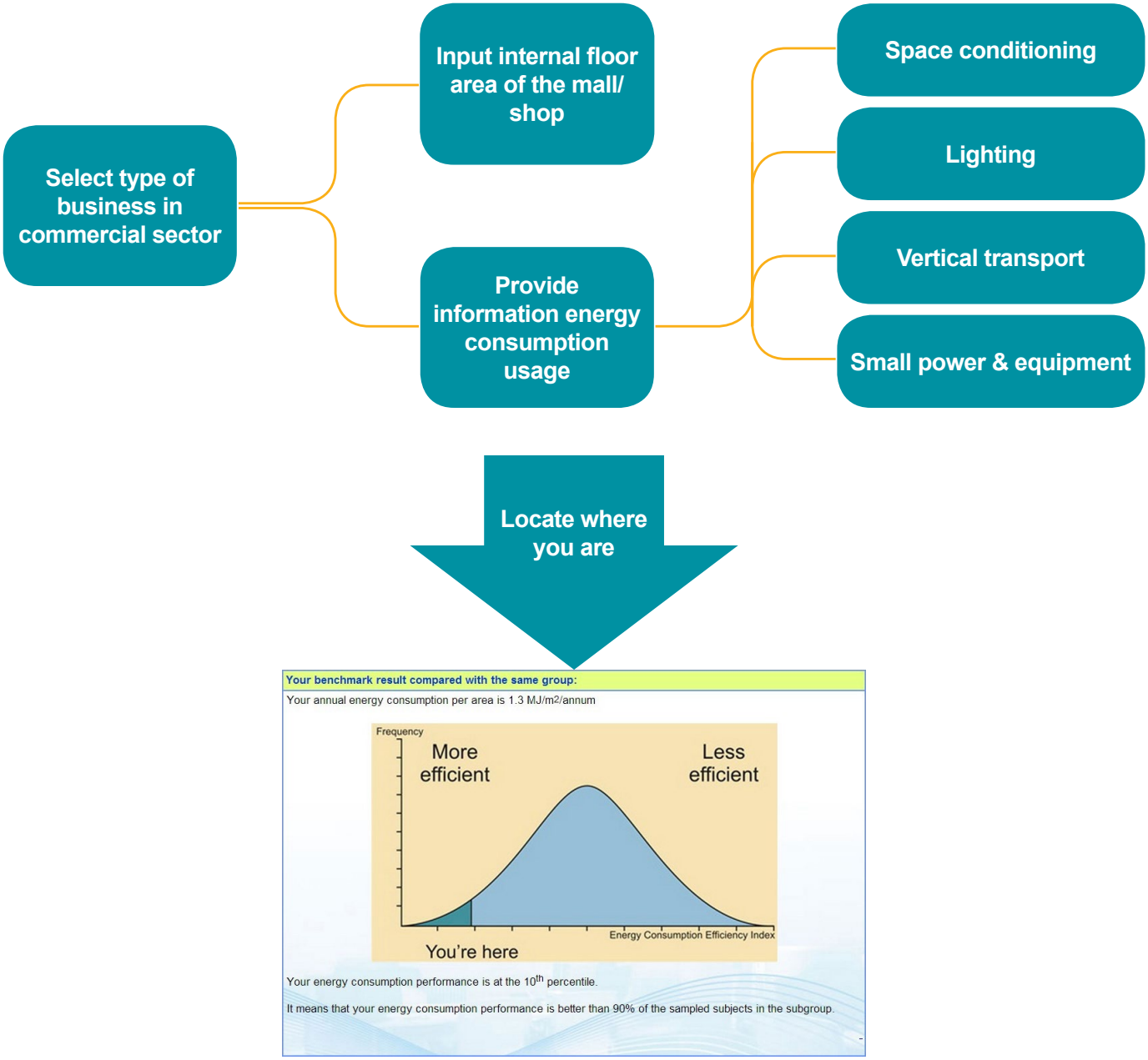
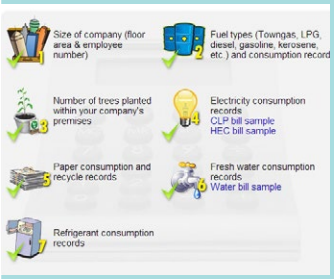


Figure 36 Work flow of online benchmarking tools
(Source: Electrical and Mechanical Services Department)

C2. CLP Power Hong Kong Limited (CLP) online benchmarking tools

Organisation	Services/tools	Reference website	Features
CLP Power Hong Kong Limited (CLP)	GREEN^{PLUS} Energy Billboard benchmarking tool	https://www.clponline.com.hk/Documents/Common/En/ENERGY_BILLBOARD%20_EN.pdf	A user-friendly online portal for shop owners to input and estimate their energy consumptions and also compare their business ranking against their industry norm up to five quarters.

C3. Other carbon emission calculators and benchmarking tools

Organisation	Services/tools	Reference website	Features
Council for Sustainable Development	Carbon manager	 Figure 37 Carbon Manager (Source: Council for Sustainable Development) http://carbon-manager.hkpc.org	A web-based carbon management tool for household, retail, catering and other building user groups to help them assess their carbon footprint which will be analysised and compared among each user group. This will help raise the public awareness on climate change impact.

D. Technical support and services from power utility companies

Mall operators, shop owners and tenants can seek technical support and services on energy saving from the three power utility companies in Hong Kong, as indicated below.

D1. Technical support and services from CLP

Organisation	Services/tools	Reference website	Features
CLP Power Hong Kong Limited (CLP)	GREEN^{PLUS} Experience Centre	https://www.clponline.com.hk/MyBusiness/Documents/2012_GP_BillInsert_en.pdf	An exhibition area with ambassadors to analyses the particular needs of visitors and tailor-made solution to achieve energy consumption savings, enabling small and medium-sized enterprises (SMEs) to get a preliminary plan on integrating energy saving schemes into green business.
	Energy audit service	https://www.clponline.com.hk/mybusiness/energymanagement/informationhub/easandeels/pages/energyauditservice.aspx?lang=en	An audit service to assess the energy efficiency performance of the system/equipment, identify energy management opportunities and recommend energy savings solutions for the customers.
	Energy efficiency loan scheme	https://www.clponline.com.hk/MyBusiness/EnergyManagement/InformationHub/EASandEELS/Pages/EnergyEfficiencyLoanScheme.aspx?lang=en	A loan scheme under preferential interest rate (currently interest free) as financial assistance for the implementation of energy efficient projects.

D2. Technical support and services from HK Electric

Organisation	Services/tools	Reference website	Features
Hongkong Electric Company Limited (HK Electric)	Enterprise Advisor Service	http://www.hkelectric.com/web/CommercialAndIndustrialServices/ServicesForSME/BusinessStart-Up/Index_en.htm	A service platform at customer centre providing shop owners energy efficient advices.
	Pre-check installation or existing building inspection	http://www.hkelectric.com/web/CommercialAndIndustrialServices/ServicesForSME/BusinessStart-Up/Index_en.htm	An installation or inspection services for the new and existing shop building owners. This can help shop managers and owners to check for better energy management.
	Smart Power Centre	http://www.hkelectric.com/NR/rdonlyres/184A214B-1434-4588-983C-D35FAAB5D1A4/0/PowerPulse_02_customer_corner.pdf	An exhibition area to introduce energy-efficient devices, window film, low emissivity glass or intelligent panel to shop owners.

D3. Technical support and services from Towngas

Organisation	Services/tools	Reference website	Features
The Hong Kong and China Gas Company Limited (Towngas)	One-stop Free Advisory Services	http://www.towngas.com/eng/cust/business/commerceindustry/proservices/onestopadvisoryservices.aspx	A free professional consultation service to advise businesses how to use town gas in the most efficient way. The advisory team will make site visits to the businesses, and can prepare an optimum fuel utilisation plan, design piping systems for individual needs with cost estimates.

E. Holding a low-carbon event

Have you ever thought of hosting an event in your shopping mall in a low-carbon or even a carbon neutral way? Producing decorative materials, transporting materials, using electricity for lighting and air conditioning during the event, all these involve carbon emissions.

GREEN TIPS

Keys for holding a low-carbon event

Follow the strategies below and try to be carbon-less next time you plan to hold an event a shopping mall.

- Consider holding the event outdoors during the daytime
- Eliminate the use of disposable containers, plates, bowls, cups and cutlery
- If catering is provided, order organic, fair trade coffee and tea and locally produced food and beverages
- Offer guests the choice of attending the event via videoconferencing or alternatively provide guest shuttle services
- Provide electronic or paperless communication
- If paper must be used, choose Forest Stewardship Council (FSC) certified paper
- Organise an end-of-show take-back and recycling programme
- Offset the carbon emissions that remain after reduction efforts by renewable energy certificates which is like purchasing renewable energy
- Share your experience about the event's greening initiatives

F. Getting recognition for your carbon reduction commitment

Carbon "Less" Certificates

The Carbon "Less" Certificates Scheme, as part of the Hong Kong Awards for Environmental Excellence (HKAEE), recognises organisations that demonstrate an absolute reduction of overall carbon emissions over a period of time. Consider finding a qualified service provider (QSP) to quantify and verify your carbon reduction achievement and get it recognised. Details of the certification scheme and list of QSPs can be found on HKAEE's website.

TECHNICAL NOTE

Increasing numbers of organisations awarded Carbon "Less" Certificates

As of 30 September 2012, the cumulative number of organisations awarded Carbon "Less" Certificates is 226, resulting in a total reduction of 71,525 tonnes of CO_2 equivalent.

Moreover, 14 out of 226 Carbon "Less" certified organisations/buildings are shopping malls or buildings with shopping spaces, which account for about 6% of the total.

Figure 38 Hong Kong Awards for Environmental Excellence
(Source: Environmental Campaign Committee, Environmental Protection Department)

Read more at:
List of qualified service providers (QSP)
Hong Kong Awards for Environmental Excellence (HKAEE). (2012). Qualified service providers. Retrieved 5 April 2013, from
http://www.hkaee.org.hk/english/category/carbonless_cert/qsp/qsp.html

2.5.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of green measures for carbon emissions at shopping malls and in shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) – Appendix A (2)
- Landscape architects – Appendix A (3)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Registered energy assessors (REA) – Appendix A (6)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

3 PLANNING FOR SHOPPING MALLS AND SHOP SPACES

If there is a chance to start from scratch, how would you design a green shopping mall? Or if there is an old shopping mall renovation project, what opportunities are there to make it consume less energy? This chapter aims to provide an overview of various aspects of shopping mall planning that might be helpful in achieving environmentally friendly designs.

Remember: it is always advisable (and sometimes mandatory) to involve building professionals to carry out shopping mall or shop projects so that the latest practices required under the law and good practices on safety, hygiene and environmental performance can be assured.

GREEN TIPS

Professional help

Some of the building professionals that would probably be needed for shopping malls or shop projects include:

- Architects
- Structural engineers
- Building services engineers
- BEAM Professionals (BEAM Pro)
- Registered contractors
- Building surveyors

For projects involving building works that require statutory approval and consent by the Building Authority, authorised persons and registered structural engineers, and if applicable registered geotechnical engineers, might also be needed. You would need to consult your building professionals.

Readers may refer to **Appendix A** with the contact information of registered professionals and **Appendix B** with the contact information of specialised contractors in different disciplines.

3.1
Retrofitting existing buildings to become new shopping malls and shop spaces

Retrofitting of existing shopping malls is not uncommon in Hong Kong. Often, old malls are renovated to provide a new 'look' to attract more shoppers or to accommodate a new rental strategy. Arcade layout, circulation planning, the building appearance and its interior design are often changed during retrofitting. But apart from what is seen on the surface, retrofitting provides an excellent opportunity to make the shopping mall more environmentally friendly and save costs on future electricity bills.

Figure 39 Retrofitting of Lok Fu Plaza, Lok Fu
(Source: The Link Management Limited)

Figure 40 Retrofitting of Leung King Plaza, Tuen Mun, New Territories
(Source: The Link Management Limited)

Benefits & relevance of sustainable retrofitting:

3.1.1 Upgrading building safety and health

Retrofitting an existing shopping mall and shop spaces enables its health and safety standards to be upgraded to meet the latest regulations. Alteration and addition (A&A) is the terminology commonly adopted for the works involved in a retrofitting exercise. Generally the Buildings Department only requires areas affected by the A&A to comply with the latest building regulations or codes. Those parts of the building not affected by the A&A works do not need to be upgraded. Rather than obstacles, these requirements should be viewed as opportunities to enhance the building's performance.

Examples of the latest building codes that might be relevant to A&A of a shopping mall and shop spaces are:

- Code of Practice for Fire Safety in Buildings 2011 for means of escape, fire resisting construction, access for firefighting and rescue.
- Design Manual: Barrier Free Access 2008 details requirements for ramps, lifts, toilets, signs, etc. for ease of access by persons in wheelchairs or the visually impaired.
- Practice Notes for Authorised Persons, Registered Structural Engineers and Registered Geotechnical Engineers for various issues covering the minimum number of toilet cubicles, etc.

GREEN TIPS

Benefits and results of safety and health upgrades

Better fire safety	Better fire safety with updated fire prevention and alarm systems
Better public safety	Better public safety with upgraded design and structural calculations for balustrades in atrium spaces
Reduced risks	Renewal and upgrading of HVAC systems to reduce risk of Legionnaire's Disease
Better sanitation	Introduction of more female toilets and improvement of toilet design for better sanitary conditions

3.1.2 Improving the connectivity

Shopping mall retrofitting can create opportunities for improving the connectivity to local transport and social systems that have appeared since the building was first completed. This encourages shoppers to use public transport, and might also enhance the mall's rental value due to the increase in visitors.

A new transport hub, MTR entrance or bus stop, new nearby developments or even changes in the population are items to look into. New access routes or amenities such as entrances, covered footbridges, shuttle services, bicycle storage, etc. are possibilities that may encourage pedestrian access.

3.1.3 Energy saving through building systems and façade upgrading

Technology makes tremendous advances. Retrofitting a shopping mall and its shop spaces creates an opportunity to upgrade the building systems – air conditioning and ventilation system, lighting, pumps, lifts and escalators, etc – replacing them with new equipment which consumes less energy for the same performance as compared to those manufactured fifteen or twenty years ago. The saving in energy consumption can become a saving in the long-term running costs.

Apart from creating a new image for the shopping mall, retrofitting external façades also creates opportunities to 'rectify' problems of glare or excessive solar heat gained through windows and glass walls by introducing external or internal shading devices and low-emissivity (low-e) double glazing products. Please see **Chapter 4 – Green design for shopping malls and shop spaces** for further discussion on façade design.

3.1.4 Improving the indoor environment

Retrofitting also creates opportunities to improve the comfort levels of a building that could improve the experience of visitors and prolong their stay or increase the frequency of their visits. Apart from thermal comfort concerns as discussed in **Chapter 2**, internal spaces can become more enjoyable by introducing natural daylight (See **Section 4.3**), providing green plants and seating (See **Section 4.4**) and improving internal circulation (See **Section 4.1**).

Benefits of sustainable retrofitting

Pacific Place, Admiralty

Figure 41 Retrofitting of Pacific Place, Admiralty (Source: Swire Properties Limited)

Pacific Place was originally constructed in the 1980s. Over 1.6 million man-hours have been spent on the retrofitting project since it was initiated in 2007 and completed in 2011.

- Flat skylights replace the previous pyramid-shaped ones to maintain natural daylight inside the building whilst allowing the roof to be converted into a public terrace.
- It has also installed a new signage system around the building, helping visitors find their way around.
- Landscape: 72 variations of plant species were employed for landscaping of the level 4 area in the new design.
- Soundscape: Journeys through the mall are more enjoyable with a new music system continuously playing music tracks interwoven with natural sounds. More details about soundscape will be discussed in **Section 3.6 – Outdoor green space**.

Source: Swire Properties Limited

3.1.5 Professional help

It is important to engage professionals for detailed consultations on the implementation of retrofits at shopping malls and shop spaces. The following is a list of references for getting professional help:

- Authorised persons (AP) and registered structural engineers (RSE) – Appendix A (2)
- Landscape architects – Appendix A (3)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered contractors – Appendix B (1) (4) (5) & (9)

3.2 Building new shopping malls and shop spaces

As discussed in **Section 2.1.1**, natural wetlands and forests, etc. should be avoided for any developments. To secure their natural beauty, our Country Park Ordinance already prohibits development of any kind within our countryside. For more information about different types of development sites for building new shopping malls (e.g. "Greenfield sites" and "Brownfield sites"), please refer back to **Section 2.1 – What makes a building green?**

Building shopping malls and shop spaces on brownfield sites would have fewer impacts to the natural environment. However, it is not always possible to build on brownfield sites only. With the ever increasing demand for housing and supporting facilities, it would be inevitable at times to develop greenfield sites for accommodating the increasing population. For building new shopping malls and shop spaces in new development areas, studies including environmental impact assessment and careful planning together with adequate public consultation should be carried out when planning for greenfield sites

3.2.1 Professional help

It is important to engage professionals for detailed consultations on the development of new shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) and registered structural engineers (RSE) – Appendix A (2)
- Landscape architects – Appendix A (3)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered contractors – Appendix B (1) (4) (5) & (9)

3.3 Neighbourhood

Like all buildings, shopping malls and shop spaces create various environmental impacts on their neighbourhood.

3.3.1 Noise nuisance

Noise is one of the adverse impacts a shopping mall and shop spaces can make on their neighbours. Noise generated by building services equipment serving the shopping arcade needs to be treated at source. Acoustic linings inside the plant rooms and acoustic louvers help reduce the noise level. Expert advice on the application of these acoustic measures is recommended.

Another potential noise nuisance from shopping arcades is the outdoor dining areas, bars and exits or areas near the entrances to cinemas or other entertainment facilities where crowds might gather. These problems cannot be ignored during the planning and design since little can be done afterwards to resolve them.

For the statutory requirement required by the Noise Control Ordinance, please refer to **Section 2.3.3 A – Green related ordinance in Hong Kong**.

GREEN TIPS

How to avoid noise nuisance in shopping malls and shop spaces

Put yourself into another's shoes. Every shopping mall should avoid noise nuisance and it is a very easy task. Here are some tips:

Careful location of noisy areas

Locate noisy areas away from sensitive recipients (like residential buildings), and especially avoid placing open dining courtyards directly underneath residential towers.

Noise absorbing paving materials

Choose paving materials which are noise absorbing. Examples of a better choice of materials:

- Linoleum on concrete (3% better than marble tile)
- Wood flooring on concrete (5% better than marble tile)
- Carpet tiles (sound absorbing) (30% better than marble tile)

Avoid large flat wall

For courtyards or semi courtyards, avoid large flat wall surfaces that might reflect or echo noise.

Provision of canopies

Where permitted by regulations, provide glass or solid canopies which can reduce noise while providing shading/protection against the weather.

Acoustic performance in a shopping mall

Stanley Plaza

Figure 42 Stanley Plaza (Source: The Link Management Limited)

Indoor Vibration Measurement and Equipment Noise Assessment were conducted in the Stanley Plaza, the results of the project comply with the criteria set out in ISO standard and recommended in the Hong Kong Planning Standards and Guidelines. Strategies that the project adapted are:

- Environmentally friendly partition with excellent sound insulation and absorption performance is erected.
- Measures are taken to avoid excessive noise and vibration from building services equipment.

Source: The Link Management Limited

3.3.2 Exhaust nuisance

'No building or fixture thereon shall be so constructed that it permits the escape into or over any adjacent footpath or street at a height of less than 2.5 m of any noxious gases or exhaust from any ventilating system'

- Chapter 123F Building (Planning) Regulation, Regulation 4. [1]

Besides fulfilling the statutory requirement, kitchen exhaust or exhaust from building services equipment, such as chillers, cooling towers or generators, must be treated for any possible exhaust nuisance at source.

Considerations for exhaust nuisance:

Exhausts should be located away from residential buildings, schools, etc. which rely on natural ventilation, and away from air intake louvers of any buildings.

In designing the façade of shopping malls and shop spaces, it is always advisable to design slightly more than enough louvers in its elevation to allow for having more food and beverage tenants in the future.

Shop owners and tenants should plan the location of kitchen exhausts within the controlled zone according to the shopping mall's design and management, and not randomly punching out holes in the walls without consideration of exhaust nuisance.

Shop owners and tenants should have proper mechanical ventilation systems and maintain their premises under negative pressure to avoid unpleasant odours from escaping into the arcade.

Exhausts should be properly treated by an odour removal system such as scrubbers or odour filters, or by having the discharge ducted to the roof where practicable to mitigate odour problems.

[1] The Government of Hong Kong Special Administrative Region (2012). Chapter 123F Building (Planning) Regulation. Regulation 4 Buildings not to obstruct, endanger or cause nuisances.

3.3.3 Light nuisance

The design of façade lighting should cater not only for aesthetics but also for the neighbourhood. A building façade with a vibrant coloured lighting display can create memorable scenery. But when these lights shine through a bedroom window every night, they can become an excessive nuisance for the occupants. Control of timing and careful design are needed to strike a balance.

Another source of light pollution is the lighting for shop signs, displays and advertisements that are usually very bright at street level. These are particularly problematic for residents living on lower floors. Again, controlling time and choosing appropriate light fittings which emit light in restricted directions can reduce the problem.

GREEN TIPS

Ways to minimise light nuisance and energy wastage

Guidelines on industry best practices for external lighting installations

In order to minimise the nuisance and energy wastage that may be caused by external lighting, it is recommended that reference is made to the "Guidelines on Industry Best Practices for External Lighting Installations" issued by Environment Bureau in January 2012. The Guidelines set out best practices for the design, installation and operation of external lighting, covering areas such as the operating hours of lighting installations, automatic controls, light pollution control measures, energy efficiency measures and lighting project design planning. Key points include:

Switch off external lighting after 23:00 or after business hours

Position and aim the lighting properly to avoid over-spilling of light outside, and use shields, baffles, louvers and cut-off features to control light beams whenever appropriate.

Avoid over-illumination of signs, façade, shop fronts and facilities with lighting.

Read more at:
Environment Bureau
The Government of Hong Kong Special Administrative Region. Environment Bureau. (2012). Guidelines on Industry Best Practices for External Lighting Installations. Retrieved 8 April 2013, from http://www.enb.gov.hk/en/resources_publications/guidelines/files/guidelines_ex_lighting_install_eng.pdf

Light pollution assessment

Stanley Plaza

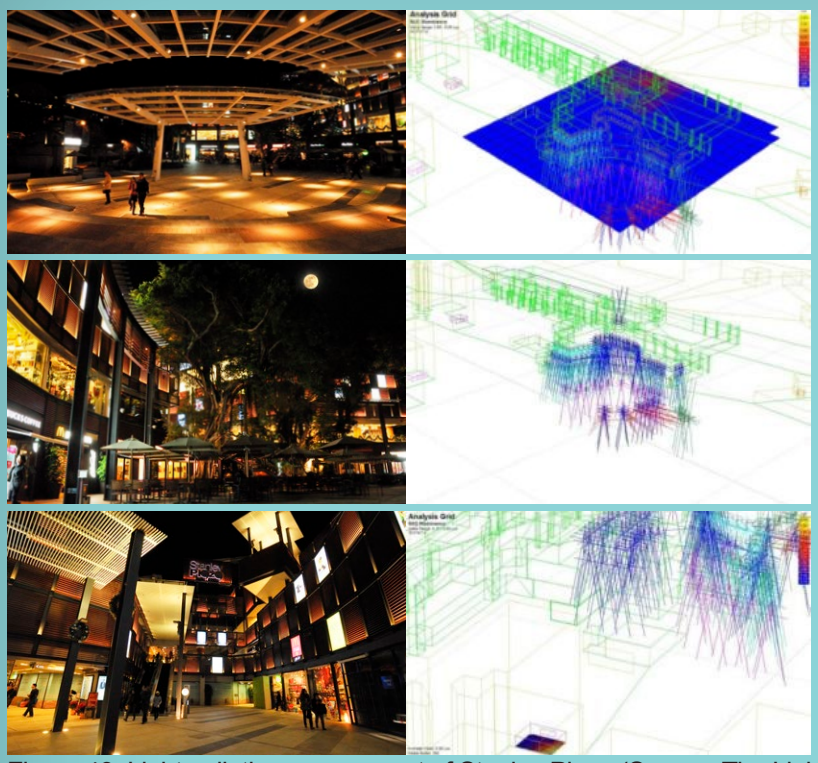


Figure 43 Light pollution assessment of Stanley Plaza (Source: The Link Management Limited)

Light pollution assessment was carried out in Stanley Plaza to evaluate the impacts on its external lighting to the neighbourhood:

- Results show that exterior lightings do not create unwanted and unnecessary light pollution.
- Average values of light into windows at nearest sensitive receivers ranged from 0.36 lux to 1.01 lux.

Source: The Link Management Limited

3.3.4 Creating benefits

A. Noise barrier

Shopping malls and shop spaces are not noise-sensitive recipients. Since a shopping mall usually comprises a low podium block of a few storeys, the shopping mall and shop spaces can be located close to noise sources such as roads with high traffic volumes or railways and become a noise buffer for other buildings on the same site. This strategy has been adopted in many of the Housing Department's public housing projects with excellent results.

B. Focal point in the neighbourhood

Apart from high-end downtown shopping malls and shop spaces which are magnets for shoppers and tourists, local shopping malls and shop spaces, which are smaller in scale and part of the neighbourhood, often serve as more than an agglomeration of shops meeting the community's daily necessities. Unlike the downtown shopping malls and shop spaces, which are less frequently visited during the daytime on weekdays, the local shopping malls and shop spaces are usually full of elderly people or children during office hours. They are sanctuaries from the heat and rain and provide a communal place for the elderly which is close to their homes. The design of these local shopping malls and shop spaces can cater for these special social needs and become a focal point in the neighbourhood. Indoor and outdoor areas for 'hanging around' can be inserted into the public areas of the malls.

3.3.5 Professional help

It is important to engage professionals for detailed consultation on the implementation of site selection and planning for shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Registered architects – Appendix A (1)
- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Acoustic consultants – Appendix A (8)

3.4
Connectivity and transport interface

3.4.1 Site and transportation

For the development of a new shopping mall building, it is important, where possible, to choose a site that is close to the public transportation system such as the Mass Transit Railway or a bus terminus. Where public transportation is not nearby, provision of a shuttle bus service provides shoppers with a convenient means of transportation.

Convenience of public transportation or a shuttle bus service reduces trips by private vehicles, thus reducing traffic congestion around the mall as well as lowering customer frustration. This also reduces the level of air and noise pollution caused by private vehicles.

3.4.2 Connectivity

Figure 44 MTR entrance, directly connected to the shopping mall in Hysan Place, Causeway Bay

Figure 45 Tramway connection, linked to the shopping mall in Pacific Place, Admiralty

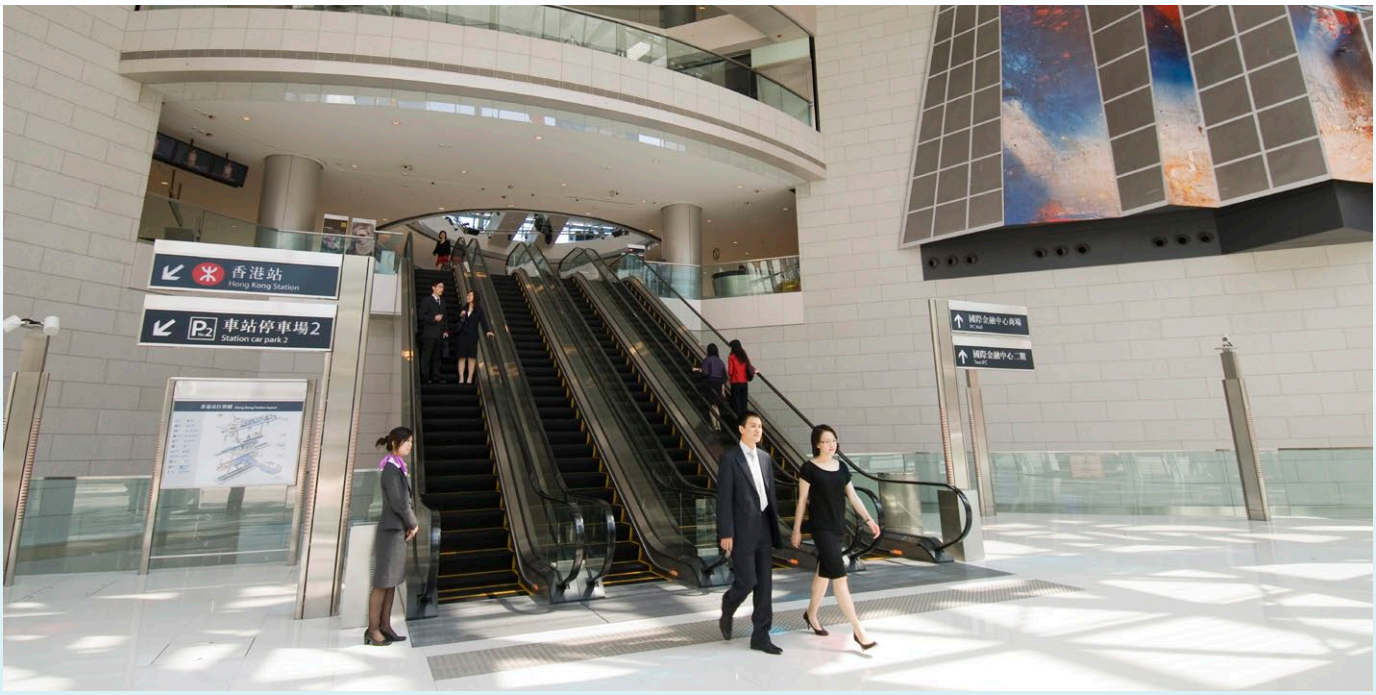


Figure 46 MTR connection entrance, directly connected to the shopping mall in ifc mall, Central
(Source: Photographer, William Furniss)

Connectivity of shopping malls with public transportation is important to enable shoppers to walk conveniently to public transportation. This will encourage shoppers to take public transportation instead of using private vehicles or taxis. It will also help reduce air and noise pollution caused by private vehicles and taxis.

To provide an easy and convenient access to public transportation, shopping mall entrances can be linked with all-weather pedestrian bridges, covered walkways, and direct indoor connections to an MTR station, bus terminus, mini-bus or shuttle bus stops to suit the actual site situation.

3.4.3 Professional help

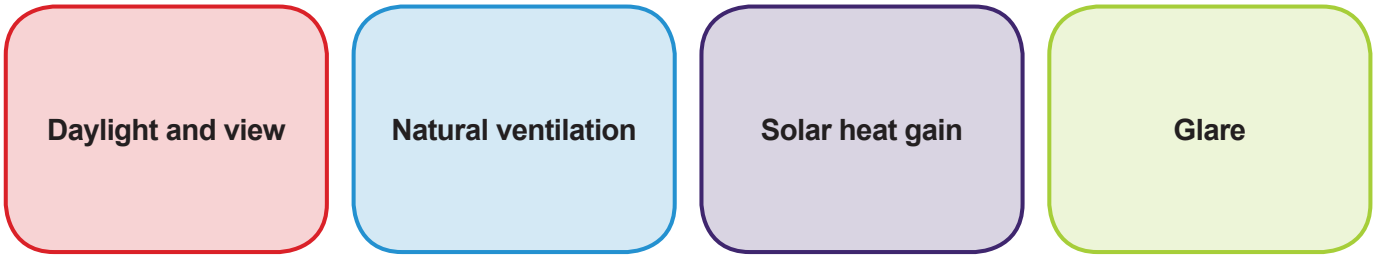
It is important to engage professionals for detailed consultation on the implementation of connections and transport interface at shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered contractors – Appendix B (1) (4) (5) & (9)

3.5 Orientation

Orientation of a shopping mall is a fundamental element to kick start a 'Green' shopping mall and 'Green' shopping spaces. All the energy saving technology and facility management techniques are just complementary tools for any inadequacy in orientation.

Considerations of orientation during design stage:



3.5.1 Daylight and view

Where large glass areas are preferred to daylight and a view, it is important to consider using the north facing façade for large glass windows or glass walls. North facing glass areas will result in less solar heat being gained compared to the glass areas which face another direction.

Figure 47 North facing glass areas of ifc mall, Central (Source: Photographer, William Furniss)

3.5.2 Natural ventilation

To optimise the use of natural ventilation, prevailing wind direction must be determined. This can be done by checking the relevant information on the Hong Kong Observatory's website. It is important to orientate the building so that window openings are located according to the most desirable orientation to capture the prevailing wind for more effective natural ventilation.

3.5.3 Solar heat gain

Orientating the building's long side to face the north and the south while minimising the frontage on the east and west sides will help to minimise solar heat gain by the building.

North facing façades receive the least amount of solar heat. Skylights facing north will also acquire less solar heat. This means that the interior space will not become too hot and that less energy will be used for air-conditioning.

GREEN TIPS

Measures to reduce solar heat gain through orientation

1. **Long frontage facing north and south**
2. **Short sides facing east and west**
3. **Other useful methods: Use low-E glass/Double glazing for better thermal insulation**

3.5.4 Glare

To avoid glare caused by skylights and glass areas, it is important to avoid siting skylights and glass areas to face West. Where the problem of glare is encountered, measures should be taken to reduce glare by adding exterior shading screens or using tinted or fritted glass.

GREEN TIPS

Measures to reduce glare from skylights by orientation

1. **Avoid skylight and glass area facing west**
2. **Other useful means: Add exterior shading screens or use tinted glass or fritted glass**

3.5.5 Professional help

It is important to engage professionals for detailed consultations on the design and planning of the orientation of shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Registered architects – Appendix A (1)
- Authorised persons (AP) – Appendix A (2)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

3.6 Outdoor green space

Provision of an outdoor green space brings benefits to both the shopping mall as well as to the surrounding environment. Outdoor greenery helps reduce the heat island effect and create a more pleasant environment around the shopping mall.

In the congested urban environment of Hong Kong, outdoor green space is also an amenity for shoppers. The outdoor green space enhances the function as well as the attractiveness of the shopping mall.

Considerations of outdoor green space during design stage:

Orientation

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

Maintenance

Figure 48 Outdoor green spaces and shop spaces in Citywalk, Tsuen Wan
BEAM 4/04 new building project – platinum rating (Source: Sino Group)

3.6.1 Design

Design of the outdoor green space should be integrated with the building design of the shopping mall and the functional needs of the shopping mall and shop spaces.

Views from the interior of the shopping mall and shop spaces should also be taken into consideration to avoid the blockage of views or circulation. Other factors such as planter size and suitability of plant species (i.e. “Right species for right place” principle) for long term sustainable growth are also important in the design stage for outdoor green space.

Figure 49 Green wall design as a carpark façade of a shopping mall, Citywalk, Tsuen Wan (Source: Sino Group)

3.6.2 Plants

When deciding on plants to use in outdoor green spaces, designers should take into considerations the ease of maintenance, the tolerance to pollution and vandalism, public safety etc. Native species should be used including in the planting palette as they are more adaptive to the local environment and for biodiversity will be easier to maintain, and require less water for irrigation.

Trees can be introduced at suitable locations to provide shade for the buildings and the pedestrians. However, it is important to avoid any introduction of greenery that will block any shop entrances or hinder access to any shop.

Figure 50 Maintenance of green wall façade in Citywalk, Tsuen Wan (Source: Sino Group)

Water efficient landscaping

Some recommendations for water efficient, drought-tolerant or adapted landscaping are as follows:

Tree		
Botanical name	**Common name**	**Chinese name**
Murraya paniculata	Orange-jessamine	 九里香
Bridelia tomentosa	Pop-gun Seed	 土蜜樹
Polyspora axillaris	Hong Kong Gordonia	 大頭茶
Reevesia thyrsoidea	Reevesia	梭羅樹
Litsea glutinosa	Pond Spice	潺槁樹
Macaranga tanarius	Elephant's Ear	血桐
Mallotus paniculatus	Turn-in-the-wind	白楸
Phoenix loureiroi#	Spiny Date Palm	刺葵
Schima superba	Schima	木荷 (荷樹)
Terminalia mantaly	-	小葉欖仁
Ligustrum sinense	Chinese Privet	 山指甲
Melastoma sanguineum	Blood-red Melastoma	 毛蒽

Shrubs		
Botanical Name	**Common Name**	**Chinese Name**
Rhaphiolepis indica	Hong Kong Hawthorn	石斑木
Rhapis excelsa	Lady Palm	棕竹
Rhododendron simsii	Red Azalea	紅杜鵑
Aglaia odorata	Mock Lime	米仔蘭
Bambusa tuldoides	Verdant Bamboo	青稈竹 (花眉竹)
Ixora chinensis	Chinese Ixora	龍船花 (山丹)

Note#: Due to its spiky leaves, it should be avoided for areas easily accessible by children.

Figure 51 Native species readily available in the market (Source: Agriculture, Fisheries and Conservation Department, Civil Engineering and Development Department)

Specific water saving strategies using irrigation systems for landscape will be further discussed in **Section 7.1.1 – Water efficient irrigation systems**.

TECHNICAL NOTE

Useful information, guidelines and references on urban greenery

Government departments and university institutes suggest lots of useful information, guidelines and references on urban greenery through their websites. Shopping mall developers and shop owners can take more references for the considerations of outdoor green space.

Read more at:

1. **Sustainable Building Design Guidelines**
   The Government of Hong Kong Special Administrative Region. Buildings Department. Practice Note Authorized Persons, Registered Structural Engineers, and Registered Geotechnical Engineers (PNAP) APP 152 – Sustainable Building Design Guidelines. Retrieved 7 August 2013, from http://www.bd.gov.hk/english/documents/pnap/APP/APP152.pdf
2. **Use of Native Plant Species in Public Works Projects**
   The Government of Hong Kong Special Administrative Region. Development Bureau. Use of native plant species in public works projects. Retrieved 7 August 2013, from http://www.greening.gov.hk/en/planting_knowledge/public_work_projects.html
3. **Check Lists of Hong Kong Plants**
   The Chinese University of Hong Kong. Department of Biology. Check lists of Hong Kong plants. Retrieved 7 August 2013, from http://www.hkflora.com/v2/flora/plant_check_list.php
4. **Hong Kong Herbarium**
   The Government of Hong Kong Special Administrative Region. Agriculture, Fisheries and Conservation Department. Hong Kong herbarium. Retrieved 7 August 2013, from http://www.hkherbarium.net/Herbarium/index.html
5. **Hong Kong Flora and Vegetation**
   The Chinese University of Hong Kong. Department of Biology. Hong Kong flora and vegetation. Retrieved 7 August 2013, from http://www.hkflora.com/

3.6.3 Other landscape elements

A. Water features

Water features can be introduced to provide a cooling effect on the shopping mall environment. The sound of water from the water features can create a soundscape which will mask noise pollution from the traffic outside. Water features can also enhance the attractiveness of shopping malls.

Figure 52 Water feature in Citywalk, Tsuen Wan

B. Weather protection

Covered walkways and canopies can be provided in outdoor green spaces to provide weather protection for shoppers. Covered walkways and canopies protect shoppers from the rain as well as shade shoppers from the hot summer sun.

Figure 53 Outdoor landscaping above covered walkways between different phases of the shopping mall development, Olympian City, West Kowloon (Source: Sino Group)

C. Paving

Light coloured paving materials and grass pavers can reduce heat gain. This will reduce the heat island effect in the paved areas of the outdoor green space of the shopping mall.

Recommendations	Examples	
Use of recycled materials or materials that contain a substantial amount of recycled content can reduce the carbon footprint of the shopping mall.	**Paving blocks made from recycled waste glassware and glass containers**	**Paving tiles and paving blocks that have recycled content**
Use of environmentally friendly products that have a less harmful effect on the environment should also be considered.	**Paving blocks which contain an air cleaning agent such as titanium dioxide to help remove air pollutants**	**Wood deck made from timber from a sustainable source**

Shopping mall with improved outdoor environment

Hysan Place

Figure 54 Green spaces at Hysan Place, Causeway Bay

Figure 55 Urban windows at Hysan Place, Causeway Bay

There are several large openings at lower levels of the building. They act as “urban windows” to enhance natural air ventilation and improve the microclimate in the neighbourhood. These openings also provide green spaces to mitigate the heat island effect.

Source: Hysan Development Company Ltd.

Shopping mall with improved outdoor environment

Stanley Plaza

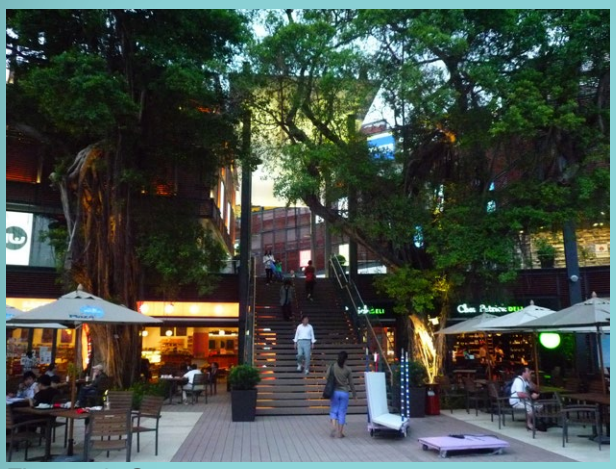


Figure 56 Greenery
(Source: The Link Management Limited)

Figure 57 Green roof
(Source: The Link Management Limited)

Enhancement of the outdoor environmental qualities of Stanley Plaza helps promote the social and cultural value of the site and the surrounding area. It has also created one of the most popular tourist spots.

- The greenery area was doubled after the renovation work.
- 28 existing trees were preserved, of the remaining trees, 16 were transplanted and 12 additional trees were planted.
- The roof top has been used to establish a pleasant green roof; this helps mitigate the heat island effect and enhance air quality. A green roof can also prolong the life of the roof by reducing the thermal extremes and insulation.
- New outdoor seating helps create a relaxing setting for a green lifestyle.

Source: The Link Management Limited

TECHNICAL NOTE

Soundscape in urban open spaces

Soundscape is a sound or combination of sounds that integrates sound, human beings and the sound environment.

Soundscape

- The Introduction of a natural, historical, cultural and social sound environment.
- Soundscape can work perfectly with landscape to enhance the acoustic comfort and harmony of urban open spaces. It is also increasingly a solution to noise control and to reducing the background noise level.

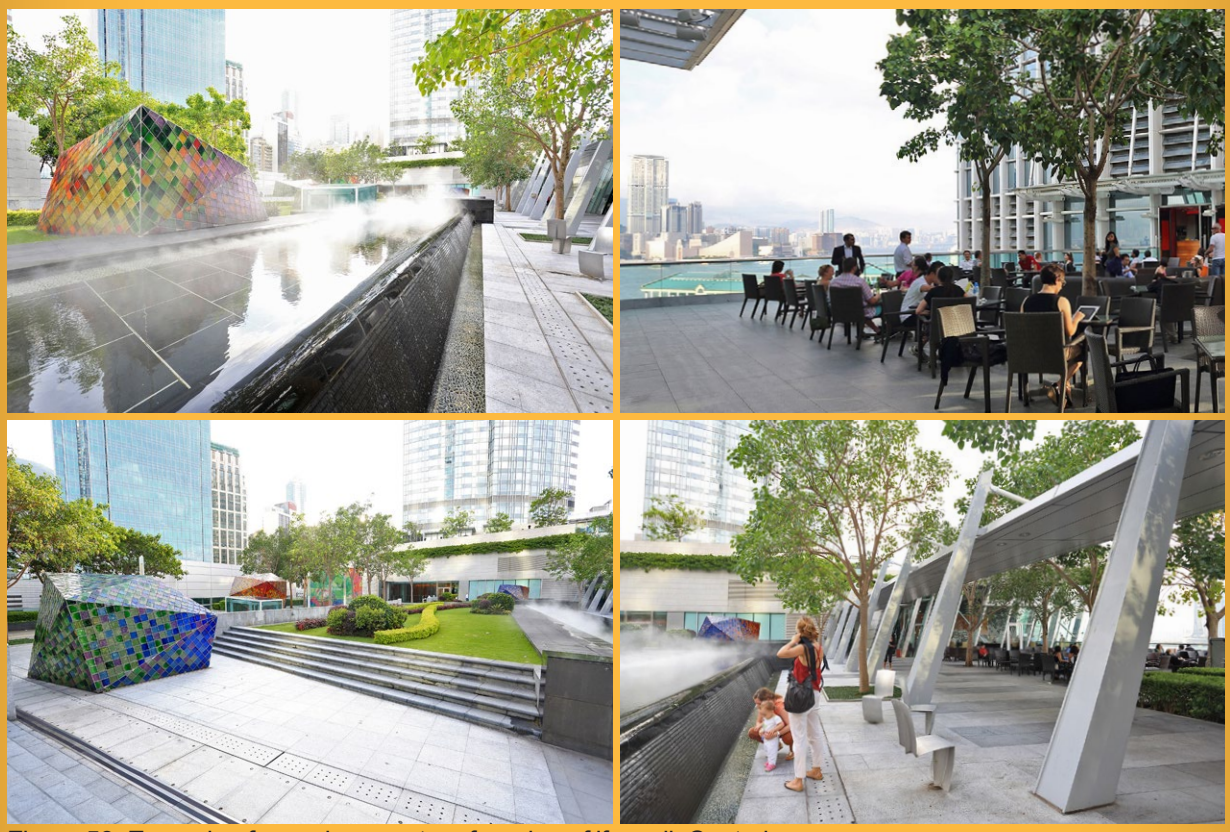


Figure 58 Example of soundscape at roof garden of ifc mall, Central

3.6.4 Professional help

It is important to engage professionals for detailed consultation on the implementation of outdoor green space at shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Landscape architects – Appendix A (3)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered contractors – Appendix B (1) (4) (5) & (9)

3.7 Between air-conditioning and no air-conditioning

Natural ventilation saves energy. When the weather is right, opening the windows to bring in fresh air is welcomed by most people. However, a few important issues must be considered when providing natural ventilation in shopping malls and shop spaces:

3.7.1 Humidity problem

Humidity in Hong Kong is the key deterrent to providing natural ventilation in shopping malls and shop spaces. While the indoor temperature can be increased or decreased slightly through passive design to make it more comfortable or suitable, humidity is extremely difficult to mitigate without any mechanical means. When the outdoor air is warm and humid, condensation will appear on surfaces where the temperature is lower. This condensation might cause sweating on shop windows, slippery floors and even long-term damage, including smells from mould or rotting decorations.

For the above reasons, it does not seem possible to rely on natural ventilation for tenants' areas within a shopping mall and for shop spaces except in the case of outdoor restaurants or displays of outdoor furniture in a furniture store.

The following discussion focuses mainly on providing natural ventilation within the common areas of a shopping mall and shop spaces.

3.7.2 Possibilities for natural ventilation in shopping malls and shop spaces

A. Balcony shopping corridor

A balcony shopping corridor with shops on one side and open to outside air on the other is a common type of permanent naturally ventilated shopping mall and shop spaces in Hong Kong. Excellent connections to the outdoors can be achieved and this arrangement is particularly beneficial in attracting customers or when there are nice views.

Care, however, must be taken on the selection of finishing materials. Non-slip floor finishes are critical since the floor might become dangerously wet with condensation. Shop front design is also needed to prevent the infiltration of pollutants from causing damage to shop goods, decorations, etc. which might not be a problem in air conditioned shopping malls and shop spaces.

B. Courtyards

Outdoor courtyards in shopping malls and shop spaces create interesting spaces and attractions. They provide opportunities for festive functions, alfresco dining and break-out spaces for children and the elderly.

Open-sided courtyards are better than those that are fully enclosed in terms of natural ventilation. To capture more wind, it is advisable to open up the courtyard from different directions and at different levels.

C. Hybrid ventilation

Creating air-conditioned shopping malls and shop spaces that can switch to a natural ventilation mode whenever the weather and population density are suitable seems to be the ideal solution in the context of Hong Kong.

The simplest form of hybrid ventilation is daily adopted by most of us as we turn on the air conditioner when it is hot and open the windows when it is cool. In its application to shopping malls and shop spaces, air conditioning and mechanical ventilation systems are provided alongside operable vents and windows. The two systems work together through a computerised control system to maintain internal comfort while using less energy. Hybrid ventilation uses the natural system most of the time but supplements it with a mechanical system when the required comfort level cannot be reached by the natural system alone. The mechanical system is usually a low-energy fan. Hybrid ventilation still allows occupants to enjoy pleasurable external conditions at any time.

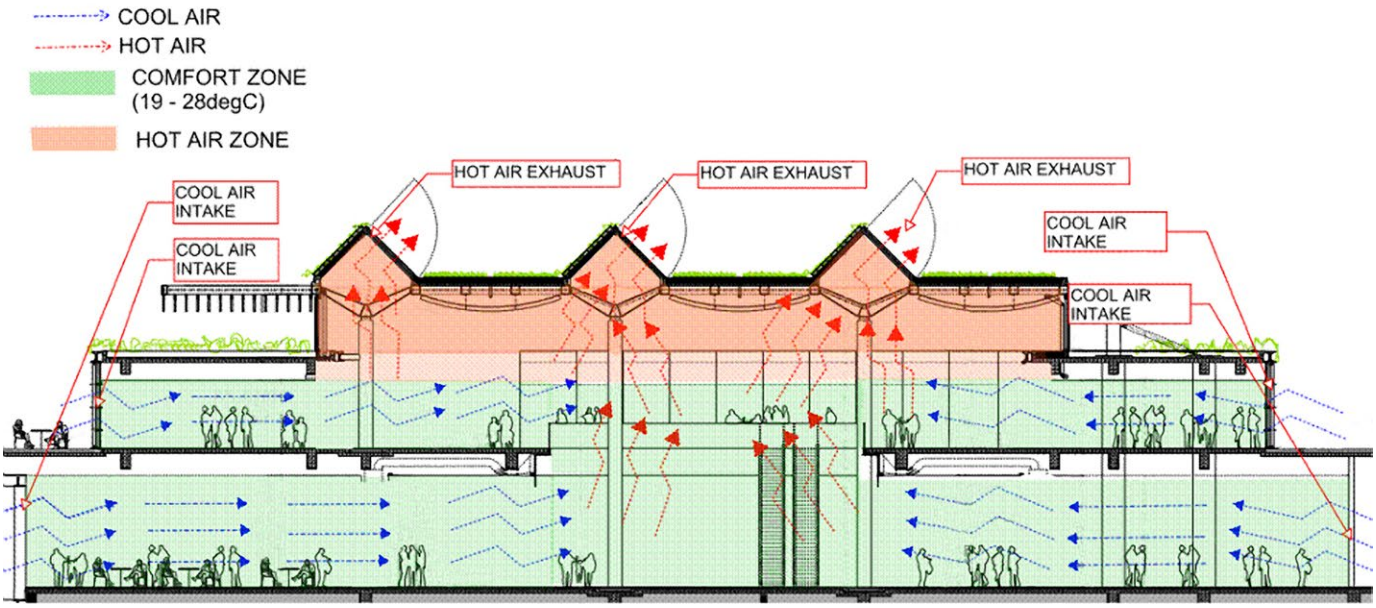


Figure 59 Hybrid ventilation schematic section

3.7.3 Professional help

It is important to engage professionals for detailed consultation on the design and planning of ventilation in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

3.8 Amenities for shopping malls and shop spaces

3.8.1 Parking

Where parking for customers is provided, it is important to provide parking spaces and charging facilities for electric vehicles.

Providing a smart parking system can reduce unnecessary driving of cars around the carpark while looking for empty parking spaces. This will reduce the amount of vehicular traffic, and reduce the pollution emitted by driving vehicles.

Parking guidance system

Figure 60 Parking guidance system
(Source: Kai Shing Management Services Limited)

Electric vehicle charging facilities

Figure 61 Electric vehicle charging facilities
(Source: Swire Properties Limited)

3.8.2 Bicycle parking

To encourage and support shoppers' use of bicycles instead of private vehicles, bicycle parking spaces should be provided at convenient locations at the shopping mall.

Parking layout and circulation should also be planned and designed to provide safe and convenient bicycle paths. Designated bicycle lanes should be introduced where possible. Safe pedestrian routes should also be provided to connect the bicycle parking areas to the shopping mall entrances.

Bike lending service in shopping malls

The Link Management Limited

Figure 62 "Link the Bike" Campaign (Source: The Link Management Limited)

The Link Management Limited launches "Link the Bike" campaigns in shopping malls. It offers bikes for free use if shoppers spend a minimum required amount in the malls. Shoppers can enjoy a healthy and green alternative getting home after a shopping trip.

Source: The Link Management Limited

3.8.3 Making shopping malls family friendly – provision of childcare and children's playrooms

It is important to provide amenities that make shopping malls family friendly. Amenities such as childcare and children's playrooms provide a service that is important for shoppers with young children. Shoppers can then enjoy shopping while their young children can enjoy activities at the childcare centre and in children's playrooms.

GREEN TIPS

Provisions that help make a shopping mall family friendly

- Provide adequate places for parking strollers.
- Provide diaper changing areas in restrooms.
- Provide childcare facilities and children's playrooms in the shopping malls and shop spaces to help families to arrange activities for the children while parents are shopping.
- Provide both quiet and active activities in the playroom to suit the needs of different children.
- Provide adequate fresh air supply and ventilation.
- Provide natural daylight and views to childcare centres and children's play rooms.
- Provide adequate numbers of trained supervisors.
- Avoid using toys and play equipment with materials or parts containing chemicals that may be harmful to children's health.
- Avoid using materials that may be harmful or toxic such as the following:
  - Paint with lead content (See Section "Read more at" Item 1 for more details)
  - Pressure treated wood – arsenic preservative (See Section "Read more at" Item 2 for more details)
  - PVC
  - Formaldehyde
  - Carpets that emit gas
  - Playmats that emit gas

Read more at:

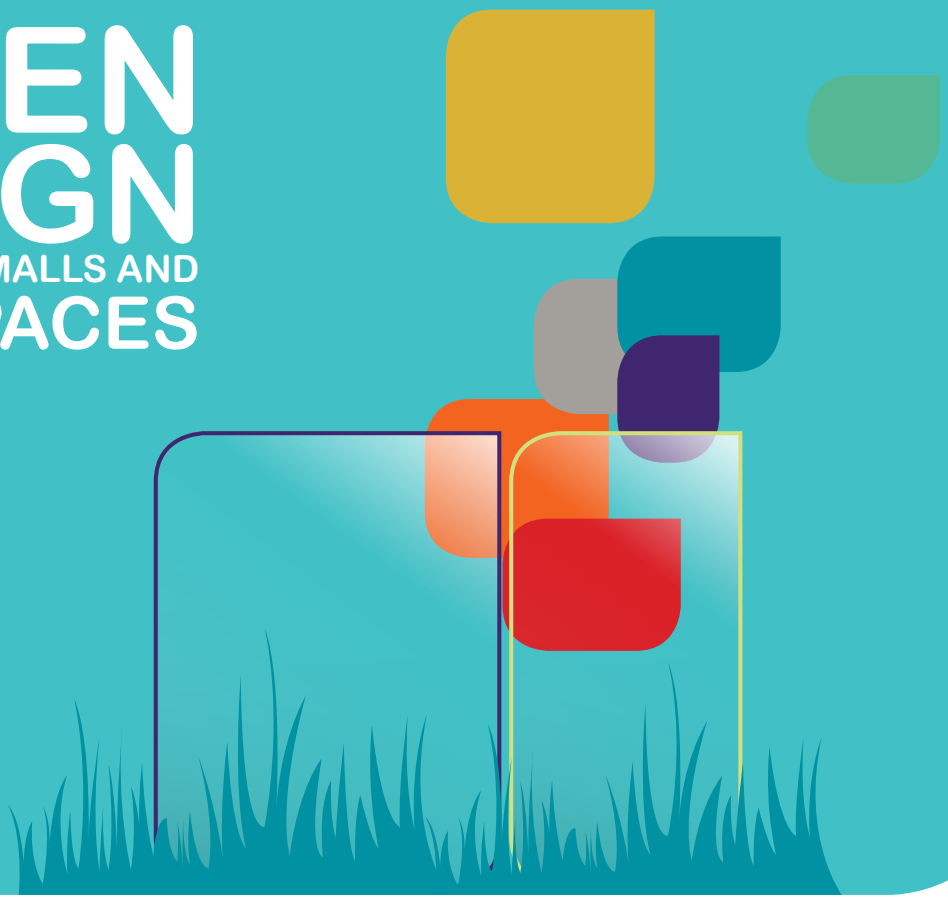
1. **Childcare Facility Painting, Renovation and Repair**
   United States Environmental Protection Agency. (2013). Childcare Facility Painting, Renovation and Repair. Retrieved 8 April, 2013, from http://www.epa.gov/lead/rrp/cofacilities.html
2. **Chromated Copper Arsenate (CCA): Questions & Answers: What You Need to Know About Wood Pressure Treated with Chromated Copper Arsenate (CCA)**
   United States Environmental Protection Agency. (2013). Chromated Copper Arsenate (CCA): Questions & Answers: What You Need to Know About Wood Pressure Treated with Chromated Copper Arsenate (CCA). Retrieved 27 August 2013, from http://www.epa.gov/oppad001/reregistration/cca/cca_qa.htm
3. **Pressure Treated Wood in Playground Equipment**
   The Massachusetts Department of Environmental Protection. (2013). Pressure Treated Wood in Playground Equipment. Retrieved 27 August, 2013, from http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/pressure-treated-wood-use-in-playground-equipment.html
4. **CCA – Treated Wood**
   Agency for Toxic Substances and Disease Registry. (2013). CCA – Treated Wood. Retrieved 27 August 2013, from http://www.atsdr.cdc.gov/CCA-Treated_Wood_Factsheet.pdf

3.8.4 Professional help

It is important to engage professionals for detailed consultation on the design and installation of amenities in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered contractors – Appendix B (1) (4) (5) & (9)

4 GREEN DESIGN FOR SHOPPING MALLS AND SHOP SPACES



The shopping arcade building is like unknown territory in which opportunities for passive design for energy saving should be explored. Careful planning of the arcade and shop spaces and design of the internal circulation can not only enhance the shopping experience but also reduce energy consumption. The design of the building façade, choice of glazing and shading and even the interior decoration will determine whether natural ventilation or natural lighting will be successful.

GREEN TIPS

Professional help

Some of the building professionals that would probably be needed for shopping malls or shop projects include:

- Architects
- Structural engineers
- Building services engineers
- BEAM Professionals (BEAM Pro)
- Building surveyors

For projects involving building works that require statutory approval and consent by the Building Authority, authorised persons and registered structural engineers, and if applicable registered geotechnical engineers, might also be needed. You would need to consult your building professionals.

Readers may refer to **Appendix A** with the contact information of registered professionals and **Appendix B** with the contact information of specialised contractors in different disciplines.

4.1
Retail zoning and circulation planning

The way shops are zoned and the design of circulation within a shopping mall and shop spaces is critical to its success in optimising its energy savings as well as achieving its ultimate green goal.

4.1.1 Zoning

Different programmes in a shopping mall require different opening and closing hours. For example, restaurants open earlier than retail shops because people eat breakfast early in the morning; cinemas close later than restaurants and shops because of late shows. Therefore, a good cinema circulation design has an exit that leads moviegoers directly out of the mall so that operations in the mall and lighting and air-conditioning usage can be stopped at the time when shops and the mall are supposed to be closed. This eliminates the necessity for the mall to maintain its electrical usage beyond its closing time, thus reducing energy consumption. A similar approach can be adopted for restaurants, and in particular Chinese restaurants where banquets might end very late at night.

This arrangement not only saves energy but also reduces costs for security, etc.

General zone:
Shops with normal opening hours

Boutique and shops

Extra-hour zone:
Shops with long opening hours

Ice rink

Food courts

Restaurants

Figure 63 Zoning of programmes with different opening and closing hours

4.1.2 Shopping experience – escalators, lifts, stairs and ramps

Escalators, lifts, stairs and ramps form a vertical circulation path in a shopping mall. Nowadays, low energy consumption variable speed escalators, which go faster only when someone is using them, are very common and widely utilised. New laws require the decoration loading inside lift cars to be lighter so as to reduce the energy required to operate the lifts. Here are some strategies for energy saving by different forms of vertical circulation:

Strategies for energy saving by vertical circulation in shopping malls and shop spaces

A. Escalators

A variable speed escalator reduces its speed when no people are on the escalator, but resumes its operating speed when passengers are detected. Less energy is required without any additional safety and management problems.

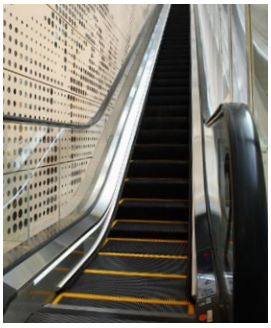


Figure 64 Hysan Place

B. Lifts

The Building Energy Efficiency Ordinance requires that the decoration loading of lift car's interior should be no heavier than 600kg.

(A granite paving slab measuring 1.5m x 1.5m (12mm thick) is approximately 88.5 kg)

Figure 65 Hysan Place

C. Stairs and ramps

Apart from these measures, stairs and ramps can be integrated into the circulation system to provide alternatives for shop goers, indirectly encouraging physical exercise by the public for greener living. There are shopping malls where the shopping corridor system is actually a ramp through which different levels of shops are seamlessly connected. Stairs, apart from being useful for walking up and down, can create spaces for leisure seating and mingling.

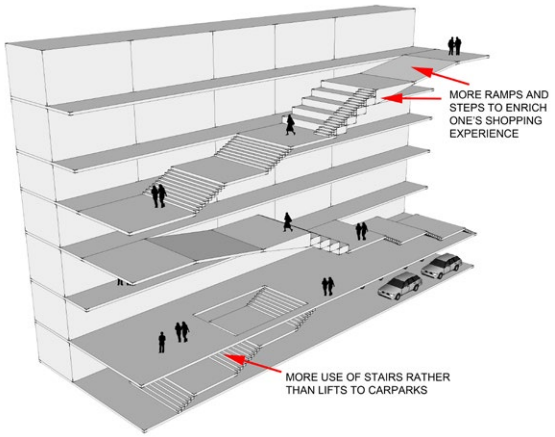


Figure 66 Stairs and ramps in shopping malls and shop spaces

4.1.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of retail zoning and circulation planning within shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Registered architects – Appendix A (1)
- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered Professional Surveyor in the building surveying or property and facility management discipline – Appendix A (9)

GREEN TIPS

Stairs in shopping malls and shop spaces

Tread size in shopping malls and shop spaces

Stairs serving the purpose of shopping mall circulation need to be less steep than the usual fire escape stair. As a rule of thumb for optimum results, tread rise should not be more than 150mm and the shallowest tread depth not less than 300mm. A resting landing should intervene when the number of treads exceeds more than 15 but preferably at 8 to 10 depending on the space available.

Figure 67 Tread size

4.2
Natural ventilation for shopping malls and shop spaces

Naturally ventilated malls imply that the central spaces, managed by the landlord, use natural or hybrid ventilation methods. This system is cost-effective and more sustainable while also maintaining a healthy, comfortable indoor environment. The shops operate off a separate system that provides mechanically cooled or heated air, generally controlled by the tenant. The shops can aid the thermal comfort level of the main space due to the general open-door policy of the shops during shopping hours.

There are some fundamental aspects of natural ventilation for shopping malls that are worth noting.

4.2.1 Stack effect

Heat build-up from poor ventilation

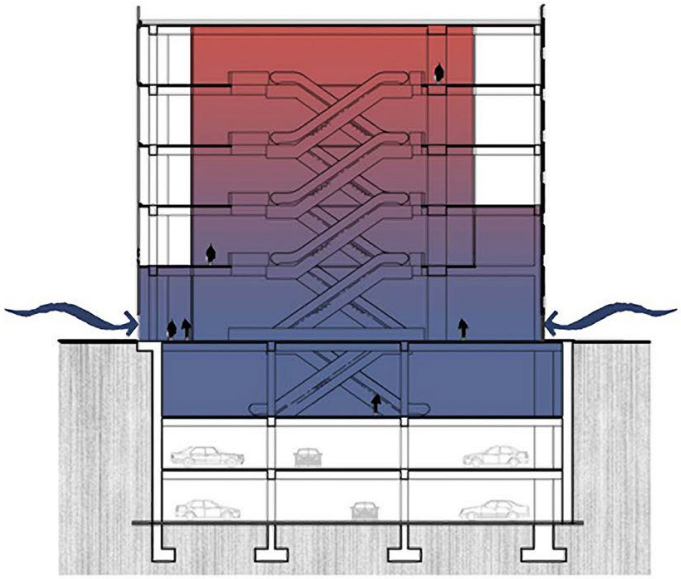


Figure 68 Hot air rising and gathering with no escape

Sustainable natural ventilation design method

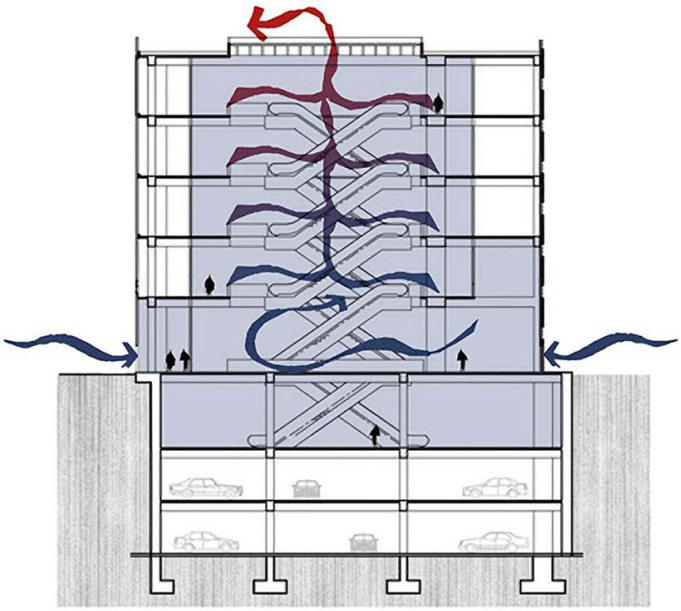


Figure 69 Ventilated skylight for hot air escape

The degree of natural ventilation can be determined by the force of the stack effect, also referred to as the 'chimney effect'. A force is created when air travels into and out of a building, chimney or other enclosure due to the varying air densities. This is due to the differences in temperature and moisture. Cool air is dense and hence heavier, while hot air is less dense and thus lighter. The force of air movement is determined by the extent of the climatic differences and the height of the enclosure. Stack effects are strengthened through solar chimneys, stairwells, shafts and elevators, while being weakened by interior partitions, floors and fire barriers.

A stack effect can be induced in multi-storey shopping malls in which vents are provided at the top and bottom. The temperature difference between the two will cause outdoor air to enter from the bottom and the air heated up by lights, people or daylight indoors to be vented at the top. The indoor temperature and humidity that can be achieved by the stack effect is equivalent to the outdoor temperature at the intake vents. Therefore it is also essential to ensure that the incoming air is not heated by expanses of hard paving or dark coloured flooring material.

4.2.2 Solar chimney

A solar chimney, also referred to as a thermal chimney, strengthens the stack effect by increasing the thermal differences caused by solar energy. Mechanical ventilation can be incorporated into the chimney shaft to maximise the suction effect. In order for the stack effect to have cooling properties, incoming air is guided through ducts at ground level, cooling it down before being ventilated through the spaces. This too will increase the air suction of the solar chimney.

While the design of the chimney may vary, there are common guidelines for its three main components to ensure its effectiveness. The solar heat absorber is dependent on its orientation, surface area and thermal and insulating quality. The chimney shaft is also dependent on its thermal quality and height. The inlet and outlet air apparatus require aerodynamic considerations.

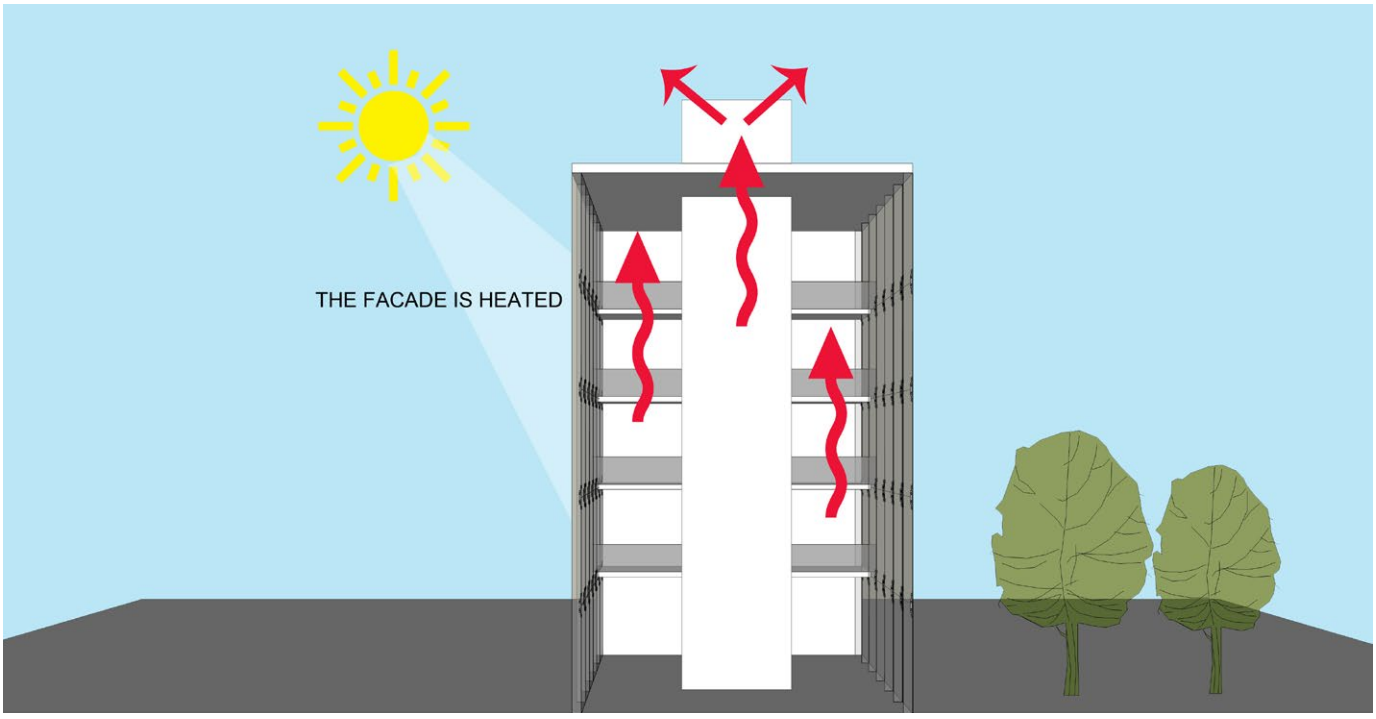


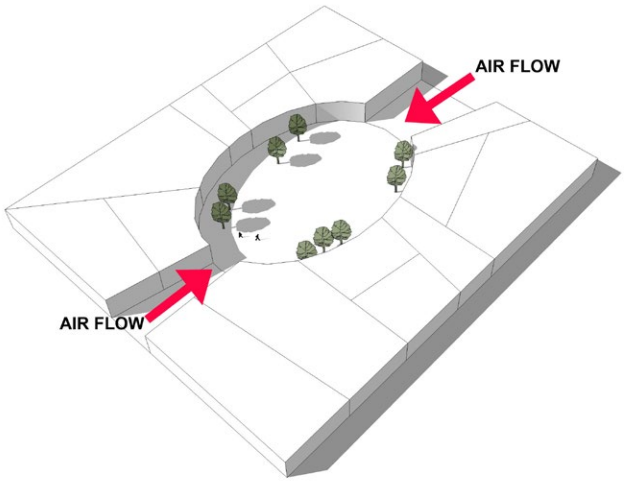
Figure 70 Principle of stack effect of a solar chimney

4.2.3 Prevailing winds

Another source of natural ventilation is the prevailing wind. Positive pressure is created on the windward side of the building so that, due to the equalising pressure, air is driven through openings. The negative pressure on the leeward side creates a suction that draws the air through the openings.

Design methods to enable prevailing summer winds to induce a stack effect include high leeward-side-openings and low windward-side openings, avoiding their being positioned directly opposite each other. Another method is to locate a ridge vent or even a vented skylight perpendicularly to the summer winds.

Shopping mall design with cross ventilation in 2 directions



Shopping mall design with cross ventilation in 4 directions

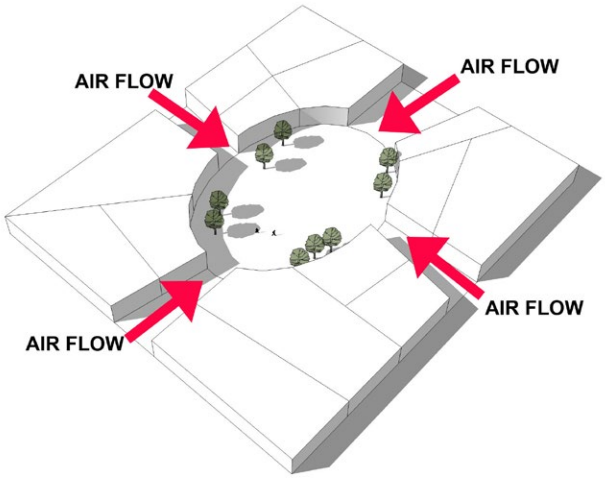


Figure 71 Designs using prevailing winds to assist in natural ventilation

GREEN TIPS

Importance of shop front continuity when considering natural ventilation

Maintain shop front continuity

When designing a shopping mall, business and operational needs must be considered. Shopping mall owners and tenants usually prefer continuous shop fronts to enhance business and customer traffic to shops. It is very important that shop front continuity should be maintained in the design of the shopping mall when openings are introduced to enhance natural ventilation in shopping malls.

Examples of some strategies to maintain shop front continuity at locations where openings have been created to enhance natural ventilation:

- Locate shop tenants who will benefit from an open plan layout at the location where windows or doors will be opened to the outside, such as a cafeteria or coffee shop connected to an outdoor seating area.
- Locate shop kiosks which do not need a full height wall as a shop front next to the wall openings. This will allow air ventilation to flow above and around the kiosks while allowing shopping activities to continue.
- Locate openings at the normal break out points such as the corridors leading to washrooms.
- Wall openings or louvers for natural ventilation can be located at high level, above the door height or at higher levels.
- Consider placing signage, advertisement or display showcases that do not need full wall height where wall openings for natural ventilation have been placed above at a high level.

4.2.4 Microclimate – tempering the intake air temperature

Even when the humidity is right, it is not possible to adopt natural ventilation when the outdoor air is very hot. To increase the chance of success in a naturally ventilated shopping mall, it is necessary to 'cool down' the air near the building. Special attention should be paid to the microclimate surrounding the shopping mall building.

Depending on its colour tone, temperature of external paved surfaces can reach up to 75°C or even more on a hot sunny summer afternoon. Air travelling over these hard paved areas picks up the heat and transfers it to the building during natural ventilation. This is not desirable. The following are a few methods to avoid this:

Strategies for cooling in the microclimate of shopping malls

A. Cooling by greenery

The temperature of living plants and grass is always below 37°C. Proper planting of canopy trees provides shade, which reduces heat gain, and evapotranspiration of plants helps cool the air intake to the building.

Compared to a concrete pavement, a landscaped area is always cooler. Breezes blowing across landscaped areas before entering the building will bring in cooler air compared to those the blow across a simple hard paved area. Green walls will also provide a similar benefit.

Figure 72 Green wall in Citywalk, Tsuen Wan (Source: Sino Group)

B. Cooling by evaporation

Evaporating water also takes away heat from the atmosphere. This is the additional value of a water feature apart from its visual aesthetic. Apart from water features, there are also successful examples of integrating permeable hard paving material with a built-in water supply system where water is evaporated through the hard-paved surfaces during hot summer days. This system requires careful engineering design for optimum performance with minimum energy consumption. As with water features, harvested rain water or recycled grey water should be used to avoid excessive consumption of potable water.

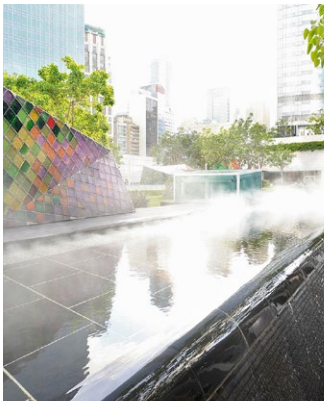


Figure 73 Water mist systems in ifc mall, Central

C. Cooling by creating shading

Where regulations and gross floor area permit, using building elements to create shading can also lower the temperature around the building.

Figure 74 Canopy in Citywalk, Tsuen Wan (Source: Sino Group)

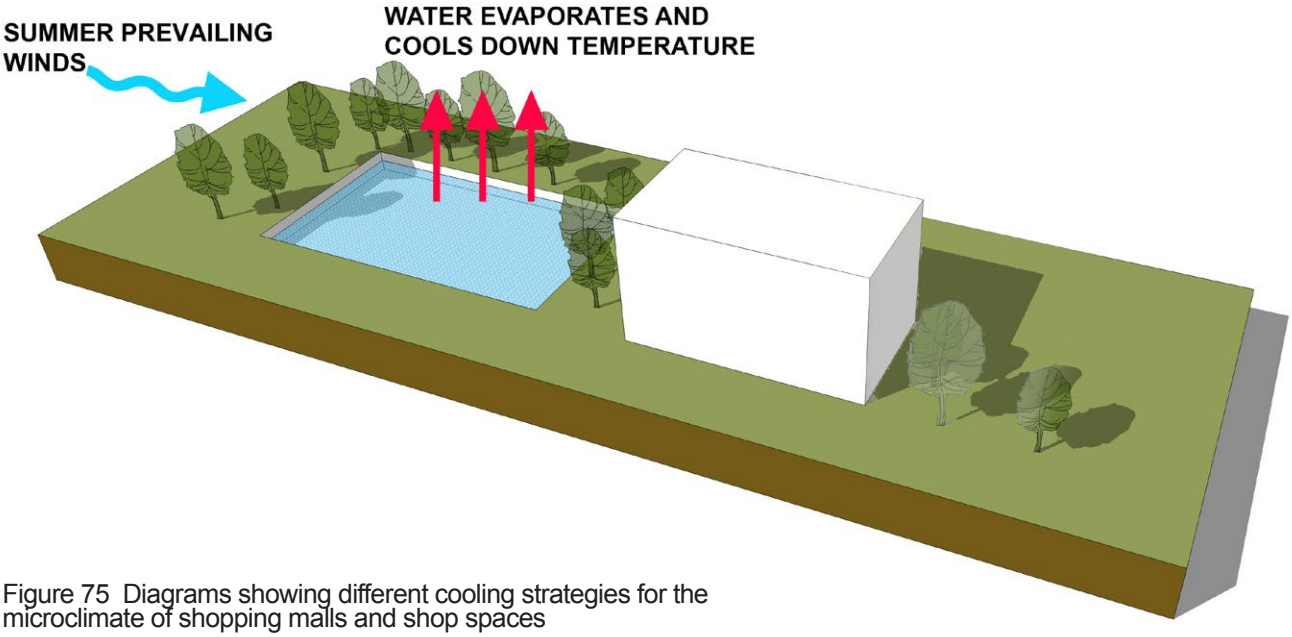


Figure 75 Diagrams showing different cooling strategies for the microclimate of shopping malls and shop spaces

TECHNICAL NOTE

Advanced green measure: Wind catcher

In micro-climates where openings are not directed towards prevailing summer winds, wind-stimulated ventilation can be achieved by incorporating wind catchers into window casements to steer wind into or out of a space.

Figure 76 Windcatcher in ZCB (Source: ZCB, Construction Industry Council)

Water-retaining pavement

Marunouchi Park Building, Japan

Benefits:

The water retained in the pavement can have an evaporative cooling effect on the air blowing towards the building. As a result, temperature all-around of the building can be cooled down, and its occupants can enjoy cool breeze inside.

The adoption of rainwater-using water-retaining pavement:

Water-retaining pavement is adopted for part of the courtyard, and on fine days in summer, water is supplied from the feed-water pipe installed beneath the pavement.

Source: Obayashi Corporation Technical Research Institute, Sony City Osaki

GREEN TIPS

Placement of greenery should respect the shop front

When designing a shopping mall, business and operational needs must be considered. Visibility of and accessibility to all shops are important. Greenery introduced outside or inside the shopping mall should not block any shop fronts. Blockage to shop fronts can be avoided by proper selection of plant type and placement of greenery.

Outdoor greenery:

- Avoid introduction of greenery that will block shop fronts from view or reduce access to the shops.
- Avoid planting trees directly in front of shop fronts or interrupting the movement of shoppers.
- Avoid placing raised planters in front of shop fronts.
- Avoid placing greenery at locations that may interrupt movement of shoppers.
- Allow overhead and underground spaces for tree planting.
- Check out the mature size of plant species, in particular trees to avoid over pruning in the future.

Indoor greenery:

- Avoid the introduction of greenery that will block the shop front from view or reduce access to shops.
- Avoid placing greenery at locations that may interrupt the movement of shoppers.
- Avoid placing indoor planters directly in front of shop fronts.

Alternatives for cooling the intake air temperature in lieu of greenery:

- Evaporative cooling – consider the use of permeable hard paving material with the built-in water supply system where water is evaporated through the hard paved surfaces during the hot summer days.

4.2.5 Professional help

It is important to engage professionals for detailed consultation on the design of natural ventilation at shopping malls and in shop spaces. The following is a list of references for obtaining professional help:

- Registered architects – Appendix A (1)
- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered Professional Surveyor in the building surveying or property and facility management discipline – Appendix A (9)

4.3
Natural lighting in shopping malls and shop spaces

Introducing natural daylight to the interiors of shopping malls enhances spatial qualities and creates a visual connection directly or indirectly to the outdoors that is enjoyed by most people. When designed properly, natural daylight can replace artificial lighting and therefore provide savings in lighting energy consumption.

The means to allow daylight indoors while providing direct visual contact with the outdoors include windows, glass façade and skylights. Other devices including light tubes or light shafts that only transmit daylight for luminance. In this section, we will focus on the windows, glass walls and skylights only.

Shopping mall with natural lighting

Stanley Plaza

Use of wood tone blinds-shaped exterior & minimisation of perimeter wall

Figure 77 Wood tone blinds
(Source: The Link Management Limited)

Figure 78 Recessed perimeters
(Source: The Link Management Limited)

Stanley Plaza, awarded the BEAM platinum rating and being one of the finalists of the Green Building Award 2012, demonstrates the application of natural lighting design:

- Use of a wood tone blinds-shaped exterior and minimisation of the perimeter wall to maximise the use of natural lighting and utilise natural breezes near the seafront help reduce solar heat gain.
- Retail shops and corridors that are the most frequently occupied during the daylight hours are placed to the south.

Source: The Link Management Limited

4.3.1 Avoiding excessive heat gain

A fundamental consideration in designing a window or skylight for natural daylight in Hong Kong is to avoid excessive heat gain that might result from the opening. Sunlight comes with heat. When a lot of sunlight enters the building it can bring in sufficient heat to cause the 'greenhouse effect'. Indoor temperatures will rise significantly causing the air conditioning system to work harder to achieve the required comfort level. To limit the heat gain when bringing in sunlight, the following need to be considered:

A. Size of window or skylight

When determining the size of the opening, it is essential to distinguish between the need to see outside and the requirement to allow daylight to enter. Windows for viewing need to be of a certain size to be useful, but the same does not apply to skylights. The larger the opening, the more light and heat that enters. With proper internal reflective devices, correct finishing materials and colours, a small skylight can actually provide an impressive daylighting effect.

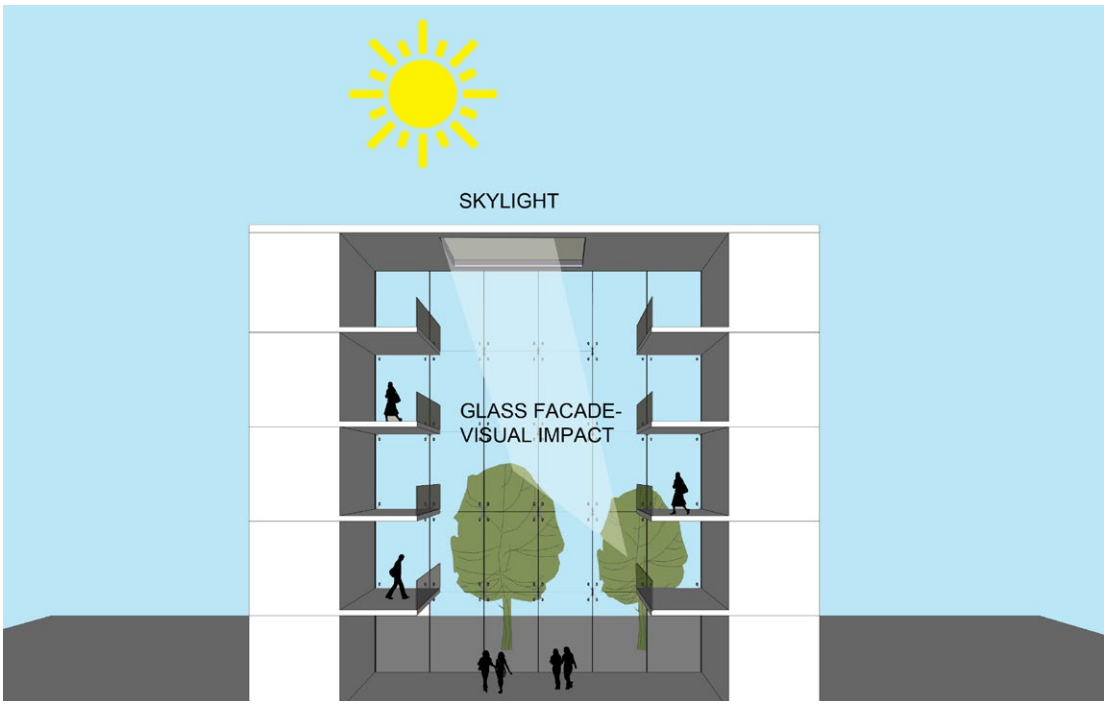


Figure 79 Design balancing size of skylight with daylight and heat gain

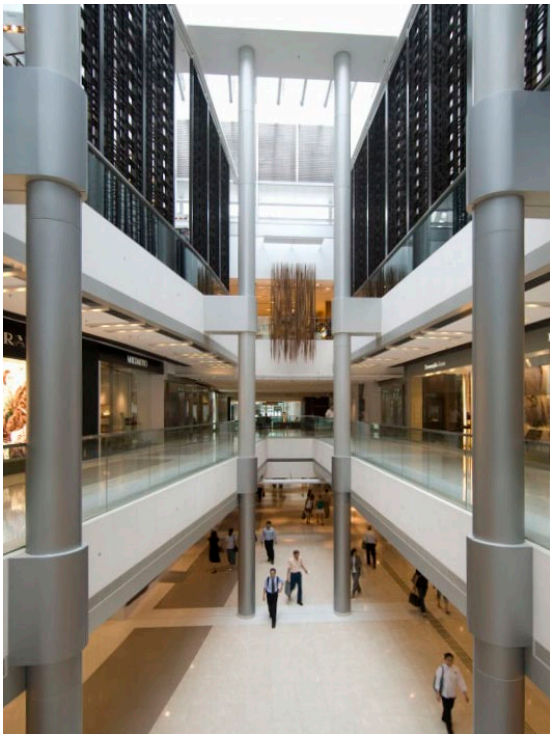


Figure 80 Effect of skylights in ifc mall, Central (Source: Photographer, William Furniss)

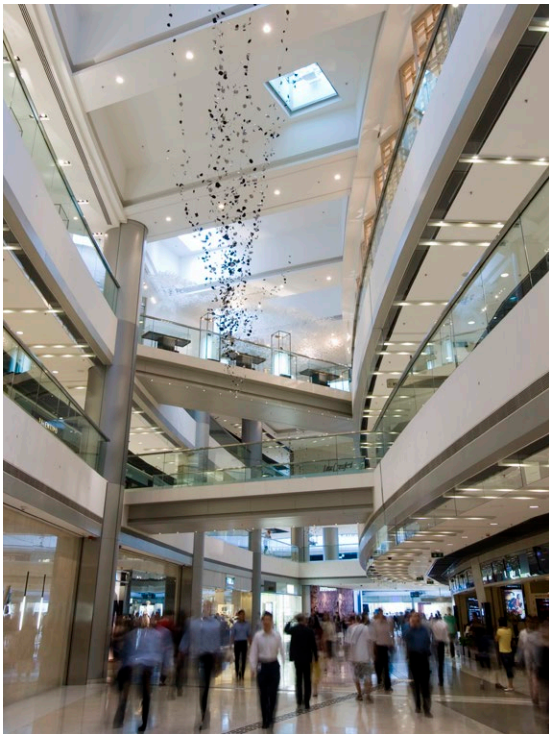


Figure 81 Effect of skylights in ifc mall, Central (Source: Photographer, William Furniss)

B. Type of glazing

Solar radiation contains a wide spectrum of wavelengths from infra-red (heat) through visible light to ultra-violet (UV). Modern technologies can produce glazing with coatings that allow the glass to transmit only the visible light part of sunlight while blocking most of the infrared heat (low-e coating). A careful selection of glazing material can largely reduce heat gain in the interior of a building.

Sometimes the public is confused and believes that the application of 'double glazing' can provide a solution to heat problems. That depends. Double glazing refers to two pieces of glass which are a few millimetres apart forming a glazing panel for use in windows or curtain walls. Sometimes air, an inert gas or a vacuum exists between the glass panes. This type of double glazing provides insulation properties – it is useful for saving air conditioning or heat energy when a large temperature difference needs to be maintained between the exterior and the interior. The glass used in double glazing may or may not have the required coating described above.

Double glazing can also be mixed up with 'double window' where two windows are installed one behind the other, usually 100mm apart, providing excellent insulation against traffic or railway noise. The construction of double windows has little impact on solar transmission and thermal insulation properties. These will depend on the type of glass used in the double window.

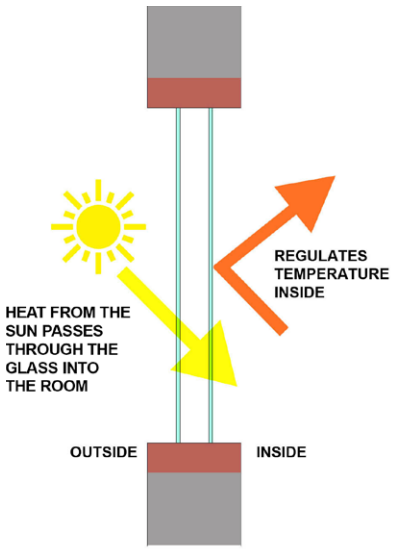


Figure 82 Principle of double glazing

C. Glazing with pattern

Some glazing products have a pattern on their surface so that the glass is not totally transparent. By reducing its transparency, the amount of light and heat that can pass through the glass is also reduced.

Figure 83 Fritted glass pattern of the skylights at Pacific Place, Admiralty (Source: Swire Properties Limited)

D. Orientation and shading devices

Daylighting comes primarily from diffused daylight (from all directions) and much less from direct sunbeams. In daylighting design, direct sunbeams should be blocked as much as possible because they carry much more heat and create other problems such as glare and strong reflections.

Horizontal skylights have the biggest problem with direct sunbeams. A classic approach to skylight design is to have a vertical skylight facing north. Otherwise, features such as deep mullions or shading devices should be employed to limit the intrusion of direct sunbeams.

Shading devices should be designed according to their orientation for optimum results. Properly designed external and internal shading devices have a similar effect in blocking direct sunbeams. External shading is less likely (as well as being more expensive) to be adjustable as it is a permanent fixture and in place even when the sky is gloomy. Internal shading devices are more easily adjustable and can respond to any outdoor conditions. However, if the shading device is heated up, it will block the sunlight and emit the heat. External shading will emit the heat into the atmosphere without affecting the interior. When the sun is strong, ultimately, a large part of the solar energy absorbed by the internal shading devices will be emitted indoors and require the air conditioning system to counter it.

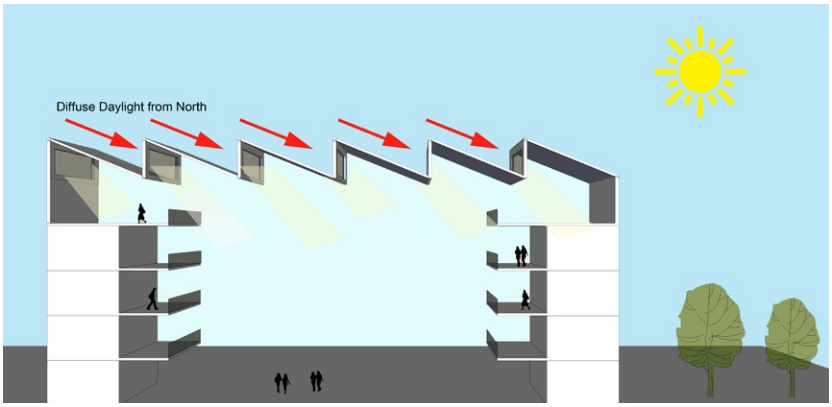


Figure 84 Example of design to block excessive direct sunlight and to allow defused daylight from skylight facing north

Figure 85 Shopping spaces with diffused daylight design, Citygate Outlets, Tung Chung (Source: Swire Properties Limited)

4.3.2 Reflection and glare

Reflection of light by shop front windows prevents shoppers from seeing the shop's interior and therefore should be avoided in shopping malls. A shopping corridor with untempered daylight penetration can reach a luminance level up to 1000 lux during a very bright and sunny day even when no direct sunbeam problems exist. Shops become very dark compared with the mall corridors. It is therefore essential to control daylight penetration, especially along corridors in front of shops.

Glare is another problem that requires special attention. Direct sunlight creates glare. Glare along a mall corridor where people would not stand for long is sometimes tolerable though not desirable. However, glare in the atrium, seating areas or within a tenant's shop area must be totally avoided. Since the sun's path is totally predictable, the problem can easily be resolved by using suitably positioned shading devices. As discussed above, adjustable shading devices provide better results as they can be pulled away when the day is gloomy to allow more daylight in. However, such devices are usually more expensive than fixed types. They also require careful control by the mall management and regular maintenance for them to function properly.

Relationship between different finishes and quality of daylighting:

A

Dark colour provides little reflection. If dark colour finishing materials are placed next to windows or skylights, a large contrast in brightness between the light source (the glazing area) and the surroundings will result. Visually, all surfaces except the light source become dark and black in colour and become very uncomfortable to look at. Unless there are special effects to be achieved through the brightness contrast, dark colour finishing should be avoided near the sources of daylight.

B

Glossy finishing as in mirror finish stainless steel, glass cladding and polished granite, etc. provides good reflection. However, since the surface is glossy, the reflection is directional, meaning you only see the reflection of the light source at the correct angle, and, when you do, it is almost as bright as the source. Glossy materials are not very useful in enhancing the daylighting qualities indoors, as they simply repeat the source through direct reflection without diffusing and tempering the light.

C

Light colour on a matt or rough surface provides diffused reflection. Sunlight is reflected in all directions creating a diffused effect. Light matt finishing next to a daylight source will appear white instead of black and dark, and the tempered contrast is more comfortable to the eye. Since light is diffused, it provides a better colour rendering in the interior with a more average luminance level.

GREEN TIPS

Classic approach to design for daylighting – reflected daylight

A classic approach to design for daylighting is to rely totally on reflected daylight and minimise direct linkage between the skylight and the interiors.

Sometimes reflectors doubling as shading devices are placed underneath skylights. Deep mullions, ceiling and wall finishing of light and matt surface help diffuse the daylight indoors and become the light source themselves. Moreover, their surfaces can decorate with reliefs of different shapes, sizes and depths to produce interesting visual effects through light and shade.

Figure 86 North facing skylight and shading devices in ifc mall, Central

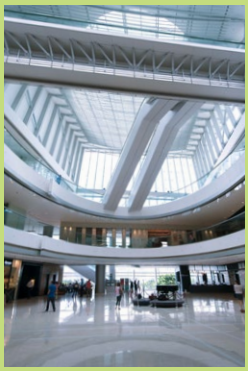


Figure 87 Effect of natural lighting at the atrium in ifc mall, Central
(Source: Photographer, William Furniss)

4.3.3 Seating arrangement and daylight

Designing for restaurant seating requires the location of natural daylight to be taken into account when it is available. Seating arrangements with one side facing and the other side backing onto an external window is undesirable, as a person will become backlit against the window and cause discomfort to the person looking at them. A much better arrangement is to have seating perpendicular to windows so that both sides enjoy external views without any glare problem. The same rule applies to designing other seating areas.

Figure 88 Restaurants with seats next to windows, Festival Walk, Kowloon Tong (Source: Mapletree Greater China Property Management Limited)

4.3.4 Professional help

It is important to engage professionals for detailed consultation on the design of natural lighting in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Registered architects – Appendix A (1)
- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered Professional Surveyor in the building surveying or property and facility management discipline – Appendix A (9)

4.4 Indoor landscaping

As shopping malls provide mainly an indoor shopping environment, the provision of indoor landscaping is an important consideration. It is an important amenity within the shopping mall. When appropriately designed, indoor landscaping will enhance the shoppers' shopping experience, and provide visual enhancement as well as improve the indoor air quality which can provide a healthy environment.

Figure 89 Indoor landscaping and skylights, Pacific Place, Admiralty

4.4.1 Design considerations

The functional layout of the shopping mall should be considered when indoor landscaping areas are introduced. The locations for indoor landscaping areas should not disrupt the shopping experience or block shoppers' access to shops.

Indoor landscaping areas should be placed under skylights or near windows to optimise the use of daylight for indoor plants where possible. Use of daylight will also reduce energy use due to the reduction in using artificial lighting.

Water features can be introduced to provide a cooling effect and soundscape. The design of water features can also bring a theming character to the shopping mall.

Sitting areas can be provided in the indoor landscaping areas as an amenity for shoppers to enjoy, which can also increase the attractiveness of the shopping malls to shoppers.

Indoor landscaped areas can also be designed to integrate with the seating areas of restaurants, cafés and food courts. With an appropriate design, indoor landscaping areas can enhance the function and the attractiveness of these eating outlets.

4.4.2 Materials

Environmentally friendly materials should be used where possible and practical. The following aspects should be considered when choosing materials (refer to **Section 4.5** for details):

- Recycled content
- Regional materials
- Rapidly-renewable materials
- Certified wood products
- Reduced PVC content
- Low-emitting materials

The use of light coloured finishing materials will help reflect light more efficiently and reduce the need for the number of artificial light fittings and the intensity of lighting required to achieve a sense of brightness.

Figure 90 White canopy and wooden deck design for the indoor landscaping, China Hong Kong City, Tsim Sha Tsui (Source: Sino Group)

4.4.3 Plants

When plants are selected for indoor landscaping areas, the following considerations should be noted:

- Plants that can reduce pollution and increase oxygen supply should be used where possible.
- Indoor plants that are potentially toxic when ingested should be kept away from areas that are easily accessible by young children.
- If a green wall is used, low maintenance options should be considered where possible.
- Regular maintenance by a landscape contractor should be arranged for continual maintenance of the plants to ensure that they are growing healthily.
- For potential toxic plants, apart from keeping away from the reach of the children, we suggest that warning signs should be placed to alert other people including vegetation management/maintenance staff and workers.

GREEN TIPS

Care of indoor plants and the importance of full daylight spectrum for healthy plant growth

Common indoor plants are normally more shade tolerant and require less water compared to outdoor plants.

Daylight will help indoor plants to grow healthier. As such, it is best to place indoor plants under skylights or near glass exterior walls or windows where possible.

When artificial lighting is used, light fittings which provide full daylight spectrum should be used to encourage the plants to grow healthily.

Regular rotation of indoor plants is advisable so that the plants can have a healthy growth on all directions.

Indoor plants that can help to improve indoor air quality

Indoor plants are a great help in improving indoor air quality. Here are some references for choosing indoor plants which help remove VOC:

Examples of indoor plants that improve indoor air quality

Ficus benjamina
(Weeping Fig)

Figure 91 *Ficus benjamina* (Weeping Fig)

Nephrolepis exaltata
(Boston Fern)

Figure 92 *Nephrolepis exaltata* (Boston Fern)

Spathiphyllum floribundum
(Snow Flower)

Figure 93 *Spathiphyllum floribundum* (Snow Flower)

Guzmania sp.

Figure 94 *Guzmania sp.*

Hedera helix
(Ivy)

Figure 95 *Hedera helix* (Ivy)

Epipremnum aureum
(Ivy-arum)

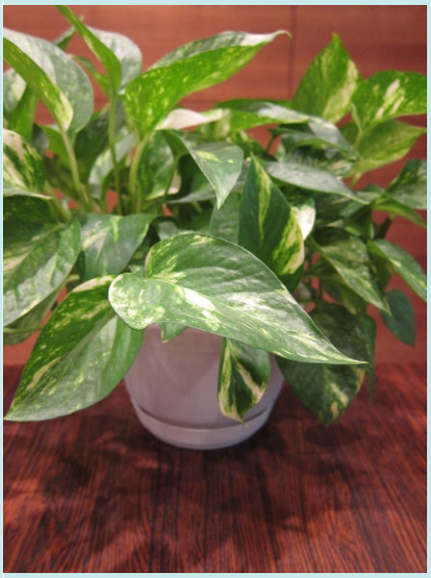


Figure 96 *Epipremnum aureum* (Ivy-arum)

TECHNICAL NOTE

Different indoor plants have different abilities to help improve indoor air quality

The ability to improve indoor air quality varies between different indoor plants.

A number of reference materials are available for selecting indoor plants that can help to improve indoor air quality.

Read more at:

1) Wolverton, B.C. (1997). How to Grow Fresh Air: 50 House Plants that Purify Your Home or Office. Middlesex: Penguin Books.
2) Environmental Protection Administration Executive Tuan, R.O.C.(Taiwan) (n.d.). Application and Management of Indoor Air Purification Plants. Retrieved 2 April 2013, from http://ivy1.epa.gov.tw/air/object/淨化室內空氣之植物應用及管理手冊.pdf
3) Wolverton, B.C. (1997). Eco Friendly Houseplants: 50 Indoor Plants That Purify the Air. London: Weidenfeld Nicolson Illustrate.
4) Dong Sik Yang, Svoboda V. Pennisi, Ki-Choel Son, Stanley J. Kays. (2009). Screening Indoor Plants for Volatile rganic Pollutant Removal Efficiency. HortScience 44(5):1377-1381. Abstract retrieved from http://hortsci.ashspublications.org/content/44/5/1377.full.pdf+html
5) Kim KJ et al. (2010). Variation in Formaldehyde Removal Efficiency among Indoor Plant Species. HortScience 45(10):1489-1495. Abstract retrieved from http://hortsci.ashspublications.org/content/45/10/1489.full.pdf+html

4.4.4 Professional help

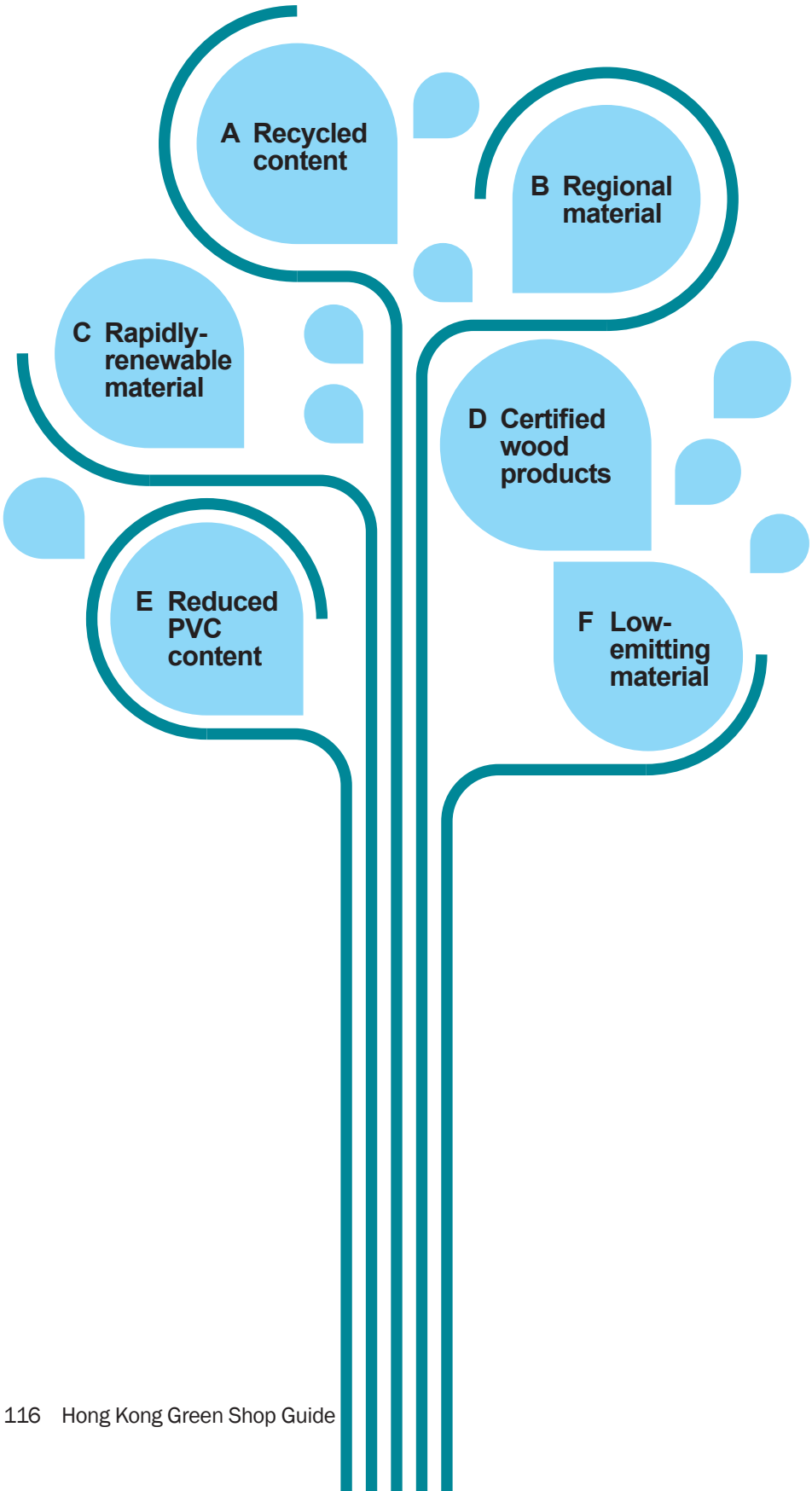
It is important to engage professionals for detailed consultation on the implementation of indoor landscaping in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Registered architects – Appendix A (1)
- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Landscape architects – Appendix A (3)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

4.5
Material selection

When selecting materials for shopping malls and shop areas, owners and tenants should consider aesthetics, function, maintenance and financial issues. However, environmentally friendly material selection is also important as this contributes to occupants' health, a building's sustainability, as well as the Earth's well-being. The following are the six main green aspects to be considered in material selection for shopping malls and shop areas:

Six green aspects for shopping mall & shop spaces material selection



GREEN TIPS

Check out each category

Remember this is a checklist of considerations. Do not just to fulfill one item and forget the others during selection. For example, some of the materials in the 'Rapidly Renewable Material' category are less green in the other aspects.

HKGBC Green Building Product Listing Service

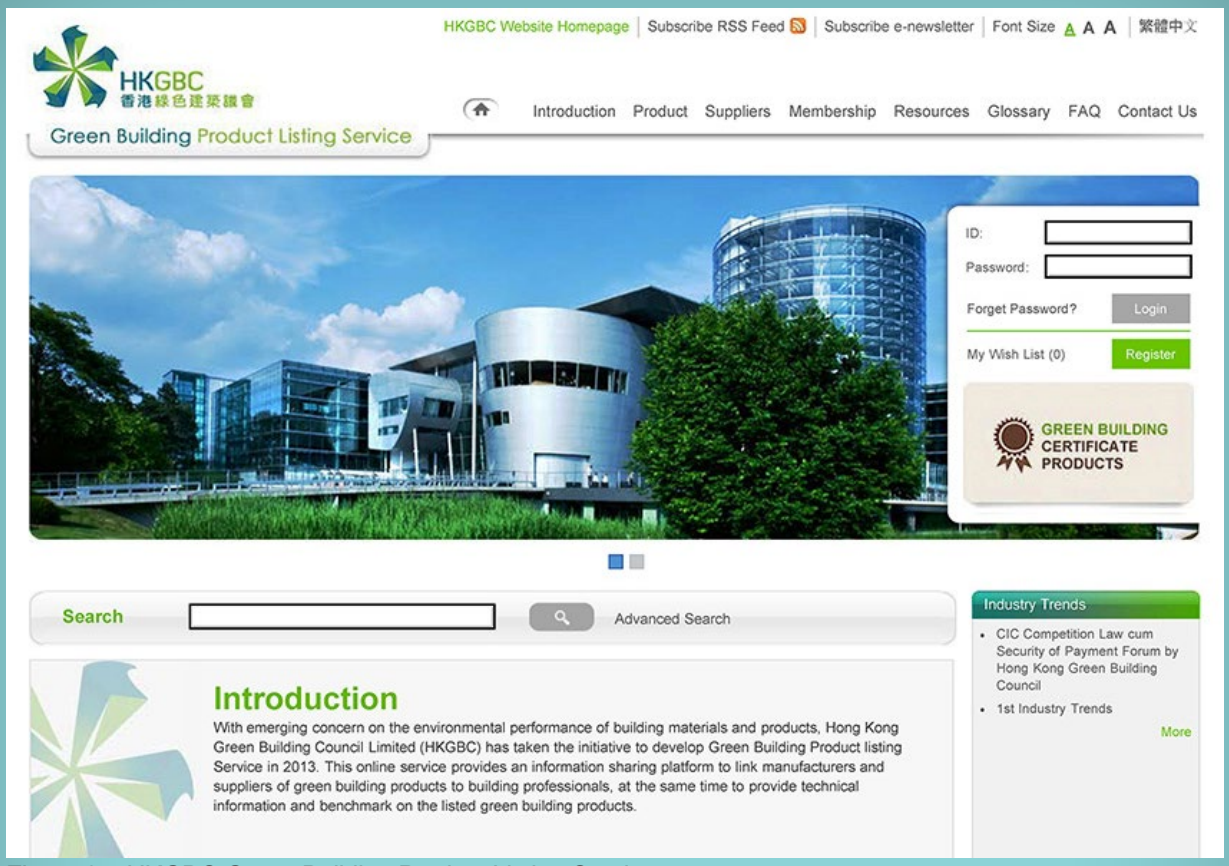


Figure 97 HKGBC Green Building Product Listing Service

With emerging concerns over the environmental performance of building materials and products, HKGBC launched the Green Building Product Listing Service in 2013 to facilitate the selection and procurement of sustainable products during building construction, renovation and retrofits. The user-friendly online platform serves as a good channel for sharing market information on green building technology, as well as providing a linkage between building product suppliers and building professionals.

Read more at:
HKGBC Green Building Product Listing Service
Hong Kong Green Building Council. (2013). HKGBC Green Building Product Listing Service. Retrieved 8 April 2013, from
http://www.hkgbc.org.hk/productlisting/

4.5.1 Recycled content

Recycling is a key component of the “reduce, reuse, recycle” waste management concept. Used content (waste) in shopping malls can be recycled into new products.

Recycling programmes

EcoPark, Tuen Mun

Figure 98 EcoPark in Tuen Mun
(Source: Environmental Protection Department)

Figure 99 EcoPark official web site
(Source: Environmental Protection Department)

Getting materials and equipment that contain recycled content at EcoPark in Tuen Mun

EcoPark is a new component in the Hong Kong SAR Government’s strategy on waste management. It provides a tenant directory on its website with contact information for parties organising local materials recovery and recycling programmes. Shopping mall developers, shop owners and shop tenants can use the directory to search for suitable companies for materials and equipment that contain recycled content.

As a part of the recycling programmes, many tenants in EcoPark also provide services of collecting used materials. More details will be specifically discussed in **Section 7.2 – Recyclables collection**.

Read more at:
EcoPark tenant directory
The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). EcoPark. Tenant directory. Retrieved 8 April 2013, http://www.ecopark.com.hk/en/directory.aspx

GREEN TIPS

How to get materials and equipment with recycled content

- Common use in the existing market:
  - Carpet made from old carpet/recycled-content fibre
    Read more at:
    Carpet America Recovery Effort
    Carpet America Recovery Effort. (2013). About Carpet America Recovery Effort. Retrieved 1 August 2013, from
    http://www.carpetrecovery.org/about.php
  - Recycled content rubber flooring made of plastic bottles and tyres
  - Recycled plastic lumber from recycled-plastic and wood chips for outdoor decking
  - Floor tiles/paving blocks with recycled glass from disposed bottles
- Here are some tips for selection:

Highest recycled-content & minimal virgin material

Minimal environ-mental impact during production & throughout its life

Not only recycled, but recyclable/ biodegradable at the end

Durability & ease of maintenance

4.5.2 Regional materials

Use of regional materials will reduce costs, energy use in transportation and the associated pollution, while supporting the local economy.

A. What is considered "regional"?

"For building materials which contain components sourced beyond a radius of 800km, only that portion of the building material produced within an 800km radius is qualified to be regarded as locally manufactured." [1]

Figure 100 800km radius around Hong Kong

800 km is a long way and one may be easily surprised at the variety of materials that are produced in one's own region.

[1] Hong Kong Green Building Council. (2013). BEAM Plus for Interiors (Version 1.0). MA9 Regionally Manufactured Materials. Retrieved 8 April 2013, from
http://www.hkgbc.org.hk/eng/beamplus-main.aspx

B. Steps for acquiring regional materials for shopping malls and shop spaces:

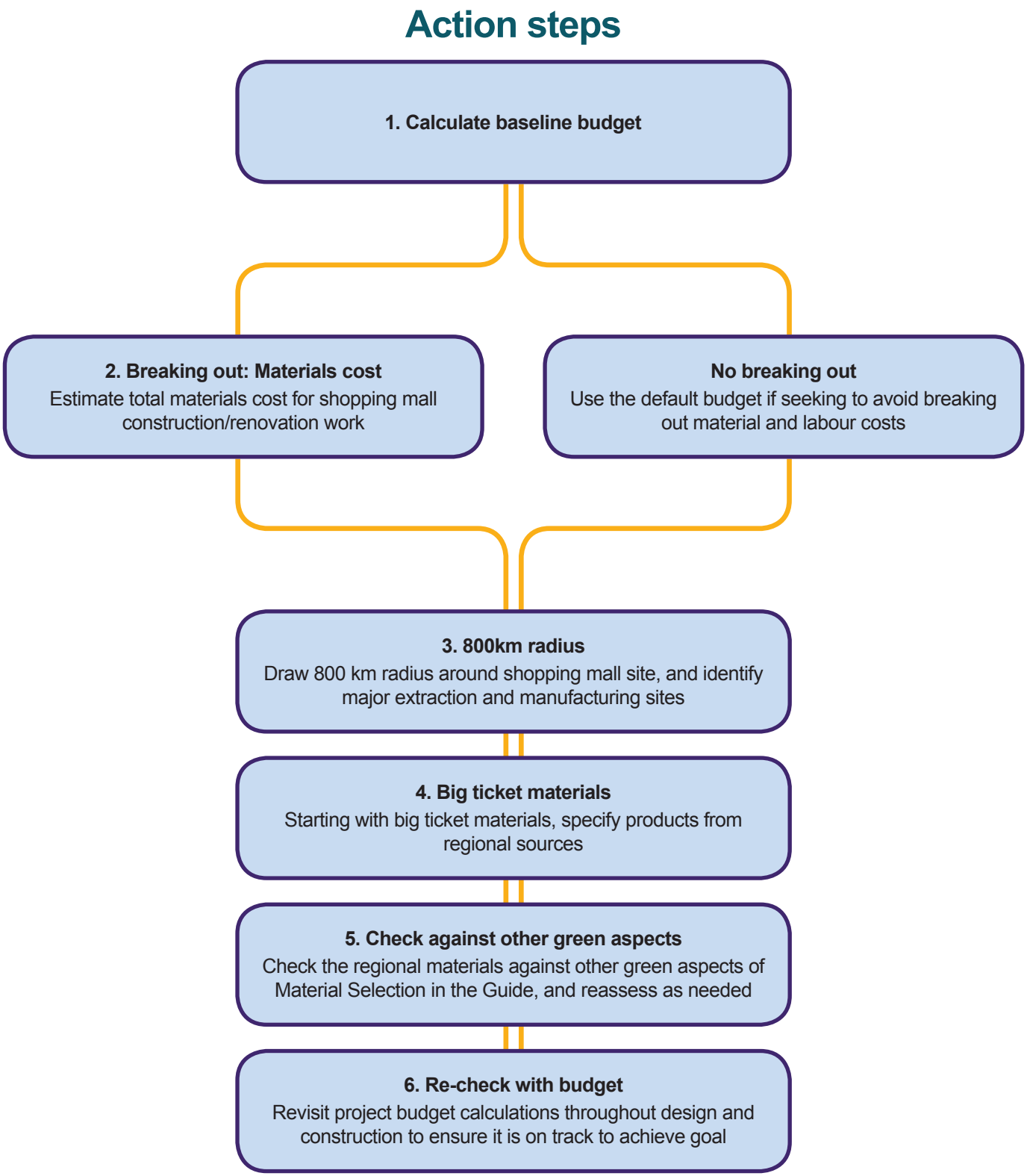


Figure 101 Action steps for application of regional materials

4.5.3 Rapidly-renewable materials

Rapidly renewable materials are materials that grow faster than traditional extraction demand (i.e. planted and harvested in less than a 10-year cycle) and do not result in significant biodiversity loss, increased erosion or impact on air quality. Here are some common rapidly-renewable building materials:

Bamboo

- **Main use: - flooring**
  - furniture construction
- With differnt colours, patterns and textures

Linoleum

- **Main use: - flooring**
- Made from linseed oil, cork dust and wood fiber

Cork

- **Main use: - flooring**
- Harvested every nine years with no harm to the tree

Wool

- **Main use: - carpets**
  - rugs
- Sheep feed on grass, and wool is rapidly renewable

TECHNICAL NOTE

Know more about rapidly-renewable materials

There is an increasing focus on the use of rapidly renewable materials. Shopping mall developers, shop owners and shop tenants should have a better knowledge of each material and apply them in the design of shopping malls and shop spaces.

Read more at:

1. Stephens, J. (2009). Growing Demand – The Green-Building Industry Seeks Rapidly Renewable Materials. Eco-Structure. Retrieved 8 April 2013, from http://www.eco-structure.com/building-materials/growing-demand.aspx
2. BuildingGreen.com. (2012). Green Building Products. Retrieved 8 April 2013, from http://www.buildinggreen.com/menus/?__utma=1.771770294.1346294746.1346294746.1346294746.1&__utmb=1.1.10.1346294746&__utmc=1&__utmx=-&__utmz=1.1346294746.1.1.utmcsr=(direct)%7cutmccn=(direct)%7cutmcmd=(none)&__utmv=-&__utmk=14843446
3. California Department of Resources Recycling and Recovery (CalRecycle). (2013). Green Building Materials. Retrieved 8 April 2013, from http://www.calrecycle.ca.gov/greenbuilding/materials/

4.5.4 Certified wood products

Certified wood is sourced from forests participating in an approved and certified sustainable forest management programme. Buying certified wood products provides the assurance of manufacturing from certified sources using neither an unsustainable manner of extraction nor causing harmful depletion of valuable forests.

TECHNICAL NOTE

Forest certification systems

There are many creditable organisations that carry out forest certification and have unbiased opinions to assist in making decisions when choosing certified wood products.

Read more at:

1. **Forest Stewardship Council (FSC)**
   Forest Stewardship Council. (2013). Retrieved 8 April 2013, from http://www.fsc.org
2. **Programme for the Endorsement of Forest Certifications Scheme (PEFC)**
   – General, United Kingdom, Germany and Sweden.
   Programme for the Endorsement of Forest Certification. (2012). Retrieved 8 April 2013, from http://www.pefc.org
3. **Canadian Standards Association (CSA)**
   Canadian Standards Association. (2013). Sustainable Forest Management Programme. Retrieved 8 April 2013, from http://www.csasfmforests.ca/
4. **The Brazilian Forestry Certification (Cerflor)**
   Brazilian Government. Ministry of Development, Industry and Foreign Trade. INMETRO - National Institute of Metrology, Quality and Technology. (2012). Cerflor Forest Certification Programme. Retrieved 8 April 2013, from http://www.inmetro.gov.br/qualidade/cerflor.asp
5. **Malaysian Timber Certification Council (MTCC)**
   Malaysian Timber Certification Council (MTCC). (2013). Retrieved 8 April 2013, from http://www.mtcc.com.my/

4.5.5 Reduced PVC content

Polyvinyl chloride (PVC) products can usually be found in shopping mall fittings and furnishings including electrical cables, furniture components, floor coverings, blinds, finishes etc.

For example, rows of PVC resin panels are one of the most common interior finishes used in shopping malls and shop spaces in Hong Kong. It is a cheap cladding material that is easy to cut, install and replace as necessary. However, little attention has been paid to its gas emitting effects and its potential to harm humans by causing irritating respiratory illnesses such as asthma. Greenpeace has provided an evaluation for PVC. It has many harmful effects:

Toxic emissions	• **Production of PVC may release a toxic chemical, dioxin, into the air, which may pollute water and the land.**
Toxic additives	• **Such as phthalates are added to make it more soft and flexible.**
Toxic by-products	• **Toxic by-products produced during burning.**
Toxic disposal	• **When PVC reaches the end of its useful life and is disposed of in a landfill, it again leaks dioxin and heavy metals.**

A. Seeking alternatives

Remember that for virtually all PVC applications, safer alternatives exist, involving more sustainable, traditional materials – such as using metal/wood/glass panels instead of PVC resin panels.

B. Bio-based plastic

Bio-based plastic is an alternative to PVC, being a less environmentally damaging plastic. It is made out of products obtained from natural raw materials (e.g. starch and cellulose) and is readily degraded and composted.

4.5.6 Low-emitting materials

Low-emitting materials are products that do not release significant pollutants into the indoor environment.

Common pollutants emitted from materials in shopping malls and shop spaces:

Volatile organic compounds (VOCs) & formaldehyde (HCHO)

- Chlorofluorocarbons (CFC) & hydrochlorofluorocarbons (HCFC)
- Radon (Rn)

A. Use of zero and low volatile organic compound (VOC) products

Even non-designers can learn which are low VOC products through the product labels.

B. Use of non-chlorofluorocarbons (CFC)/non-hydrochlorofluorocarbons (HCFC) based refrigerants

Do not use CFC-based/HCFC-based refrigerants in HVAC&R equipment. Alternative refrigerants for air-conditioners (e.g. R-410A, R-134a and R-407C) are free of CFCs/HCFCs.

TECHNICAL NOTE

How to check the type of refrigerant

To ensure that HVAC&R equipment is free of CFC/HCFC based refrigerants:

- ask the suppliers/retailers.
- check the type of refrigerant displayed on the energy label to ensure that they are CFC (commonly used in, for example, **R-11/R-12**)/HCFC (commonly used in, for example, **R-22**) free air conditioners.

Read more at:
The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Scheduled Substances, Ozone Layer Protection Ordinance. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/application_for_licences/guidance/wn6_licen1_1.html

C. Prevent extensive use of granite and marble finishes

Granite and marble are major external and internal finishing materials in Hong Kong shopping malls and shop spaces. However, the general public is not aware that radon (Rn) is emitted from granite and marble.

Radon is a colourless radioactive gas. Exposure to elevated levels of radon indoors increases the risk of having lung cancer.

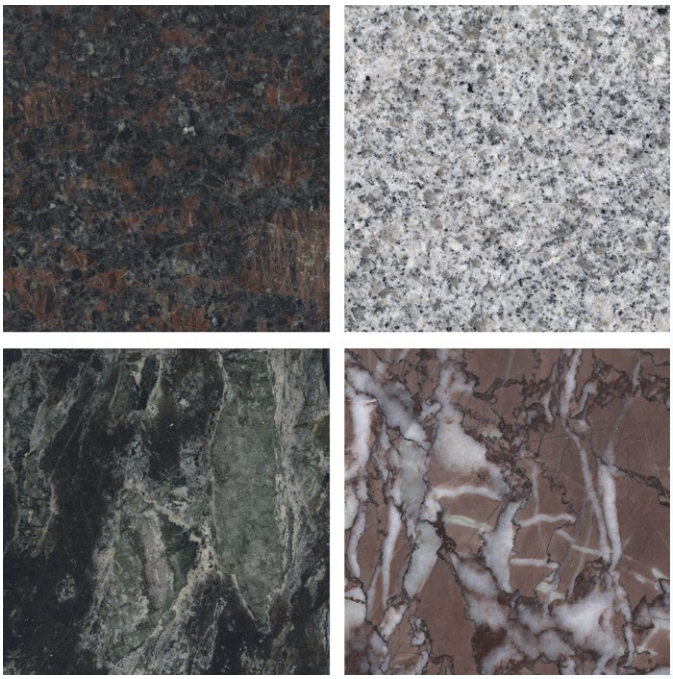


Figure 102 Granite and marble

TECHNICAL NOTE

Recommended ways of applying granite and marble finishes

Granite and marble finishes in shopping malls and shop spaces should be designed carefully. Here are some recommended ways:

- Choice of materials should avoid extensive use of granite and marble.
- Especially for malls with an enclosed space, adequate ventilation should be planned to avoid an unacceptable accumulation of radon.

Read more at:
BEAM Plus for New Buildings (Version 1.2)
BEAM Society Limited. (2012). Beam Assessment Tool. BEAM Plus for New Buildings (Version 1.2). Chapter 6.3 Indoor Air Quality. Retrieved from 12 September 2013, from http://www.beamsociety.org.hk/en_beam_assessment_project_1.php

4.5.7 Professional help

It is important to engage professionals for detailed consultation on material selection for shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Registered architects (RA) – Appendix A (1)
- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

5 ENERGY EFFICIENT BUILDING SYSTEMS FOR SHOPPING MALLS AND SHOP SPACES

5.1 Heating, ventilation and air-conditioning (HVAC)

Research indicates that an air conditioning system accounts for about 40% of the total electric power consumed in a typical shopping mall in Hong Kong. Air conditioning systems for shopping malls are also characterised by the high cooling load due to high population density and their inherent nature as discussed in the beginning of the Guide (See **Section 1.1.1**). Therefore, proper air conditioning design practice and appropriate equipment selection are crucial for achieving an overall saving in energy consumption by a shopping mall.

The design considerations for HVAC systems are described in the following paragraphs.

HK3030 Campaign

To confront the challenge of global climate change and to deal with the increasing demand for electricity, it is essential for Hong Kong to explore options to meet its greenhouse gas reduction target. In December 2012, HKGBC launched the HK3030 Campaign, a vision for a low carbon, sustainable built environment in Hong Kong by 2030. The HK3030 Campaign sets out a roadmap to reduce the absolute level of electricity consumption by buildings in Hong Kong by 30% of the 2005 level by the year 2030.

Figure 103 Logo of HKGBC HK3030 Campaign

Read more at:
HKGBC HK3030 Campaign
Hong Kong Green Building Council. (2013). HK3030 Campaign. Retrieved 30 June 2013, from http://www.hkgbc.org.hk/hk3030/eng/

5.1.1 Central chiller plant

The chiller is one of the most energy intensive items of equipment in a building. An efficient central chiller plant can significantly contribute to the overall energy saving of the building.

Commercial chillers can either be air cooled or water cooled. For air cooled chillers, short-circuiting hot discharged air will lead to inefficient operation of the chillers, which will substantially affect the energy performance of air conditioning system. To avoid short-circuiting, air cooled chillers should be located on an open roof whenever possible.

In Hong Kong, most of the retail outlets are located in the podium of a comprehensive development. Due to planning constraints, air cooled chillers may not be located on an open roof. Therefore, indoor air cooled chillers may be inevitable. In such case, air intake and exhaust louvers should be properly arranged to avoid air short-circuiting. The recommended strategies are as follows:

Figure 104 Air cooled chiller

1
Provide louvers with different building orientations

2
Adequate separation between intake and exhaust

3
Provide intake louvers facing south-east to minimise short-circuiting due to the prevailing wind direction in summer

Water cooled air conditioning system (WACS) consumes 35% less energy compared with an air cooled chiller system. Although the installation cost of water cooled system is slightly higher than an air cooled system, the payback period is expected to be about 2 to 3 years. WACS should be considered for shopping malls to improve the overall energy performance of the air conditioning system.

Location of the chiller plant should also be considered to minimise the airborne and structural borne noise nuisance to occupants and the neighbourhood.

5.1.2 Chilled water circulating system

Chilled water is circulated to air-conditioning equipment by water pumps. Variable speed pumps should be used which are capable of varying the flow of chilled water in response to the change in building cooling load. Energy used by both the pump and the chiller can be saved.

For retail tenants, the on/off control valve for the fan coil unit (FCU) should be the “Normally Closed” type to enable the saving of pump power when the FCU is switched off. As the tenants’ operating hours may be different according to the nature of their business, it is preferable to install individual motorised on/off valves for each shop to enable the A/C supply to be shut down independently. The valve should be operated by the building management system (BMS) to suit the different business hours of tenants.

Energy meters should be provided in addition to motorised control valves for the anchor shops to facilitate energy management. To provide incentives for tenants to save on energy, it is also recommended to charge the A/C cost by actual demand rather than based on the rentable area.

Piping accessories, such as isolation valves, strainers, etc., should be minimised to reduce the energy loss.

5.1.3 Air side system

An FCU system allows individual small areas to operate independently to suit the cooling demand and operation schedule. Independent FCU control is recommended to enable better environmental control of zones without over-cooling. Meanwhile, FCUs should be switched off or set to operate at a higher temperature during unoccupied periods.

For large spaces such as arcades and public areas in shopping malls, central all-air system by using AHU is recommended. To minimise power consumption by the fans, the air distribution ductwork should be sufficiently sized to avoid high air resistance. Meanwhile, various energy saving features, such as free cooling, heat wheels, desiccant dehumidifiers, and multi-speed motors, should be considered wherever viable. A comparison of various energy saving schemes for an AHU are listed for reference.

Items	Energy saving schemes			
	Multi-speed motor	Free cooling	Heat wheel	Desiccant dehumidifier
Brief description	Operation of fan and AHU at reduced capacity	Cooling by 100% fresh air in cold weather conditions	Recovery of waste cooling energy from building exhaust	R.H. control method other than re-heat
Saving objectives	Fan power	Year-round cooling energy	Cooling energy for fresh air	Avoid simultaneous cooling and heating
Application	High fluctuation of occupant level	AHU room space and louver is available	High building exhaust rate and exhaust system centrally allocated	R.H. control is essential and plant space is available.
Season of operation	Any period when occupant level is low	Mild and cold season	Hot season	Wet season
Cost	Minimal	Relatively low	Relatively high	Relatively high
Plant area	No extra plant space	Extra space for accommodation of bulky ductwork and exhaust air fan	Extra space for accommodation of heat wheel, central fresh air and exhaust fans.	Extra space for accommodation of dehumidification equipment
Other architectural implication	Nil	Extra louver area	Nil	Nil

Figure 105 Comparison of different energy saving schemes for air handling unit (AHU)

5.1.4 Energy efficient controls

An accurate and reliable automatic control system is essential to achieve energy saving. Common control problems such as over-cooling and system hunting will substantially affect the operation of air conditioning systems and lead to a waste of energy.

One common problem for shopping malls in Hong Kong is the over-cooling of space. This is attributed to incorrect settings of thermostats as well as the loss of accuracy of sensing elements over time. In view of this, the design of automatic control systems should incorporate the necessary maintenance provision to enable calibration of control systems annually. Facilities, such as test holes, tap points, pressure gauges, thermometers, should be provided to enable verification of control settings.

Nowadays, the technology of Direct Digital Control (DDC) system enables remote adjustment of settings through the central workstations. To minimise the possibility of incorrect settings, it is recommended that shopping malls should adopt full DDC as the automatic control system for air conditioning systems in the future planning. Through the DDC, annual calibration will become much easier. Proper testing and commissioning should be carried out on a regular basis.

5.1.5 Metering for energy audit

Effective measurement and verification (M&V) equipment is essential for performing energy audits for retail areas in the future. The prime purpose of an energy audit is to identify the demand pattern so that an energy management scheme can be implemented.

With the wider application of DDC, the M&V equipment could also link up with the DDC system so that trend logging of data becomes possible. Examples of the M&V equipment for air conditioning applications include:

1	2	3	4	5
Electromagnetic flow meter	Temperature sensor	Pressure sensor	Humidity sensor	kWh meter

Major air conditioning equipment, such as chillers, A/C pumps and air handling units, should be provided with separate M&V equipment for energy measurement. If the budget is limited, group metering could be considered as an alternative.

M&V equipment for chiller plant is particularly important. In accordance with the Building Services Research and Information Association (BSRIA) Technical Notes, the monitoring equipment should record the input and output energy use of each chiller so that the depreciation rate can be determined, and to alert the facility management staff when to carry out maintenance.

5.1.6 Other design considerations

To avoid over-sizing of equipment, appropriate outdoor and indoor air conditioning criteria should be adopted in the system design and selection of equipment. For outdoor design criteria, these are readily available from the Hong Kong Observatory as well as international design guides (such as ASHRAE handbook) and the BEC.

For indoor criteria in shopping malls, the target is to maintain human comfort under the activities level. There are international standards and guidelines available (such as AHSRAE Standard 55) and designers can refer to these guidelines to determine proper indoor criteria without over-cooling.

To minimise the fan energy against friction loss, air conditioning pipe and duct routes should be arranged according to the shortest horizontal distance, and should be self-balancing to avoid excessive pumping energy. Whenever possible, standard fitting should be used. The central air conditioning equipment should be located near to the load centre to reduce the length of the distribution pipe/duct, as well as energy consumption.

In the overall planning of shopping malls, shops with similar trading and business hours should be grouped together if possible in order to facilitate energy management. For example, the chilled water supply for an entire zone could be shut off after business hours to save pumping and cooling energy. Furthermore, the zone AHU serving the public space associated with the shops cluster can be re-adjusted to lower the fan speed or to raise the temperature setting to save fan power or cooling energy, respectively.

5.1.7 HVAC saving measures

Some common HVAC saving measures and the difficulties that may be encountered in implementation are listed in the following table for easy reference.

Saving measures for space conditioning and potential energy reduction

Saving measures for space conditioning	Difficulties	Energy reduction (%)
Increase chilled water supply temperature by 2°C	Easy and immediate.	3 – 6 (chiller)
Increase space temperature by 2°C		10 – 20 (air-conditioning system)
Regular maintenance of chiller (e.g. tube cleansing, water treatment)	Easy and immediate. It depends on the existing conditions and it may require minimal expense to improve the access or maintenance facilities.	10 – 30 (chiller)
Regular maintenance of air-side system (e.g. filter replacement/cleaning, coil cleaning)		5 – 20 (fan)
Regular system calibration, testing & balancing, re-commissioning		5 – 20 (air-conditioning system)
Optimum fresh air flow rate	Easy for new project. For an existing shopping mall, it can be implemented during annual comprehensive maintenance.	5 – 10 (power)
Proper air balancing including fresh air dampers		5 – 15 (air-conditioning system)
Use of water cooled chiller (as against air cooled chiller)	Easy for new project. For existing shopping mall, it may be implemented during plant retrofit or shopping mall renovation.	40 – 50 (chiller)
Variable speed drive chiller		20 – 30 (chiller)
Variable chilled water flow		10 – 30 (pump)
Optimum chiller operating efficiency & configuration		10 – 40 (chiller)
Appropriate chilled water control valves & proper water balancing		10 – 25 (air-conditioning system)
Optimum chilled water pipe diameter		5 – 10 (pump)
Optimum chilled water pipe insulation		3 – 10 (air-conditioning system)
Minimize air leakage at ductwork, access panels, etc.		1 – 3 (air-conditioning system)
Variable speed drive air handling units		10 – 30 (fan)
Free cooling design		5 – 15 (air-conditioning system)

5.1.8 Professional help

It is important to engage professionals for detailed consultation on the implementation of heating, ventilation and air-conditioning (HVAC) at shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Registered air conditioning contractors – Appendix B (1)

5.2 Fire services

The fire services system is designed for the purpose of protecting life, and the energy and green design element is traditionally not a concern of the designer. However, there are still some discretionary issues which can contribute to green design.

5.2.1 Zero ozone depletion fire suppression agents

For some potential fire hazards, such as fuel tank rooms and server rooms, gas flooding fire extinguishing systems may occasionally be encountered in shopping malls. The gas used for flooding is usually a halocarbon compound, but not all of them are produced with zero ozone depletion potential (ODP). To contribute to the environment, zero ODP fire suppression agents should be selected.

Figure 106 Zero ozone depletion fire suppression agents

5.2.2 Maintenance and alterations

During maintenance and alterations in shopping malls, draining off and re-filling the water in the system is necessary. However, the process may consume significant amounts of water. Instead of wasting water, it is recommended that the water collected during maintenance and alterations should be recycled whenever possible.

5.2.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of fire services at shopping malls and shops. The following is a list of references for obtaining professional help:

- Authorised persons (AP) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)

5.3 Plumbing and drainage

As mentioned in **Section 2.1.3**, water efficiency is a key issue for environmental sustainability. The retail sector is one of the major consumers of water; thus it is important to encourage retail consumers to use water efficiently.

5.3.1 Water efficient fittings

Traditional water basin taps will consume 6~9 litres/min. Nowadays, the water efficient tap can significantly reduce water consumption to 2 litres/min for normal washing purposes. Lowering the flow rate and pressure will reduce water consumption and contribute to the water economy.

Meanwhile, infra-red sensor taps can be used to replace the traditional self-closing water tap. It can help eliminate running water taps and reduce water consumption.

It is also recommended that water efficient fixtures which have been tested and labelled by the Water Supplies Department of Hong Kong be used whenever available.

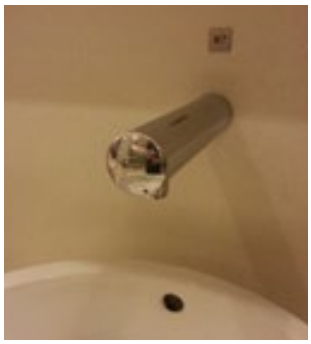


Figure 107 Water efficient fittings
(Source: Kai Shing Management Services Limited

5.3.2 Flushing and sanitary fitments

The traditional cistern is designed to use 7~9 litres per flush. Nowadays, water efficient sanitary fitments are available, which include dual flush cisterns, low volume flushing water closets, and waterless urinals. Although seawater flushing has been adopted in most urban areas in Hong Kong, water savings from flushing will also save the energy required by the government pump house, as well as the energy used for water treatment.

Figure 108 Dual flush & low volume flushing urinal
(Source: Kai Shing Management Services Limited)

TECHNICAL NOTE

Voluntary Water Efficiency Labelling Scheme

The voluntary Water Efficiency Labelling Scheme (WELS) is a water conservation initiative of the Hong Kong SAR Government. WELS intends to cover the common types of plumbing fixtures and water-consuming appliances. Products participating in WELS carry a water efficiency label that will tell consumers the level of water consumption and water efficiency of the produce to help consumers choose water efficient products for water conservation. At present, four groups of plumbing fixtures and appliances are included in the scheme:

- Showerheads for bathing
- Water taps
- Urinal equipment
- Washing machines

Read more at:
Voluntary Water Efficiency Labelling Scheme
The Government of Hong Kong Special Administrative Region. Water Supplies Department. (2013). Voluntary Water Efficiency Labelling Scheme. Retrieved 30 May 2013, from http://www.wsd.gov.hk/en/plumbing_and_engineering/wels/index.html

5.3.3 Irrigation

A shopping mall usually includes some green planting areas. Therefore, an irrigation system is also one of the major water consumption items. Where applicable, use drought resistant plants or local species to suit the local rainfall pattern to save on water consumption. Advanced water efficient irrigation systems (such as drip line irrigation system, solar wireless-intelligent weather control irrigation system, or recycled water system) can also be used for water saving. Readers may also refer to **Section 7.1.1 – Water efficient irrigation systems**.

5.3.4 Metering and accounting

Sub-meters should be installed on all major water systems, such as cooling towers, irrigation, toilets, etc. The readings taken can give a better picture of water consumption in buildings. By monitoring water usage, water saving opportunities can be identified.

5.3.5 Other design considerations

Apart from savings on water consumption, the energy consumed by the plumbing and drainage systems should be reduced wherever feasible. Direct feed systems and gravity water supply systems should be used whenever possible. If practical, the drainage system should be designed with a gravity fall instead of a sump and pump system. For up-feed pumping, variable speed pumps should be adopted.

Other design considerations include:

- Twin water tanks installation:

  This provides an uninterrupted supply of fresh and flush water to tenants, reducing water wastage during maintenance or cleaning, and improving the durability of the building's roof structure.

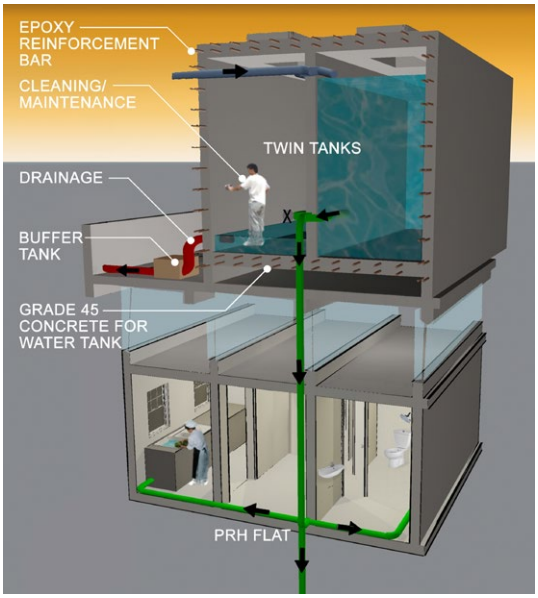


Figure 109 Typical twin water tanks in buildings
(Source: Hong Kong Housing Authority)

- Reuse of harvested rainwater, air-conditioning system condensate, municipally reclaimed water or non-potable water from any other appropriate source for cooling tower make-up water.
- Recycling cooling tower bleed-off water for flushing.

5.3.6 Rainwater harvesting

Rainwater harvesting is the accumulation and storage of rainwater for reuse. The water can then be used, without expensive treatment, for washing cars, watering plants, washing floors and windows, etc. Rainwater collected from the roofs of buildings and the podium of the shopping mall can make an important contribution to the availability of water, reduce the wastage of treated water and lower financial cost of metered water charges.

The Building Services Branch of the Architectural Services Department of the Hong Kong SAR Government issued a B.S.B circular in 2008 as a Design Guideline for the Rainwater and Grey Water Recycling Installation. For shopping malls, it is worth adopting such a system since there will be plants inside and outside the shopping malls for greening and refreshing purposes. Recycled rainwater can be used for irrigating these plants and reducing water and sewerage charges.

Figure 110 Simple rainwater harvesting system

5.3.7 Professional help

It is important to engage professionals for detailed consultation on the implementation of plumbing and drainage systems for shopping malls and shops. The following is a list of references for obtaining professional help:

- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Registered air conditioning contractors – Appendix B (1)

5.4 Electricity and lighting

Apart from air conditioning, power for lighting constitutes the second major source of energy consumption contributing to the electricity bill. Copper loss from the electrical distribution system and motor efficiency can also be optimised to contribute to the energy efficiency of the electrical system.

5.4.1 Use of energy efficient lighting

For the lighting design, energy efficient light fittings should be chosen. The efficiency of lighting sources is described by luminous efficacy, which is the ratio of the light emitted and the power consumed by a lamp. Typical efficacies of different lamp types are summarised in the table below.

Lamp type	Efficacy range (lumen/watt)
GLS	12 – 18
T8 tubular fluorescent (Electromagnetic ballast)	69 – 79
T8 tubular fluorescent (Electronic ballast)	85 – 95
T5 tubular fluorescent (Electronic ballast)	95 – 105
Compact fluorescent	55 – 80
Low pressure sodium	70 – 115
High pressure sodium	65 – 110
High pressure mercury	30 – 55
Metal halide	65 – 75
Induction	37 – 75
LED	90 – 100

Figure 111 Efficacy of different lamp types

High efficacy fluorescent/compact fluorescent tube	• This could be used for arcades, plant rooms, staircases, corridors, toilets and carparks. • 70 – 80% energy saving can be achieved compared with incandescent lamp.
T5 fluorescent lamp	• T5 fluorescent lamp with electronic ballast is recommended due to high luminous efficacy. • It could be used for arcades, plant rooms, staircases, corridors, toilets and carparks. • 30 – 40% energy saving can be achieved compared with the T8 fluorescent lamp.
Modern electronic ballast	• This has lower total harmonic distortion than conventional ballast; a traditional switch start T8 tubular fluorescent lamp should not be used. • 20 – 40% energy saving can be achieved compared with conventional electromagnetic ballast.
Self-luminous exit sign	• Self-luminous EXIT sign complying with BS5499: Part 2 should replace traditional EXIT signs illuminated by fluorescent light fitting/incandescent lamp. • 100% energy will be saved as no power is required.

5.4.2 Lighting controls

Lighting systems should be provided with lighting controls to enable switching off after business hours. The lighting circuit should be designed with multiple independent light control zones to enable partial switching off.

Automatic on/off systems are recommended to prevent lights from being left on without someone in attendance. The automatic on/off controls can be designed according to the occupancy schedule.

Lighting control devices should also be used in the areas where daylight is available. Either dimming or switching controls with appropriate circuit arrangements can be effective in maintaining suitable interior illumination levels. Photocells should be strategically located to reduce the artificial lighting level and hence energy consumption.

The lighting system should be designed to provide reduced light levels during cleaning periods, with a proper means of switching on and off being provided for the cleaning staff. All spaces that are not used continuously should have local or automatic switching, allowing lights to be turned off when the space is not in use.

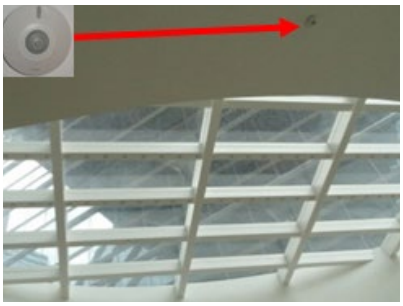


Figure 112 Photocell

5.4.3 Other lighting design considerations

The lighting design should avoid sharp contrasts in lighting levels between entrance halls/passages and outdoors. With the presence of daylight, an entrance hall should be well lit, and during hours of darkness, lighting levels should be reduced. To achieve this,

- provide additional lighting with supply taken from a separately timed and controlled circuit;
- avoid over provision of lighting for corridors, staircases, services lobbies, etc.

In order to ensure an energy efficient lighting system, the reflectance of the floors, walls and ceilings should be increased by choosing a light colour scheme. Daylight and high efficacy lamps should also be considered.

5.4.4 Lighting saving measures

Some common lighting saving measures and the difficulties that may be encountered in implementation are listed in the following table for easy reference.

Difficulties and potential energy reduction of lighting saving measures

Lighting saving measures	Difficulties	Lighting energy reduction (%)
Decrease lighting level by de-lamping or replacing bulbs with energy efficient lamp bulb	Easy and immediate.	15 – 30
Use T5 fluorescent tube instead of T8	Easy for new project. For existing shopping malls, it may not be possible to replace the light fittings without taking down the ceiling.	30 – 40
Use CFL instead of incandescent lamp		70 – 80
Use electronic instead of electromagnetic ballast		20 – 40
Use self-luminous EXIT sign instead of traditional fluorescent EXIT sign		100
Proper lighting control zones	Easy for new project. For existing shopping malls, it may be implemented during renovation as cable wiring works are required.	20 – 50
Occupancy sensor control for infrequent occupation		>20
Lux sensor to dim parameter lighting or lighting under/adjacent to skylight		20 – 40

5.4.5 Power distribution system

The design of the power distribution system should minimise direct losses, such as copper loss, losses due to phase current imbalance and harmonics, and indirect losses due to temperature rise which will induce an extra heating load to the air-conditioning system.

The location of distribution transformers and the main LV switchboards should preferably be sited at their load centres to reduce long cable runs and copper loss. The electrical circuits should also be sized to minimise copper loss.

Power factor correction equipment should be provided so that the electrical system can achieve a power factor of 0.85 or higher. The single-phase load in a three-phase system should be evenly and reasonably distributed among the phases. A power factor higher than 0.85 (e.g. 0.9) should be considered in order to improve the power station efficiency.

The requirements for energy efficiency in power distribution; efficient utilisation of power, energy efficiency of power quality, metering and monitoring facilities, and the maximum total harmonic distortion of current for any circuits must comply with the BEC.

Figure 113 Power distribution system

5.4.6 Metering for energy audit

A permanent power meter is an essential item of equipment to perform an energy audit for retail areas in the future. Through the energy audit, the demand pattern can be identified and an energy management scheme can be implemented. The provision of meters should follow the BEC requirements.

5.4.7 Professional help

It is important to engage professionals for detailed consultation on the implementation of electrical and lighting systems in shopping malls and shops. The following is a list of references for obtaining professional help:

- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Registered electrical contractors – Appendix B (4)

5.5 Lifts and escalators

Lift and escalator services are generally designed to suit the vertical transportation needs of the building. The general approach for achieving energy efficiency in the vertical transportation system is to ensure an effective utilisation of the system and at the same time minimise any unnecessary wastage and energy consumption while meeting the transportation needs.

5.5.1 Efficient escalators

Unlike office blocks and other high-rise buildings, the vertical transportation system for shopping malls should rely mainly on escalators, which are capable of handling heavy traffic demand.

As escalators run continuously, regardless of passenger demand, they consume a fixed amount of energy even though they are not being used by passengers. Therefore, energy can be saved if the speed of the motor drive can be adjusted according to the traffic demand. The use of a variable speed motor drive system and infra sensor can adjust the speed of an escalator during a period of low demand.

5.5.2 Professional help

It is important to engage professionals for detailed consultation on the implementation of lifts and escalators at shopping malls and shops. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered lift and escalator contractors – Appendix B (9)

5.6
Renewable energy opportunities

Almost all energy on Earth comes from the Sun (except a small amount of tidal energy which comes from the gravitational force of the Moon). Even fossil fuel can be considered solar energy which has been stored for millions of years.

Renewable energy resources include: biomass, hydro energy, geothermal energy, solar energy, wind energy, ocean thermal energy, wave energy and tidal action. However, to be able to adopt renewable energy to shopping malls, the following renewable energy designs are most commonly encountered and applied.

5.6.1 Solar energy system

Solar energy system can be classified into photovoltaic, solar thermal and day lighting systems. The podium roof of a shopping mall will have an open space where direct sunlight is available and is a possible site for installing a photovoltaic system as well as a solar system for the shopping mall.

The photovoltaic (PV) system includes PV panels, thin film photovoltaic (TFPV) panels and building integrated photovoltaic (BIPV) panels or a combination of the three that can be installed at roof level of the podium to generate electricity from sunlight to cater for part of the electricity demand of the ventilation, lighting or other systems. The PV system will comprise a PV array and equipment such as charge controllers or inverters, electric cables and switchgear surge arrestors.

Besides the PV system, solar hot water preheating system, using vacuum tube hot water solar panels, is also one of the common renewable energy systems with a payback of around 5 to 6 years depending on the system's capacity and usage of hot water.

Another renewable energy system using solar power is the daylight system. Light pipes are used for transporting or distributing natural daylight to the interior space. They can be installed on the podium roof garden of the shopping mall to transmit daylight into communal areas, car parks and other locations where appropriate.

Figure 114 Photovoltaic installation in ZCB, Kowloon Bay

Figure 115 Solar hot water system

Figure 116 Light pipe in Zero Carbon Building (Source: ZCB, Construction Industry Council)

Figure 117 Solar lawn lamps, automatically switch on at night and only use solar (Source: Kai Shing Management Services Limited)

5.6.2 Wind energy

Wind energy will have rather limited application in terms of shopping mall design. However, by careful arrangement, some landscape lighting can be adopted to wind power. A lamp pole with a wind turbine and/or a PV panel could be considered for external/landscape lighting, thereby using wind and solar renewable energy. Long life LED lamps may also be adopted to reduce the rate of lamp replacement.

Figure 118 Hybrid wind/PV LED external lighting

5.6.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of renewable energy systems and controls in shopping malls and shops. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Renewable energy system suppliers – Appendix B (6) & (7)
- Registered electrical contractors & registered electrical workers – Appendix B (4)

5.7
Building management systems and controls

Nowadays, building management systems (BMS) are less expensive compared to the old days. The network-based equipment and industrial standardisation of communication protocols enable the full integration of BMS. All equipment can be monitored through BMS by connecting the LAN plug and using a simple software set up. Also, the Windows based operating platform and user-friendly graphic display allows the technicians to operate the BMS without difficulty.

With the full application of BMS, the operating data of the equipment can be monitored and recorded. These operating data can be further diagnosed to ensure that the mechanical and electrical systems are operating with their optimal efficiencies.

Meanwhile, the programmable nature of the BMS can facilitate property management by convenient adjustment of the timer or temperature setting. By installing suitable sensors and metering, routine energy management work and the mandatory energy audit can be performed readily without on-site taking of measurements.

BMS has already become a standard feature of new shopping malls. During large scale renovation works, it is also highly recommended that the retail facility management install the BMS in order to gain the benefits mentioned above.

5.7.1 Professional help

It is important to engage professionals for detailed consultation on the implementation of building management systems and controls at shopping malls and shops. The following is a list of references for obtaining professional help:

- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)

5.8
Energy simulation and evaluation

5.8.1 Energy simulation for new buildings

Energy simulation is also known as “energy modelling” or “energy analysis”, which is the virtual or computerised simulation of a building or complex to predict annual energy consumption, utility bills and life cycle costs of various energy related items, including:

1 Air conditioning, heating and ventilation	**2** Lighting	**3** Hot water service	**4** Lifts and escalators	**5** Small power and plug load	**6** Renewable energy installation

A. Why is energy simulation important?

Generation of energy means to burn fossil fuel resources and emit carbon dioxide and other greenhouse gases. Being a socially responsible designer, engineer or developer, it is recommended that energy-saving goals be set for developments. With the aid of energy modelling software, it is possible to predict energy consumption, costs of operation, and compare the energy saving performance with benchmark buildings, in order to optimise building designs.

B. When to conduct energy simulation?

Whenever you want to:

- Predict the monthly energy consumption and costs
- Predict the annual energy cost
- Predict annual carbon emissions
- Compare and contrast different efficiency options
- Determine life cycle payback on various options

TECHNICAL NOTE

What software is available?

The website of U.S. Department of Energy provides a directory containing information on 403 building energy simulation tools. eQuest, a DOE-2 based programme, is one of the easiest options for energy simulation and free of charge. Energy Plus, another freeware, with more advanced modelling capabilities, is suitable for experts in energy simulation.

Read more at:
Building energy software tools directory
U.S. Department of Energy. Energy efficiency and renewable energy. Building Technologies Office. (2013). Building energy software tools directory. Retrieved 9 April 2013, from http://apps1.eere.energy.gov/buildings/tools_directory/

5.8.2 Energy evaluation for existing buildings

Starting from 21 September 2012, the owners of newly constructed and existing commercial buildings and the commercial portion of a composite building are required every 10 years to engage a registered energy assessor (REA) to carry out an energy audit for the central building services installations in accordance with the latest edition of the Energy Audit Code:

- Air-conditioning installations,
- Electrical installations,
- Lighting installations, and
- Lift and escalator installations.

An energy audit is an effective energy management tool by which a building manager examines the energy account of energy consuming equipment or systems, checks how the energy is used and for areas of inefficiency, and proposes strategies for improvement.

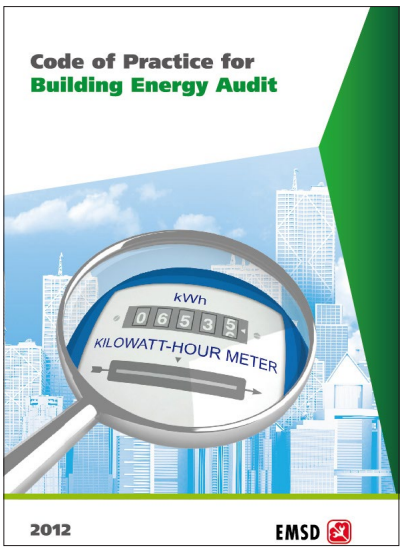


Figure 119 Code of Practice for Building Energy Audit
(Source: Electrical and Mechanical Services Department)

TECHNICAL NOTE

Codes and technical guidelines

The Building Energy Code 2012, associated with the mandatory Buildings Energy Efficiency Ordinance (Chapter 610) enacted on 21 September 2012, sets out the technical guidance and details for a prescriptive and performance-based approach towards compliance with the ordinance. Energy simulations with comparisons between reference and designed buildings are required when using the performance-based approach. More details are discussed in **Section 2.3.3 – Hong Kong ordinances and guidelines** and **Appendix C10 Buildings Energy Efficiency Ordinance**.

Read more at:

1. **Building Energy Efficiency Ordinance**
   The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services Department. (2012). Building Energy Efficiency Ordinance. Retrieved 8 April 2013, from http://www.beeo.emsd.gov.hk/
2. **Technical guidelines on energy audit code**
   The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services Department. (2012). EMSD guidelines on energy audit. Retrieved 31 July 2013, from http://www.beeo.emsd.gov.hk/en/pee/TG-EAC.pdf

5.8.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of technologies of energy simulation and evaluation at shopping malls and shops. The following is a list of references for obtaining professional help:

- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Registered energy assessors (REA) – Appendix A (6)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

5.9
Advanced technology

With concerns about climate change and carbon emissions, many new technologies have been developed and are available in the commercial market. The following energy saving technologies may be considered:

Oil free frictionless chiller	• This has gained market popularity with a much better efficiency in part-load operation when compared with traditional screw or centrifugal chillers.
Solar absorption chiller	• This uses thermal collectors to power air-conditioning. • Water heated by the sun in collectors initiates a thermal dynamic process in chambers that chills water to 7°C. • It is passive with no moving parts and no electrical input.
Variable speed permanent magnet fan coil unit	• This uses a permanent magnet motor and intelligent programmable thermostat to adjust the fan speed according to room temperature changes. • It saves on energy consumption for both the driving fan and air-conditioning system.
LED lighting	• Many different types of LED lighting are now on the market with good colour temperature and rendering, a much longer life than incandescent lamp or fluorescent tube and at a reasonable price.
Digital addressable lighting interface system	• All lighting has its device-specific address and can be controlled individually to suit the time of operation and the lighting power output as well as interfacing with sensors to adjust the lighting level.
Integrated solar/hydro-powered sensor water tap	• Indoor light and excessive kinetic energy from water flow are converted to electrical power by a micro hydro-turbine to operate the solenoid valve for the water taps.

TECHNICAL NOTE

More references for advanced technology

Shopping mall developers, shop owners and tenants can find more information about advanced technology in energy efficient building systems for shopping malls and shop spaces from the references below:

Read more at:

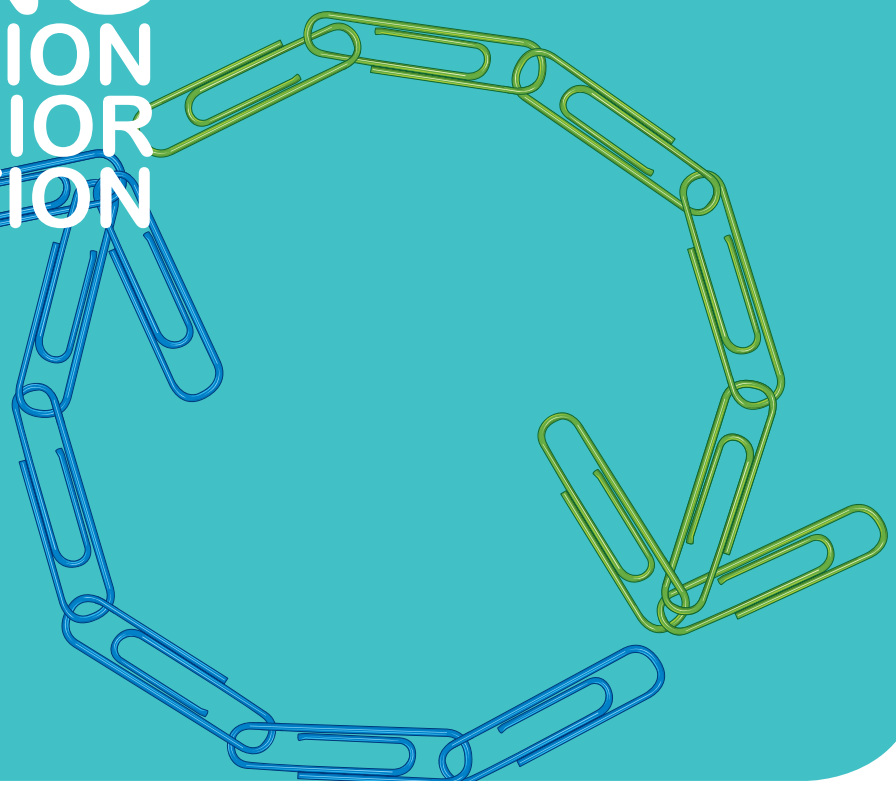
1. **Advanced Energy Saving Technology**
   The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services Department. (2012). Advanced Energy Saving Technology. Retrieved 8 April 2013, from http://www.emsd.gov.hk/emsd/eng/pee/aest.shtml
2. **Hong Kong Green Building Technology Net**
   The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services Department. (2012). Hong Kong Green Building Technology Net. Retrieved 8 April 2013, from http://gbtech.emsd.gov.hk/eindex.html
3. **Hong Kong Sustainable Technology Net**
   The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services Department. (2012). Hong Kong Sustainable Technology Net. Retrieved 8 April 2013, from http://sustech.emsd.gov.hk/index.html
4. **New and Renewable Energy**
   The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services Department. (2012). New and Renewable Energy. Retrieved 8 April 2013, from http://www.emsd.gov.hk/emsd/eng/pee/nre.shtml

5.9.1 Professional help

It is important to engage professionals for detailed consultation on the implementation of advanced technology in shopping malls and shops. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- Renewable energy system suppliers – Appendix B (6) & (7)
- Registered electrical contractors & registered electrical workers – Appendix B (4)

6 DURING RENOVATION OR INTERIOR DECORATION



As green culture in the construction industry is gaining importance, more contractors have improved their awareness toward green construction. This chapter summarises environmentally friendly construction technology and strategies on waste management, material reuse, noise control and indoor environmental quality management, which are encouraged to be put into practice.

6.1 Demolition and construction waste management

Statistical facts:

Different type of solid waste disposed of at landfills

Have you heard that the three existing landfills of Hong Kong are expected to approach their full capacity one-by-one from 2014 onwards? Landfills not only treat waste from domestic households, commercial and industrial activities, but also handle general construction waste. Overall construction waste contributed to 25% of total waste sent to landfills in 2011. Shopping malls and shop spaces produce waste from surplus materials, demolition, construction, refurbishment, renovation and interior fitting-out works.

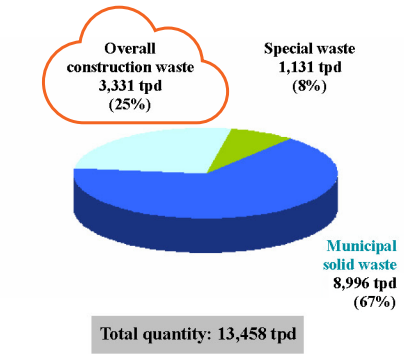


Figure 120 Different types of solid waste disposed of at landfills in 2011
(Source: Environmental Protection Department)

[1] The Government of Hong Kong Special Administrative Region. Environment Bureau. (2011). Monitoring of Solid Waste in Hong Kong – Waste Statistics for 2011.

GREEN TIPS

Reduced frequent renovation/retrofitting works

From time to time, shopping malls undergo renovation so as to attract and retain shoppers. However, renovation and retrofitting works would invariably lead to waste generation. The more frequent such works are taken, the more waste is produced. Mall owners shall try to prevent waste in the first place and avoid frequent renovation except when it is necessary.

The provision of leasing incentives is also recommended to attract long-term tenancy commitment from tenants and to minimise the turnover rate of retail leases.

6.1.1 Recommendations for site practices

As waste generation by the construction industry has always been a problem of treatment and management, strategies on waste reduction should be well planned. Some examples are presented here mainly for contractors' reference. Shopping mall developers, shop owners and tenants may also use such information for auditing purposes.

During demolition

Planning stage

- Conduct an on-site survey of the materials to be demolished/collected inside the existing premises
- Prepare a demolition waste management plan to identify key waste types and waste reduction targets

Demolition stage

- Conduct induction and toolbox training for workers
- Dismantle manually, prior to demolition using a hand-held breaker, bulldozer etc., to remove reusable furniture, electrical appliances and salvageable materials such as metals, timber, bricks and tiles
- Adopt selective sequential demolition to remove one type of material at a time to avoid mixing
- Reuse excavated spoils as back-fill materials on-site and off-site
- Separate demolition waste by category

Figure 121 On-site waste sorting facilities for recycling and reuse
(Source: Environmental Protection Department)

During construction

Planning stage

- Prepare a construction waste management plan to identify key waste types and waste reduction targets
- Select materials that can be reused in the event of alterations to minimise wastage or disposal (e.g. recycle wall blocks)

Construction stage

- Sort wastes for reuse and recycle

Figure 122 Sorted broken concrete
(Source: Civil Engineering & Development Department)

- Use precast building components, such as façades, staircases, semi-precast flooring, mid-landings, slabs and beams, as much as possible

Figure 123 Precast staircases
(Source: Hong Kong Housing Authority)

Figure 124 Precast building envelope
(Source: Hong Kong Housing Authority)

- Reuse excavated spoils or inert waste for backfilling, slope stabilisation and reclamation
- Reuse used timber for formwork where applicable
- Dispose of inert construction waste at public fill banks
- Order the right amount of building materials to be delivered at right time to avoid unnecessary cost

During major renovation and retrofitting of interior fitting-out

Planning stage

- Select materials that can be reused in the event of alteration to minimise wastage or disposal (e.g. recycle wall blocks)

Construction stage

- Sort waste for reuse and recycling
- Avoid the accumulation of renovation waste by requiring its removal once it is generated and, if possible, assign a dedicated area for its temporary storage while awaiting removal
- Use covered wheeled bins and trolleys for temporary storage and transportation

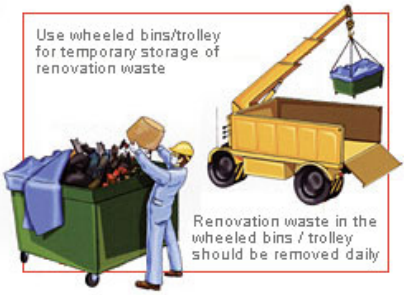


Figure 125 Use of wheeled bins for temporary storage
(Source: Environmental Protection Department)

GREEN TIPS

Further steps on waste reduction and management

During demolition

- Monitor monthly waste flow and divert more than 60% of waste from landfills and public fill banks
- Donate the furniture and electrical appliances to charities and recycle the salvageable materials by recyclers

During construction

- Consider reuse on site
- Adopt lean construction design such as reduced foundation size
- Maintain a balanced cut and fill on-site
- Apart from new purchases, consider reuse of furniture, office equipment and accessories from other site offices
- Monitor monthly waste flow and divert 60% of waste from landfills and public fill banks
- Transport excavated materials to other sites for reuse
- Precast uncommon building components such as bathrooms, kitchens, structural wall, lift and stair cores

Figure 126 Precast volumetric bathroom
(Source: BEAM Society Limited)

Figure 127 Recycling of marine mud
(Source: Hong Kong Housing Authority)

- Recycle marine mud as road pavers and fill materials, where applicable
- Use durable, recyclable material such as metal to replace timber used for formwork
- Explore ways to optimise the steel bar bending and cutting schedule to minimise scrap
- Purchase products with high recycled content

During major renovation and retrofitting of interior fitting-out

- Consider reuse on site
- Monitor monthly waste flow and divert 60% of waste from landfills and public fill banks
- Donate the furniture and electrical appliances to charities and recycle the salvageable materials
- Reuse partitions from other fitting out projects

6.1.2 Recycling construction waste

The listed materials are good examples of recyclable materials produced during demolition, construction and major renovation works, providing an idea of the types of waste that can be sorted and recycled.

Recycled materials	Uses
Aggregate	Sub-base materials for road construction, hard core for foundation works, base/fill for drainage, aggregate for concrete manufacture and general bulk fill
Asphalt	Aggregate fill and sub-base fill
Excavated materials	Filling materials
Public fill	Land reclamation
Metals	Manufacture of new metals
Glass	Substitute for sand and aggregates as pipe-bedding material, gravel backfill for walls, crushed stone surfacing, backfill, bedding and recycled paving blocks
Plastic	Synthetic materials in the form of plastic lumber for landscaping, horticulture and hydraulic engineering
Rubber	Manufacture of rubber slate tile used in roofing and sport/playground surface mats
Expanded polystyrene	Manufacture of lightweight concrete for non-structural works
Gypsum block	Manufacture of gypsum that can be recycled or reused for internal wall erection
Uncontaminated scrap lumber or pallets	Manufacture of furniture, or chipped and used as landscape mulch compost, animal bedding, boiler fuel, or engineered building products

TECHNICAL NOTE

Contact information of construction waste recycling

There are many companies that specialise in construction waste recycling in Hong Kong. Shopping mall developers, shop owners and shop tenants can contact them for collection of their construction waste generated from renovations at their shopping malls and shop spaces. The following contact information may be useful:

Websites:

1. **Hong Kong collector/recycler directory**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). Hong Kong waste reduction. Hong Kong collector/recycler directory. Retrieved 8 April 2013, from https://www.wastereduction.gov.hk/en/quickaccess/vicinity.htm
2. **Special waste collectors**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). Hong Kong waste reduction. Special waste collectors. Retrieved 8 April 2013, from https://www.wastereduction.gov.hk/en/workplace/specialwaste_collectors.htm
3. **Directory of recycled construction products (English version only)**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2010). Directory of recycled construction products. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/misc/cdm/products_list_cover.htm

Hotline:

1. **Recycling helplines (Environmental Protection Department)** Tel: 2838 3111

Recycling construction waste in shopping mall renovation

Pacific Place

Figure 128 Construction waste recycling (Source: Swire Properties Limited)

In the renovation of Pacific Place, 48 tonnes of glass and 628 tonnes of floor stone have been recycled over a five-year period. The glass was recycled into art materials used by primary school students, and the floor stone was recycled as paving blocks.

Source: Swire Properties Limited

6.1.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of demolition and construction waste management in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered minor works contractors – Appendix B (3)
- Registered general building contractors – Appendix B (8)

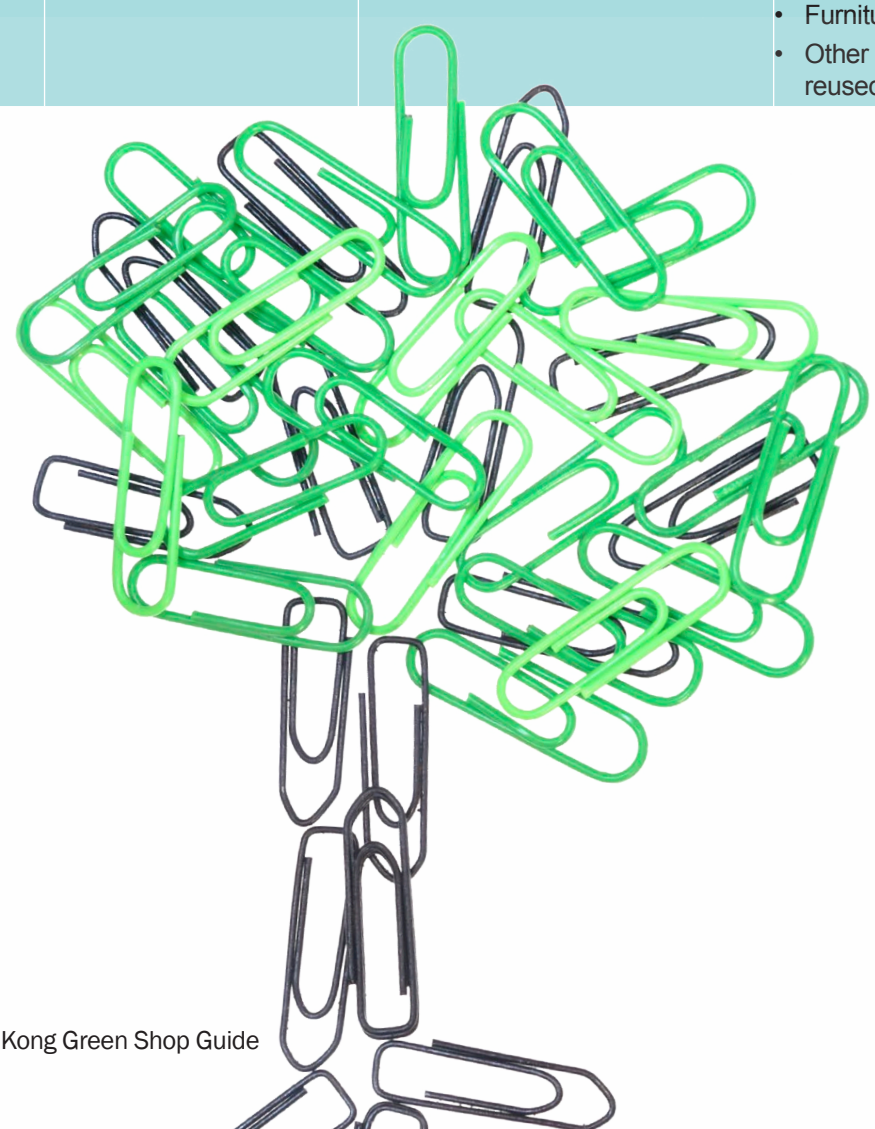
6.2 Material reuse

Reuse is defined as the use of a material after its original intended purpose has been fulfilled, without breaking it down into its raw components. Reuse is fundamentally different from recycling, because when a material is recycled, it is processed into a whole new product, requiring additional resources and energy.

Before thinking about recycling of waste, material reuse should be considered in the first place.

6.2.1 What materials can be reused?

	For new construction	For major renovation	For retrofitting of interior fitting-out
Structural components	• Foundation piles of previous developments	• Existing sub-structure - Structural wall - Floor - Roof decking • Existing envelope - Exterior skin and framing, excluding window assemblies and non-structural roofing material	
Non-structural components		• Interior wall • Glazing • Door • Floor covering • Ceiling system • Partition wall for temporary use	
			• Furniture and furnishings • Other salvaged, refurbished or reused materials



6.2.2 How can materials be reused successfully within a shopping mall?

Material reuse can be self-managed in shopping malls and shop spaces. There is no need to call any company to collect or recycle the waste. The waste can be reused within the shopping mall itself in many simple ways.

Figure 129 Material reuse in shopping malls and shop spaces

GREEN TIPS

Reuse of festival decorations

When festivals are celebrated, decorations and furnishings are placed and hoisted inside the shopping mall for a certain period of time. These materials are disposable and not durable. Consider the following methods before you next hold a festival:

- Reuse festival decorations in the following year

Figure 130 Reuse of festival decorations in Festival Walk (Source: Mapletree Greater China Property Management Limited)

Figure 131 Reuse of festival decorations in different shopping malls of Swire Properties Limited (Source: Swire Properties Limited)

- Donate festival decoration

  Donating festival decoration to the charity can extend the life of the goods. Small-scale collection and sale programmes are organised by the community.

Read more at:

1. **Recycling Programme**
   The Salvation Army. (2012). Recycling Programme. Retrieved 8 April 2013, from http://www.salvationarmy.org.hk/en/services/donate
2. **Community Recycling Coop**
   Industrial Relations Institute. (2005). Community Recycling Coop. Retrieved 8 April 2013, from http://www.iri.org.hk/2nd_shop_team.html

6.2.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of material reuse in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Registered architects (RA) – Appendix A (1)
- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

6.3
Acoustics and noise pollution control

Building renovation and retrofitting works within a shopping mall always generate different kinds of nuisances such as noise, waste and dust, in which noise directly affects potential retailers and transient shoppers.

What contractors and mall developers can do to alleviate the nuisance during different stages of construction are listed in the following section.

6.3.1 Recommendations for site practices

During demolition and construction

- Restrict noisy work and use of equipment that generates noise, (e.g. hand-held breakers) to less sensitive hours of the day
- Avoid noisy activities before 9 am and after 7 pm
- Use noise barriers or absorbers and fit noise mufflers to machines
- Place rubber mats/pads beneath work benches and noisy machines

Figure 132 Movable noise barrier (Source: Environmental Protection Department)

During major renovation and interior retrofitting

- Enclose the work area with tight temporary partitions
- Avoid noisy activities during peak hours
- Notify the affected tenants and customers of the schedule of noisy work

GREEN TIPS

Further steps in noise control

During demolition and construction

- Use quiet machines, such as a hydraulic crusher for demolition
- Liaise with the residents most affected to schedule noisy works at mutually acceptable hours and period

Figure 133 Quiet machine for demolition
(Source: Environmental Protection Department.)

During major renovation and interior retrofitting

- Include sound absorptive materials in the partition wall
- Carry out the noisy activities during non-peak and/or non-working hours

TECHNICAL NOTE

Searching for quality powered mechanical equipment (QPME) for the project

Quality powered mechanical equipment (QPME) items are construction equipment items that are new, notably quieter and more environmentally friendly. The QPME system is an inventory developed by the Environmental Protection Department to provide up-to-date information of quality construction equipment to contractors. Types of equipment for building and general construction works in the QPME system include:

- Asphalt paver
- Bulldozer, tracked
- Bulldozer, wheeled
- Compactor, vibratory
- Crane, mobile
- Excavator, wheeled/tracked
- Generator
- Loader, tracked
- Loader, wheeled
- Power rammer
- Road roller
- Roller, vibratory

Read more at:
QPME inventory information
The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). QPME inventory information. Retrieved 8 April 2013, http://www.epd.gov.hk/cgi-bin/npg/qpme/search_gen.pl?lang=eng&st=sim&smtype=0

6.3.2 Professional help

It is important to engage professionals for detailed consultation on the implementation of acoustics and noise pollution controls in shopping malls and shop spaces during renovation or interior decoration. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Acoustic consultants – Appendix A (8)
- Registered minor works contractors – Appendix B (3)
- Registered general building contractors – Appendix B (8)

6.4 Indoor environmental quality (IEQ) management

Poor indoor environmental quality may result in sick building symptoms and affect the performance of occupants. Contractors, mall developers, shop owners and tenants should endeavour to maintain a good indoor environment. Good site practices are recommended as follows.

6.4.1 Recommendations for site practices

During all kinds of work activities

- Develop and implement an indoor air quality (IAQ) management plan; monitor construction processes regularly
- Only use windows for fresh air supply; keep the main door closed and seal all gaps with plastic coverings or wet towels to avoid causing a nuisance to neighbours
- Compare the product labels on the volatile organic compound (VOC) content and choose products without, or with a low VOC content (such as water-based paints)
- Store VOC-containing products in air-tight containers
- Use mechanical ventilation devices such as fans and blowers
- Enclose the renovation work area with tight partitions
- Cement, sand, debris or any other dusty materials stored outside the site should be covered or kept moist
- Spray water before breaking, grinding, polishing or wood cutting operations
- Protect all HVAC systems and components during construction and renovation works

Figure 134 Covered stockpile with tarpaulin to minimise fugitive dust (Source: Environmental Protection Department)

GREEN TIPS

Further steps on indoor environmental quality management

During all kinds of work activities

- Encourage the neighbours to cover the main door with plastic sheets or seal the door gaps with wet towels
- Agree with neighbours on the use of VOC products at mutually acceptable hours
- Use absorbents and filters
- Fit vacuum cleaners to grinding, polishing or wood cutting machines; attach a vacuum cleaner to the grinding machine for effective dust control

Figure 135 Use of vaccum cleaner to reduce dust impact (Source: Environmental Protection Department)

Figure 136 Grinding machine attached to a vacuum cleaner (Source: Environmental Protection Department)

- Carry out building flush-out prior to occupancy

TECHNICAL NOTE

Building flush-out

Prior to occupancy of newly constructed and renovated buildings, flush-out is an important process used to remove indoor air pollutants, such as VOC- and particle-emitting construction materials, furnishings, interior finishes and cleaning agents, from a building by taking in outside air through the building HVAC system.

Procedures for building flush-out may vary from case to case. No matter how similar the buildings are, parameters such as duration, required air volume, maintained temperature and relative humidity are different.

It would be better for tenants and developers to schedule flush-out as part of the construction programme and to carry out an indoor air quality measurement to verify its performance.

Read more at:
Centre For Sustainable Building Research. Minnesota Sustainable Housing Initiative. (2011). Knowledge base – flush out. Retrieved 8 April 2013, from http://www.mnshi.umn.edu/kb/scale/flushout.html

6.4.2 Professional help

It is important to engage professionals for detailed consultation on the implementation of indoor environmental quality (IEQ) management in shopping malls and shop spaces during renovation or interior decoration. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)
- Registered minor works contractors – Appendix B (3)
- Registered general building contractors – Appendix B (8)

6.5 Post-occupancy commissioning

Shopping centres in Hong Kong are characterised by short rental periods. Given the continuous change in the nature of tenants' business, the demand on utilities, such as electricity, air conditioning and water, will also vary. To optimise the energy performance of the various systems, regular post-occupancy commissioning is considered necessary, particularly after renewal of a major leasing contract.

For effective implementation of post-occupancy commissioning, it is recommended that a retail operator engage an independent commissioning authority to plan and supervise the maintenance contractors to ensure that the commissioning works are conducted efficiently and effectively.

GREEN TIPS

Post-occupancy commissioning

- Regular post-occupancy commissioning to optimise the energy performance of various systems
- Engage an independent commissioning authority (CA) to plan and supervise the commissioning works

6.5.1 Professional help

It is important to engage professionals for detailed consultation on the implementation of post-occupancy commissioning at shopping malls and for shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

7 OPERATION MAINTENANCE AND MANAGEMENT

7.1 Water-saving strategies

Water conservation may not seem like an important issue for buildings in Hong Kong because of its low water and sewerage tariff structure. However operating a large shopping mall can use a lot of water for landscaping, cleaning and flushing. Throw in a few restaurants, fast food shops, laundries and hairdressers, and water use goes up dramatically. How can mall operators and individual tenants contribute to protecting and conserving water resources?

Water conservation in shopping malls

Stanley Plaza

The annual water consumption and flushing water consumption of Stanley Plaza have been reduced by 38% and 28% respectively in comparison with the HK-BEAM baseline for buildings. To achieve these two successes, the project implemented the following strategies:

- Low-flow water fixtures
- Infrared sensor controlled water taps
- Flood detection sensors
- Adequate checking meters for auditing purpose
- 75% of new trees planted are native species
- Dual flushing system and infra-red sensor operating urinals

Source: The Link Management Limited

GREEN TIPS

More landscaping resources available on the web

Hong Kong SAR Government has published a considerable amount of information on greenery for practitioners' reference.

Read more at:

1. **Technical guidelines on landscape treatment for slopes**
   The Government of Hong Kong Special Administrative Region. Civil Engineering and Development Department. (2011). Technical guidelines on landscape treatment for slopes. Retrieved 27 May 2013, from http://www.cedd.gov.hk/eng/publications/geo/manu_1_2011.htm
2. **Hong Kong herbarium**
   The Government of Hong Kong Special Administrative Region. Agriculture, Fisheries and Conservation Department. (2003). Hong Kong herbarium. Retrieved 27 May 2013, from http://www.hkherbarium.net/

7.1.1 Water efficient irrigation systems

Adopting water efficient irrigation systems can help reduce potable water consumption as well as the energy used in plumbing systems. Where outdoor amenity greenery is located or replaced, the following measures are recommended:

- Maintain high-efficiency irrigation technologies such as micro-irrigation, moisture sensors, or weather-data based controllers
- Install a pressure regulator that operates when water-supply pressure exceeds 80 psi or 552 kPa
- Use captured rainwater, grey water, municipally reclaimed water or on-site treated wastewater for irrigation, where available
- Use mulch and compost to maintain plant health; compost can be combined with a food-waste composting system

7.1.2 Water efficiency measures for water features

Water efficiency should be applied for fountains and water features in shopping malls and shop spaces, the following measures are recommended:

- Design ground pools with splash troughs around the perimeter that drain back into the pool
- For all filtration processes, install pressure gauges to determine when to backwash or change cartridges, then backwash based upon the pressure differential
- Monitor water use for abnormal increases in flow that may indicate leaks that should be identified and repaired
- Use water treatment only when necessary
- Reuse backwash water for irrigation
- Use shrubs or fences to shade the water features and block wind that increases evaporation

7.1.3 Water efficiency measures for shop owners and tenants

If shop owners and tenants are required to install or replace water closets and lavatory fixtures:

- Choose the most water-efficient plumbing items that are available on the market, including dual-flush toilets, automatic water taps and water-free or ultra-low-flush urinals (Also refer to **Section 5.3 – Plumbing and drainage**)

7.1.4 Professional help

It is important to engage professionals for detailed consultation on the implementation of water-saving strategies in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Landscape architects – Appendix A (3)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)

7.2 Recyclables Collection

With the increasing public awareness of environmental protection, more people are committed and getting involved in source separation of waste and recycling. Shopping malls and shop spaces are ideal places for collection of recyclables or sharing the recycling message.

7.2.1 Major types of recyclables

Figure 137 Recyclables and non-recyclables
(Source: Source Separation of commercial and industrial waste, Environmental Protection Department)

Type	Materials
Paper	Newspapers, magazines, leaflets, envelopes, paper shopping bags, books*, cardboard, packaging materials and egg cartons *It is recommended that books be reused or donated to charitable organisations.
Metals	Steel/aluminium cans, cookware, food containers and scrap metal
Glass	Glass bottles
Plastics	Plastic bottles, shopping bags, plastic wrapping, toys, stationery, plastic containers and chairs, used CDs/VCDs
Electrical appliances	Small electrical appliances (e.g. cookers, ovens, etc.) and large electrical appliance (e.g. air-conditioners, refrigerators, etc.)
Electrical and electronic equipment	Computers, printers, scanners, keyboards, loudspeakers, etc.
Rechargeable batteries	All rechargeable batteries
Fluorescent lamp	Compact fluorescent lamps and other fluorescent lamps
Others	Food waste, used cooking oil, printer cartridges

GREEN TIPS

Can't coffee grounds be reused?

Coffee shops are becoming popular places for meetings and gatherings. Coffee grounds generated during the coffee making process can be collected by tenants in catering business and used as cigarette butt extinguishers in ashtrays in outdoor smoking areas or used as organic fertilisers for planting.

7.2.2 Recycling strategies

No matter who you are, do a little more by taking the first step as shown below.

	Mall operators	Individual retailers/tenants	Shoppers
Provide waste collection bins on each floor of the centre - an easily accessible area - or in areas dedicated to the separation, collection and storage of material	✓		
Provide waste collection bins within retail stores		✓	
Organise and advertise educational recycling programmes	✓		
Instruct and educate staff to carry out waste separation	✓	✓	
Conduct regular checks to ensure waste is separated properly	✓	✓	
Maintain records of the quantities of waste collected for recycling and review them continually	✓	✓	
Arrange for a waste collector to pick up the recyclables for recycling in contract terms	✓	✓	
Donate and/or collect old durable reusable goods, such as computers, furniture and office equipment etc. to charities or people in need	✓	✓	✓
Separate recyclables and non-recyclables before disposal	✓	✓	✓
Participate in source separation and waste reduction programmes organised by the mother shopping mall		✓	✓

TECHNICAL NOTE

How to get a recycling bin?

Free recycling bins (excluding glass bottle)

Under the Promotion Programme on Source Separation of Waste launched by the Environmental Campaign Committee, any commercial and industrial buildings including shopping malls can apply for **not more than 5 sets** of waste separation bins free of charge. For details, please visit:

- **Promotion Programme on Source Separation of Waste**
  The Government of Hong Kong Special Administrative Region. The Environmental Campaign Committee. (2011). Promotion Programme on Source Separation of Waste. Retrieved 8 April 2013, from http://www.ecc.org.hk/english/publicity/ppssw_cib.html

Supplier directory

Shopping mall owners and building managers can buy recycling bins with reference to:

- **Non-exhaustive list of local suppliers of waste separation bins**
  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Hong Kong waste reduction. Non-exhaustive list of local suppliers of waste separation bins. Retrieved 8 April 2013, from https://www.wastereduction.gov.hk/en/household/pmc_bins_supplier.htm

Funding support

There is funding support from the Environment and Conservation Fund Committee for buying recycling bins. A funding limit of **50% of the total actual expenditure but not exceeding a limit of HK$1,000 per building floor** can be reimbursed. For details, please refer to:

- **Environment and Conservation Fund**
  The Government of Hong Kong Special Administrative Region. The Environmental Campaign Committee. (2013). Environment and Conservation Fund. Retrieved 8 April 2013, from http://www.ecf.gov.hk/en/application/index.html

Free glass bottle recycling bins

Under the Pilot Programme on Source Separation of Glass Bottles launched by the Environmental Campaign Committee, each shopping mall can apply for not more than 2 glass bottle recycling bins free of charge. For details, please visit:

- **Pilot Programme on Source Separation of Glass Bottles**
  The Government of Hong Kong Special Administrative Region. The Environmental Campaign Committee. (2012). Pilot Programme on Source Separation of Glass Bottles. Retrieved 1 August 2013, from http://www.ecc.org.hk/english/publicity/publicity.php?id=46

Adequate Recycling bins in shopping malls

In order to reduce waste generation, shopping malls should start at the source by conducting awareness campaigns and by providing an adequate number of recycling bins.

Figure 138 Different designs of recycling bins in different shopping malls (Source: Swire Properties Limited)

Mall management should work together with tenants and cleaning and waste collection contractors to increase waste recovery and reduce disposal.

Figure 139 Cleaning and waste collection (Source: Swire Properties Limited)

Mall management should work together with tenants and cleaning and waste collection contractors to increase waste recovery and reduce disposal.

Source: Swire Properties Limited

7.2.3 Educational recycling programmes

Some educational recycling programmes are extracted here which are good examples for mall owners, operators, shop owners and tenants to implement in their shopping malls and shop spaces.

Figure 140 Rechargeable Battery Recycling Programme (Source: Environmental Protection Department)

Rechargeable Battery Recycling Programme

The first battery recycling programme in Hong Kong began in April 2002 with the launch of the pilot Mobile Phone Battery Recycling Programme. After that, the programme was widened to include all other rechargeable batteries. As of 2012, more than 1300 housing estates, 600 commercial/industrial buildings and 200 schools provide collection services to their occupants.

No matter what type of building and location you occupy, the Environmental Protection Department welcomes your participation and provides cardboard collection boxes, publicity materials and detailed guidance to organisers.

Figure 141 Computer Recycling Programme (Source: Environmental Protection Department)

Computer Recycling Programme (CRP)

The Computer Recycling Programme was launched in 2008 after gaining experience from a pilot programme in 2003. The CRP has lined up a charitable organisation, Caritas (Hong Kong), to help refurbish computers that are still in a satisfactory working condition and donate them to the needy.

By submitting an application form to the Environmental Protection Department, any commercial building can join the CRP. A free collection service will be provided once every four to six months on a roster basis. Special requests for bulk pick-up can be freely met.

Figure 142 Fluorescent Lamp Recycling Programme (Source: Environmental Protection Department)

Fluorescent Lamp Recycling Programme (FLRP)

The Fluorescent Lamp Recycling Programme was launched in 2008 for collection and treatment of mercury-containing lamps in line up with international practices. As of 2012, more than 1000 housing estates joined FLRP, supplemented by 180 public collection points including retail shops and shopping malls.

Shopping malls can participate by setting up collection box to facilitate the public in recycling the spent fluorescent lamps or tubes when they visit the mall.

Figure 143 Food Waste Recycling Partnership Scheme
(Source: Environmental Protection Department)

Food Waste Recycling Partnership Scheme

In 2009, the Environmental Protection Department along with the commercial and industrial sectors, launched the Food Waste Recycling Partnership Scheme in order to collect the source separated food waste for the Kowloon Bay pilot composting plant. Although the scheme lasted for only three years, continuous support of, and technologies for, food waste reduction were promoted. In view of the completion of the site selection of organic waste treatment facilities (OWTF) phase 1, separating and diverting food waste from landfills is gaining importance.

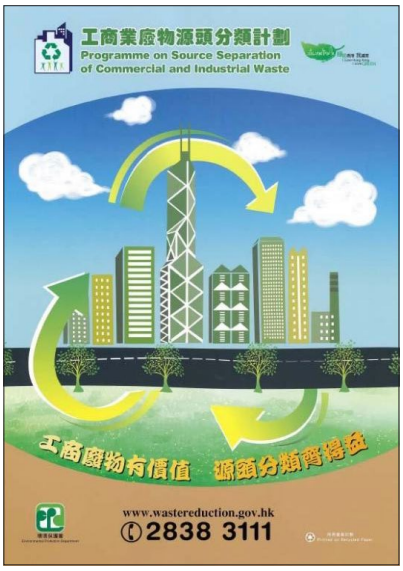


Figure 144 Programme on Source Separation of Commercial and Industrial Waste
(Source: Environmental Protection Department)

Programme on Source Separation of Commercial and Industrial Waste

The Environmental Protection Department launched the programme in 2007 aimed at encouraging property management sections to set up and implement suitable mechanisms to separate and recover waste within commercial and industrial premises. This also facilitates tenants and shoppers supporting waste separation and recycling practices.

Any commercial building can participate in the programme free of charge in the capacity of the management company, incorporated owners' committee or owners' committee and seek technical advice from the EPD.

GREEN TIPS

Organising green educational and promotion programmes

It is not a difficult task to organise a green educational and promotion programme. Large numbers of visitors and customers in the shopping malls and shop spaces can be easily attracted by:

- Eye-catching labels on the sustainable features around the shopping malls and shop spaces
- Free green guided tours to introduce them to sustainable building design features within the premises
- Video shows showing movies related to sustainability
- Green promotion campaigns such as a recycling programme, Green Monday, and the Food Wise Hong Kong Campaign

TECHNICAL NOTE

Contact information for recycling

Recycling is very easy to implement. There are a number of companies specialising in recycling in Hong Kong. Shopping mall developers, shop owners and tenants should contact them and organise more recycling at shopping malls and shop spaces with their help. The following contact information may be useful:

1. **Hong Kong collector/recycler directory**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). Hong Kong waste reduction. Hong Kong collector/recycler directory. Retrieved 8 April 2013, from https://www.wastereduction.gov.hk/en/quickaccess/vicinity.htm
2. **EcoPark tenant directory**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). EcoPark tenant directory. Retrieved 27 May 2013, from http://www.ecopark.com.hk/en/directory.aspx
3. **Rechargeable Battery Recycling Programme**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Hong Kong waste reduction. Rechargeable Battery Recycling Programme. Retrieved 27 May 2013, from https://www.wastereduction.gov.hk/en/workplace/rechargebattery_intro.htm
4. **Computer Recycling Programme**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Hong Kong waste reduction. Computer Recycling Programme. Retrieved 27 May 2013, from https://www.wastereduction.gov.hk/en/workplace/crp_intro.htm
5. **Fluorescent Lamp Recycling Programme**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013) Fluorescent Lamp Recycling Programme. Retrieved 27 May 2013, from https://www.wastereduction.gov.hk/en/household/flrp_intro.htm
6. **Food Waste Recycling Partnership Scheme**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012) Food Waste Recycling Partnership Scheme. Retrieved 27 May 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/waste/prob_solutions/owt_food.html
7. **Programme on Source Separation of Commercial and Industrial Waste**
   The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Hong Kong waste reduction. Programme on Source Separation of Commercial and Industrial Waste. Retrieved 27 May 2013, from https://www.wastereduction.gov.hk/en/workplace/cissp_what.htm

7.2.4 Professional help

It is important to engage professionals for detailed consultation on the implementation of green cleaning and maintenance strategies at shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- BEAM Professionals (BEAM Pro) – Appendix A (7)

7.3 Waste treatment and composting strategies

Landfills in Hong Kong are running out of space. Improved waste treatment and composting technologies are introduced here to help reduce the volume of waste and bring the waste to resource as fertiliser.

7.3.1 Waste treatment strategies

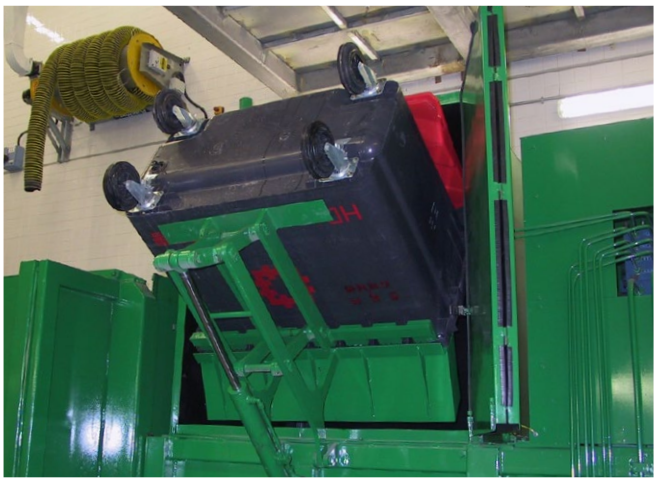


Figure 145 Central compactor system (Source: Hong Kong Housing Authority)

Figure 146 Small scale distributed compactor (Source: Hong Kong Housing Authority)

Figure 147 Baler for compacting recyclable (Source: Swire Properties Limited)

For better treatment of commercial refuse and hygiene control, mall operators may consider:

- Installing a central compactor system in larger centres; or installing a small-scale distributed compactor system in smaller centres. The handling system reduces refuse volume for storage, prevents odour leakage and minimises the frequency of transportation.
- Installing de-odourisers in the refuse collection and storage chambers to tackle the odour problems.

The use of compactor for commercial refuse may generate wastewater or leachate and depending on the quantity and strength of the leachate, a Water Pollution Control Ordinance license may be required for permission to discharge it into a public sewer.

7.3.2 Composting strategies

Food waste is an untapped energy source that mostly ends up rotting in landfills, thereby releasing greenhouse gases into the atmosphere. It is difficult to treat or recycle food waste since it contains high levels of sodium salt and moisture, and is mixed with other wastes during collection. Major generators of food waste include hotels, restaurants, supermarkets, residential blocks, cafeterias, airline caterers, food processing industries, etc.

Here are some tips on food waste handling and composting:

- Establish a communication mechanism for source separation and collection of food waste from tenant restaurants and canteens
- Recycle waste to produce compost or animal feed, or delivered to future organic waste treatment facilities for treatment
- Consider installing food waste decomposer or food waste pulping system in shopping malls to treat their source separated food waste on site and recycle it as organic fertiliser
- Not all food waste is suitable for composting, those recyclables and non-recyclables are identified.

Figure 148 Compost turned from food waste of restaurants in International Commerce Centre (ICC), Kowloon (Source: Kai Shing Management Services Limited)

A. Examples of the recyclables and non-recyclables

Recyclable food waste	Non-recyclable food waste
• Vegetables • Meat • Flour • Rice & noodles • Bread • Egg shells • Tea bags • Paper towels	• Plastic products • Disposable utensils • Foam polystyrene containers • Aluminium foil containers • Paper tray liners • Cups & lids

B. How does a food composter work?

Waste disposal → Mixing → Fermentation/decomposing → Compost generation/water discharge

Figure 149 Flow chart of a food composter

Figure 150 Food waste decomposer in Olympian City, West Kowloon (Source: Sino Group)

GREEN TIPS

Initial cost for a food composter

The general cost of a food composting system with capacity range of 75-100kg/day is around HK$230,000-HK$270,000.

Read more at:
Non-exhaustive list of local suppliers of electric composters
The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Hong Kong waste reduction. Non-exhaustive list of local suppliers of electric composters. Retrieved 8 April 2013, from
https://www.wastereduction.gov.hk/en/workplace/electriccomposters.htm

7.3.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of waste treatment and composting strategies at shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)

7.4 Green cleaning and maintenance

An intelligent retailer or shopping mall operator should develop a green cleaning programme to reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants that may adversely affect air quality, human health, building finishes, building systems and the environment.

7.4.1 Methods

A green cleaning policy should address at least the following items:

- Purchase products and equipment that meet sustainability criteria for green cleaning
- Establish standard operating procedures addressing effective floor cleaning and maintenance issues
- Develop guidelines addressing the safe handling and storage of cleaning chemicals, including a plan for managing hazardous spills or accidents
- Develop staffing and training requirements, and specifically address the training of maintenance personnel in the hazards of use, disposal and recycling of cleaning chemicals, dispensing equipment and packaging
- Implement a method for collecting occupants' feedback on cleaning policies and effectiveness
- Install continuous improvement programmes to evaluate new technologies, procedures and processes to promote green cleaning.

7.4.2 Products

In view of the overwhelming number of hazardous chemicals on the market, it is hard to distinguish them from environmentally friendly products. Here are some tips on selecting and handling the cleaning products.

Potential toxic ingredient	Tips
Deodorising/air purifying agent	
• Synthetic musk • Formaldehyde (carcinogenic)	• Be careful when choosing products with synthetic scents or anti-virus and disinfecting agents • Use alternatives with fewer toxic materials (e.g. baking soda) • Clean frequently and maintain good ventilation in order to remove the sources of odours
Detergent	
• Synthetic musk • Coal tar dye • Phosphate	• Be careful when choosing detergents with synthetic scents • Avoid detergents with the ingredient of phosphate
Bleaching agent	
• Sodium hypochlorite • Synthetic musk • Nonyl phenol (NP) and Nonylphenol polyethoxylates (NPEs)	• Be careful when choosing bleaching agents and ammonia water • Wear plastic gloves when using bleaching agents

GREEN TIPS

Key points to a success of green cleaning

- Purchase products and equipment that meet sustainability criteria for green cleaning, such as:

  Seal of Approval Vacuum
  The Carpet and Rug Institute. (n.d.). Seal of Approval Vacuum. Retrieved 8 April 2013, from http://www.carpet-rug.org/

- Develop staffing and training requirements, and specifically address the training of maintenance personnel in the hazards of use, disposal and recycling of cleaning chemicals, dispensing equipment and packaging.

Read more at:
Green building product listing service
Hong Kong Green Building Council. (2013). Green building product listing service. Retrieved 27 May 2013, from
http://www.hkgbc.org.hk/productlisting/

7.4.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of green cleaning and maintenance strategies at shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- BEAM Professionals (BEAM Pro) – Appendix A (7)

7.5 Facility management and operations

7.5.1 Guidelines for tenants – green renovation

The tenants guide should have the following elements:

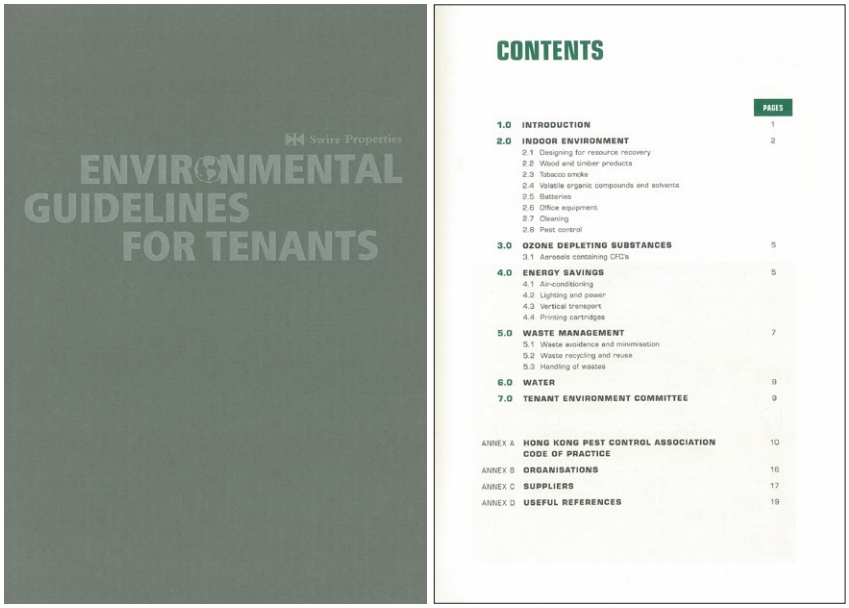


Figure 151 Example of Building User Guide for Tenants
(Source: Swire Properties Limited)

A. Environmental management

Engage a contractor that has ISO14001 accreditation.

B. Waste management

Ensure that every attempt is made to avoid construction and deconstruction waste going to landfills by reusing or recycling.

C. Building materials

When selecting the building materials to be used in fitting out work, the tenant should take into consideration of the following issues:

- Reuse of existing internal structures
- Use of regionally sourced materials
- Use of recycle materials
- Use of non-disposable hoardings. The building manager could negotiate a discounted rate from the vendor through bulk purchase
- Specify materials with no VOC or low VOC to be used for painting, carpets, ceilings, etc.
- Carpet tiles to be used instead of broadloom, allowing the tenant to replace individual tiles when spots are damaged or worn out
- Use light coloured material where possible to reduce lighting intensity

D. Waste

- Measures to minimise construction waste
- Provision of space for storage and collection of recyclables

E. Indoor environmental quality

- Efficient lighting to reduce energy cost and the heat load on the air-conditioning system
- Ensure the design of the shops is benefiting from the best levels of natural light
- Control of VOCs and other pollutants
- Appropriate amount of fresh air is drawn
- Paint the walls and ceilings in a light colour to minimise lighting demand

F. Equipment

- Design of lighting system:
  - Use of efficient fluorescent or LED and avoid using incandescent, halogen or energy intensive lighting
  - Occupancy based lighting control system with appropriate zoning and daylight linking
  - Effective use of specular reflectors
  - Consideration of circuitry to create flexibility in lighting intensity
- In areas where the tenant consistently uses the building out of operating hours, a supplementary air conditioning unit should be installed.
- Use only energy efficient equipment
- Furniture should be of:
  - Recycled content
  - Natural, renewable materials
  - High durability
  - Use mechanical fixings in preference to glues where possible
- For F&B operators
  - Not to oversize the fridge as large fridges tend to use more energy
  - Locate the fridge in a cool location, with adequate ventilation around it
  - Always load the dishwasher with a full load
  - Ensure that the hot water boilers have a timer and manual switch off, and are well insulated
  - Condensers should be located outdoors or in a well ventilated area
  - Empty the grease traps regularly
  - Clean the grease filters regularly
  - Wash the electrostatic precipitators regularly

7.5.2 Guidelines for facility management

A. Indoor environmental quality

- Temperature control
  - Optimise thermal comfort by obtaining a balance between air temperature, air movement and relative humidity
  - Provide sub-metering
  - Monitoring and maintenance of indoor temperature at set summer and winter ranges
- HVAC to be regularly cleaned and tested for contaminants, and contaminants removed
- Regular indoor air quality testing

B. Minimising energy use

- Provide adequate metering/sub-metering
- Lighting system
  - With the capability to provide individually switched lighting zones (e.g. perimeter groups of lights that can be automatically dimmed or switched off in response to natural daylight levels)
  - Remove excess tubes, install efficient tubes and LED lightings
- Sub-metering of major building services facilities will enable performance to be monitored and improved
- Develop maintenance schedules and report forms specific to the building
- Set energy targets, monitor and report energy consumption, and perform energy audit for specific periods

C. Water conservation

- Water efficient toilets and urinals
- Water efficient taps
- Sub-metering for common area water use (e.g. common lavatories, cooling towers)
- Regular Inspection for any abnormal increase in water charges and leakages
- Central food decomposer provided by building management
- Use dual water tanks, so that water can be saved during the water tank cleaning work
- Collection of rain water: this is water collected off the roof or other surfaces of a building. As a resource, it is dependent on collection area, rainfall and the amount of space available for water storage tanks.

D. Material choice

- Research both materials and manufacturers that use local resources and recommend their products to the tenants
- Recommend recycled and energy efficient consumables (e.g. light fittings with reduced price from the vendors through bulk purchasing)
- Ensure that equipment and installations are maintained in accordance with recommendations from the manufacturers to ensure longevity and the potential for future re-use.
- When ordering materials for projects, ensure that they are protected using either recyclable or returnable packaging.

E. Minimising waste

- Facilities for separate storage and recycling of paper, cardboard, containers and food waste
- Systems for recycling of items such as toner cartridges, fluorescent tubes, batteries and mobile phones
- Separation of debris from reinstatement

F. Cleaning services

- Cleaning contracts to specify use of natural, solvent free and hydrocarbon-free cleaning products
- Cleaning contracts to specify compliance with relevant waste management and energy efficiency policies
- Control of potential pollutants introduced through cleaning
- Control of potential pollutants introduced through pest control

Figure 152 Green Building Award 2010 (existing buildings – Hong Kong & Asia Pacific) facility management project, grand award – continuous low carbon operation, Festival Walk, Kowloon Tong (Source: Mapletree Greater China Property Management Limited)

7.5.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of water-saving strategies in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- BEAM Professionals (BEAM Pro) – Appendix A (7)

7.6 Transport management strategies

7.6.1 Loading and unloading bays

- Plan service vehicle traffic routes to avoid conflict with pedestrian traffic and other vehicles.
- Provide natural ventilation and natural lighting where possible.
- Provide adequate mechanical ventilation and carpark exhaust systems.
- Provide adequate space for waste sorting and recycling.
- Provide washroom facilities for service use.
- Provide CO/NO (carbon monoxide/nitric oxide) sensors for operation of mechanical ventilation.

Figure 153 Loading and unloading bay and skylights at Pacific Place, Admiralty

7.6.2 Service vehicles

- Plan service vehicle traffic routes to avoid conflict with pedestrian traffic and other vehicles.
- Provide efficient service traffic routing and parking to minimise vehicle driving and idling time, which will help to minimise exhaust gas emissions from vehicles.
- Provide clear signage to direct service traffic.

7.6.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of transportation strategies for shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

8 INCENTIVES FOR TENANTS AND SHOPPERS

8.1 Tenant incentive schemes

8.1.1 Education and tenant support

Implement a strategy to educate and support tenants in adopting more sustainable practices. The following are some examples:

- Green lease certificates to be issued annually to tenants
- Building user guide for tenants
  (More details are discussed at **Section 7.5 – Facilities management and operations**)
- Regular reporting to tenants on the environmental performance of facility management
- Formal mechanisms for gathering tenant feedback (e.g. regular surveys)

8.1.2 Holding environmental events and campaigns

- Arrange events that are themed around environmental issues
- Invite tenants to events about sustainability issues of the building

8.1.3 Communication with tenants

Keep tenants up-to-date on the performance of sustainability measures. Make them part of the process and let them know how you are improving their building.

8.1.4 Collective bargaining by property manager

Through central procurement by the property manager, costs for the engagement of various contractors for achieving sustainability are greatly reduced.

- Encourage tenants to use nominated contractors following good green practices. Engage nominated contractors at discounted rates for the tenants.
- Encourage tenants to use non-disposable hoardings. The building manager can negotiate for a discounted rate from the vendor through bulk purchase.
- Bulk purchase of energy saving light fittings for sale to tenants at a reduced price.
- In the case of fast food operators and food court operations, the landlord may take up the task of providing degradable table accessories and utensils to the F&B operators.

8.1.5 Other lease conditions

Some of the lease conditions themselves may contain clauses that will discourage sustainability initiatives by the tenants (e.g. prescribed shop front light operating hours).

Very often, there are mandatory clauses in the tenancy agreements requiring tenants to carry out retrofitting work on their shops, irrespective of the condition of the existing fitting out work, during the term of the agreement or at the time of renewal. In order to maintain the overall competitiveness of the shopping mall, the landlord may sometimes, as a business strategy, seek to change the tenant mix by moving tenants around.

Such lease conditions and policies will inevitably create redecoration waste and should therefore be reviewed to ensure that they are consistent with green policies.

8.1.6 Long term leasing initiatives

Longer leasing terms will encourage higher capital investment in the use of green building materials by tenants.

The landlord should also show flexibility by waiving the tenant's obligation to remove the fitting out work at the end of the tenancy, and thereby allow the incoming tenant to benefit from the reuse of the existing fitting out work.

Offer help in certification application

Swire Properties Limited

Creating Incentives

Swire encourages their tenants to support sustainable practices during their occupancy. For example, they have helped one of their tenants in their shopping mall, TaiKoo Hui in Guangzhou, to pursue LEED-Commercial Interior (CI) certification by acting as their commissioning authority at no charge.

Source: Swire Properties Limited

8.1.7 Professional help

It is important to engage professionals for detailed consultation prior to the implementation of tenant incentive schemes for shopping malls and shops. The following is a list of references for obtaining professional help:

- Registered professional surveyors (RPS) general practice – Appendix A (9)
- Lawyers – Appendix A (10)

8.2 Green lease

A green lease is any lease that has a sustainability outcome built in it. This can include criteria regarding energy, waste and water. The introduction of these sustainability criteria does not replace the need to consider the implications of the base lease clauses. Essentially, the green lease schedule reflects the parties desire to improve and be accountable for sustainability in the building.

Since sustainability is still a new concept in Hong Kong, and the technologies and skills necessary for achieving performance targets are still being developed, a more collaborative approach is recommended.

Under a collaborative green lease, the landlord and tenant will agree to act in good faith and take a cooperative approach towards improving environmental performance and addressing any issues arising under the lease. In particular, the following elements will be found in the green lease.

8.2.1 Objectives of the parties

These are included to ensure a clear understanding of the objectives of the landlord and tenants and to align these with the sustainability performance objectives for the building.

8.2.2 Design and performance rating tools

A thorough understanding of what will be required to maintain the performance rating is necessary:

- Energy monitoring and reduction targets
- Waste reduction/recycling targets
- Water monitoring and reduction targets
- The use of cleaning products that have a low environmental impact
- The future procurement of materials that have a low environmental impact

8.2.3 Timeframes

Both parties need to agree on a realistic timeframe, taking into consideration the full scope of works required. It should also allow for factors outside the parties' control which may influence the delivery timeframe.

8.2.4 Measuring and reporting

The parties should consider what measurement and reporting structures will be necessary to support the sustainability objectives in the lease.

8.2.5 Green financing

Economic considerations are always a major concern to the property owner when planning environmental friendly installations in the building. In this regard, a decision to fund green improvements to buildings by calculating the payback period is justified.

As sustainability is a relatively new concept, and exactly who pays for what is still being determined, landlords and tenants will have to discuss and decide who should pay.

In reality it is a combined approach. As benefits flow to both the owner and the tenant, both need to invest in the sustainability of the building. Although the landlord can ensure that the building operates in a sustainable way, the tenants are responsible for their actions within the building and how they use the space.

The following are some examples of compromises between landlords and tenants when deciding which party should pay for the capital investment work:

- The tenants pays for sustainability attributes (e.g. increased construction costs or equipment costs to meet higher performance standards) by sharing capital payments or amortising the cost over the term of the lease.
- If the shop's fitting-out needs to meet a certain green standard or is required under the lease to achieve a certain green certification standard, the landlord pays for part of the cost for green certification or discounts the rent as an incentive to the tenant.
- The landlord covers part of the cost of the facility management process for the tenant if certain processes need to be followed by the tenant in order to meet the green performance objectives of the landlord.
- The green rating achieved by the tenant will be reflected in the rental under the rent review clause in a lease.

8.2.6 Incentives for tenants to adopt a green lease

Tenants are more and more concerned about the green performance of their building and tenancy. Tenants with green commitments who want to reduce their carbon footprints are likely to be attracted to buildings that demonstrate a high level of green performance. Green lease also offers a good opportunity to create a valuable relationship between the landlord and the tenant and, as a result of their joint efforts, the environmental performance of the whole property could be improved.

Lease terms that require tenants to renovate within a few years or to relocate their shop within the shopping mall, based not on the tenants' need but rather as a standard landlord requirement, should be removed from the lease if the tenant agrees to adopt a green lease and is willing to pay for the cost for fitting out their shop to meet green performance objectives set by the landlord.

Under a green lease, a landlord can offer free green renovation and facility management advice and support to tenants. This will encourage tenants to learn about and adopt green measures in carrying out renovations and in their operations which will help them to fulfill their targets under the lease.

Green is everybody's business:
Shopping mall developers, owners, facility managers, shop tenants and staff shoppers

8.2.7 Professional help

It is important to engage professionals for detailed consultation prior to the introduction of green leases for shopping malls and shops. The following is a list of references for obtaining professional help:

- Registered professional surveyors (RPS) general practice – Appendix A (9)
- Lawyers – Appendix A (10)

8.3 Customer incentive schemes

Sustainability programmes in shopping malls will not be successful without the support of the customers. The following are incentives for customers visiting a shopping mall:

- Coupons for a lucky draw if customers do not use plastic bags provided by shop tenants
- Instead of paper leaflets for giving directions and for promotional purposes, electronic directories should be used
- Free parking for electric vehicles and car parks with charging facilities
- Reduce customers' use of private vehicles by discouraging the use of discounted parking fees as a promotional activity
- Encourage customers to use public transportation (e.g. installation of MTR Fare Saver machines; coupons given to customers who can prove with their octopus card that they have used public transport to visit the shopping mall)
- Recycle bins to be placed at convenient locations to encourage separation at source of solid waste, paper, plastic, metal, chemical and other recycled waste

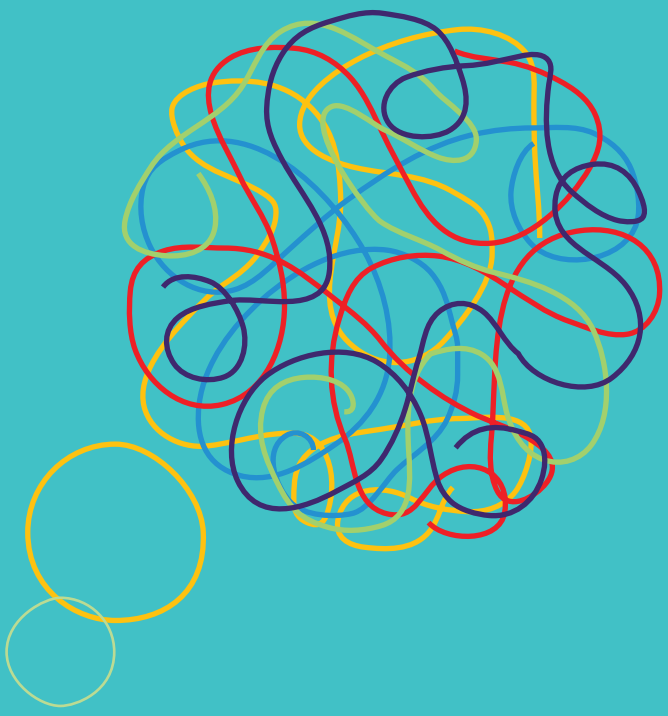
For more details about recycling programmes in shopping malls and shop spaces, please refer to **Section 7.2.3 – Educational recycling programmes**.

Figure 154 Educational recycling programmes (Source: Environmental Protection Department)

Figure 155 Recycling campaign and organic farming launched in Citywalk, Tsuen Wan (Source: Sino Group)

Figure 156 Examples of customer incentive schemes (Source: The Link Management Limited)

9 SPECIAL TOPICS



Implementation of green measures for shop spaces will help shop spaces consume less energy, have less impact on the environment, as well as provide a desirable environment within shop spaces.

Due to the different nature and functional needs of shop spaces, considerations for implementation of green measures for different types of shop spaces may vary. The following are the special case studies covered in this chapter:

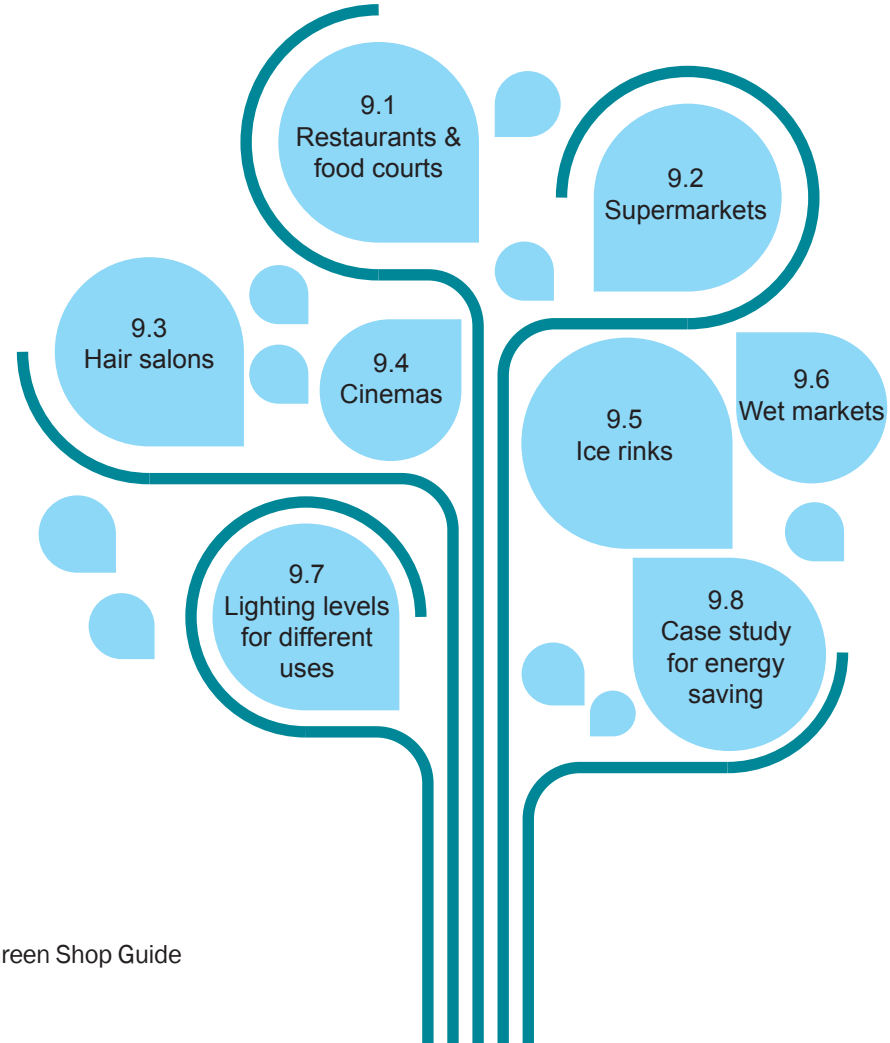


Figure 157 Restaurant in Pacific Place, Admiralty (Source: Swire Properties Limited)

9.1 Restaurants and food courts

9.1.1 Ways to reduce energy use in restaurants

Restaurants and food courts are identified as major energy consumers in shopping malls. Their cooking processes also require gas and electricity. Hong Kong restaurants have often been complained about as being “too cold” with the temperature of the air-conditioning set too low for human comfort.

Statistical facts:
Energy in restaurants generally consumed

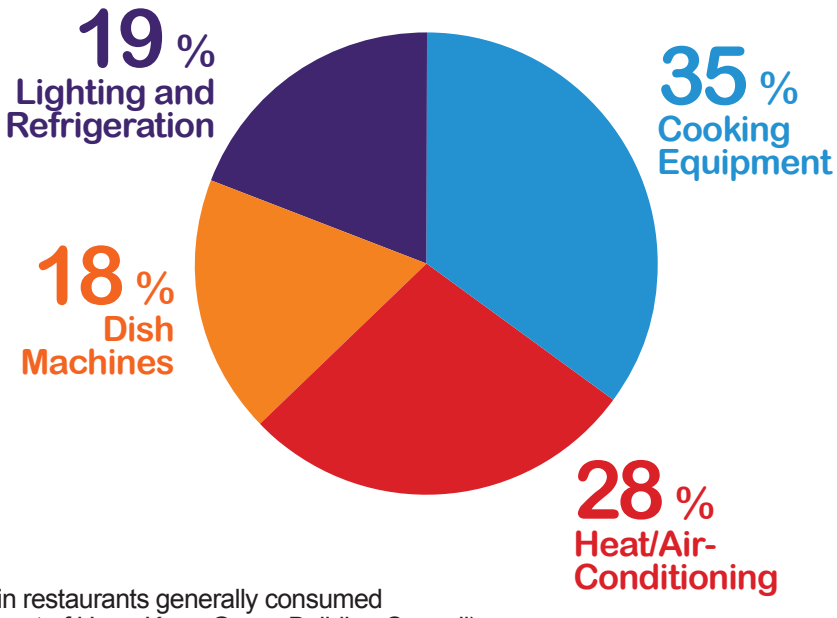


Figure 158 Energy in restaurants generally consumed
(Source: HK3030 report of Hong Kong Green Building Council)

A. Lighting

Lighting of restaurants and food courts is for functional purposes as well as for decoration. It is important to consider the following:

- Use of more natural daylight by the introduction of skylights or large windows – reduce reliance on artificial lighting and associated energy use.
- Zoning of lighting for different usage.
- Provide staff with the ability to control lighting. Install dimmers to help adjust lighting levels so that lighting levels can be reduced as appropriate.
- Install motion sensors for lights where appropriate, such as in store rooms and restrooms.
- Regular cleaning of light fittings.
- Higher reflectance of walls, ceiling and floor if possible.
- LED exit signs.
- Energy efficient lighting (e.g. compact fluorescent lamp (CFL), T5 tube, LED, etc).

B. Ventilation, heating and air-conditioning

In restaurants and food courts the design and use of natural ventilation, mechanical ventilation, air-conditioning and heating will affect energy use and cost of operation of the restaurant and food court. It is important to consider the following:

- Adequate air pollution control facilities and air ducting for the restaurants should be planned and centrally provided during construction and renovation of shopping centres.
- Consider natural ventilation or hybrid ventilation where possible.
- Provide outdoor seating where appropriate and permitted. An outdoor seating area will have fresh air and natural ventilation without the need for air-conditioning.
- Use ceiling fans to circulate air and reduce reliance on air-conditioning.
- Where windows or glazed areas are provided, use double glazing for better insulation to reduce heat and cool loading for the air-conditioning.
- Use an energy efficient air-conditioning system.
- Zone air-conditioning systems to serve different usage.
- Divide hot and cool zones inside kitchen areas to save air-conditioning energy.
- Use a heat exchanger.
- Furnace to be tuned and filters to be replaced regularly.
- Provide sub-meters to monitor use of electricity for different usage.
- Provide positive pressurisation in dining areas to prevent infiltration of exterior hot air and pollutants where restaurants are connected directly to the outside.
- Install occupancy sensors where people seldom go (e.g. store rooms).
- Good insulation of pipes.
- Use a refrigerant with an ozone depletion potential (ODP) of zero or global warming potential (GWP) of less than 100.
- If a cooling tower is used, comply with the Code of Practice for Prevention of Legionnaires' Disease and Code of Practice for Water-cooled Air Conditioning Systems.
- Use solar film.
- Good insulation of pipes and air ducting.

Figure 159 Outdoor sitting area of a restaurant in ifc mall, Central

Figure 160 Outdoor furniture for outside sitting area
(Source: Kai Shing Management Services Limited)

C. Operational measures:

Green measures in the operation of restaurants and food courts can also help to reduce energy use and save on costs. The following considerations are important:

- Keep cooking equipment clean. Carbon and grease build-up will reduce cooking equipment's energy efficiency.
- Cover pots to reduce heat loss and help to cook food faster.
- Schedule cooking times to utilise ovens, steamers and fryers fully, which will help to minimise daily operating hours of cooking equipment.

- Pre-cook food such as potatoes and chicken in a steamer before frying to help reduce use of fryers and the amount of oil used for frying. Note that steamers are more energy efficient than fryers and produce less air pollution in the kitchen.
- Set the thermostats of water heaters appropriately, not exceeding minimum necessary, so as not to waste energy (60°C for dishwashers but 43°C for hand washing).
- Consider sterilisers instead of a higher water temperature for dishwashing.
- Keep sufficient maintenance of pollution control equipment such as emptying of grease traps, cleaning of grease filters, topping up of hydrovent cleansing liquid and washing electrostatic precipitators.

D. Energy efficient kitchen equipment

Cooking equipment is a major energy user in restaurants and food courts. It is important to consider the following:

- Use of energy efficient kitchen equipment (deep fryers, grills, ovens, freezers, cold rooms).

E. Heat recovery

Cooking in restaurants and food courts generates a lot of heat. Therefore, it is important for restaurants and food courts to consider the use of heat recovery where possible. For steaming equipment, consider waste heat recovery from the electric or gas steam cabinet and the installation of a heat recovery unit to generate hot water for other applications such as dish washing.

Energy conservation in restaurants

Steamer with heat recovery system

Traditional steamers boil water to generate steam for heating and then exhaust the steam waste through pipes and fans. Steamers with heat recovery systems collect the steam waste and reuse it as heat energy in the steamer again. Existing products include:

Steamer with heat recovery system

Benefits:

- Help in reducing overall gas/electricity costs.
- Lower the room temperature of kitchens.
- Allow employees to experience “cool kitchen effect”.
- Reduce warming effect to the surroundings: temperature of the exhaust steam is greatly reduced from 250°C to 130°C.

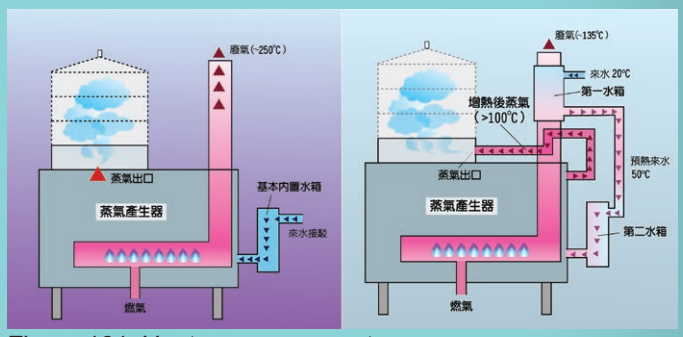


Figure 161 Heat recovery gas steamer
(Source: The Hong Kong and China Gas Company Limited)

Read more at:

1. **The Hong Kong and China Gas Company Limited**
   The Hong Kong and China Gas Company Limited. Retrieved 8 April 2013, from http://www.towngas.com/Eng/Cust/Business/CommerceIndustry/SuccessStories.aspx
2. **A handbook on the best practices in “Cool Kitchen”**
   The Hong Kong Productivity Council. (2010). A handbook on the best practices in “Cool Kitchen”. Retrieved 31 July 2013, from http://www.hkpc.org/images/pdf/cool_kitchenhandbooklowres.pdf

Source: The Hong Kong and China Gas Company Limited (Towngas) and The Hong Kong Productivity Council

9.1.2 Water efficiency

Restaurants and food courts use a lot of water for cooking, washing and cleaning. It is important to consider the following to save water:

- Use water efficient water fittings.
- Use water efficient equipment (pre-rinse spray valve, dishwasher, air-cooled ice-making machine).
- Monitor and track water consumption.
- Add extra meters for better monitoring of major water use and water leakage detection.
- Implement water saving practices such as placing frozen food in the refrigerator for overnight thawing.
- Centralised dish washing system for food court.
- Consider recycling of grey water.

Figure 162 Centralised dishes washing system (Source: Kai Shing Management Services Limited)

9.1.3 Use of environmentally friendly consumable materials

Use of environmental friendly consumable materials will help reduce waste generation. It is important to consider the following:

- Use of consumable materials that are environmentally friendly, recyclable, recycled or non-disposable for:
  - Food containers, wrappers, bags
  - Cups, bowls, plates
  - Napkins, serving utensils
  - Paper towels, toilet rolls
- Use durable tableware where possible.

Figure 163 Using durable tableware (Source: Kai Shing Management Services Limited)

9.1.4 Waste management

Restaurants and food courts generate a lot of waste, which includes food waste, plastic, glass and cooking oil. It is important to consider the following:

- Provide waste sorting and recycle facilities.
- Food waste management – consider use of a food waste decomposer.

Figure 164 Food decomposer (Source: Kai Shing Management Services Limited)

- Cooking oil – collection and use for bio-fuel generation.
- Monitor amount of waste produced and amount of waste reduced regularly.

9.1.5 Indoor air quality management

Good indoor air quality will help provide a healthier environment for customers as well as for the staff. It is important to consider the following:

- Provide an odour removal system for toilets and dining areas.
- Provide an efficient kitchen exhaust system to prevent the buildup of odours and other pollutants in the kitchen and prevent the flow of odours and pollutants to dining areas.

- Avoid use of materials and products that will emit harmful air contaminants:
  - Avoid use of toilet deodourisers containing a fragrance whose source may be a volatile organic compound (VOC) which is harmful to health.
  - Avoid cleaning products that are not environmentally friendly.
- Install CO_2 sensors to monitor concentrations of CO_2 in dining areas.
- Install CO_2 sensors to monitor concentrations of CO_2 in kitchen areas and to detect CO_2 from CO_2 cylinders used in making carbonated drinks.
- Install air sterilisation systems to control the level of bio-contaminants.
- Use of UVC emitters, electronic air filtration to treat kitchen exhaust.

Recycling of cooking oil in restaurants

Convert waste cooking oil to biodiesel

Instead of using it once only, technology is now available to recycle cooking oil in restaurants. Here is the process:

Cooking oil recycling

1. Cooking waste oil re-collected in tank

2. Oil retreatment in plants

3. Bottles of biodiesel

Figure 165 Recycle of cooking oil (Source: Kai Shing Management Services Limited)

Source: Kai Shing Management Services Limited

9.1.6 Greenery

Apart from visual enhancement, provision of indoor plants in restaurants and food courts will help improve the indoor air quality. More details are discussed in **Section 4.4.3 – Plants**.

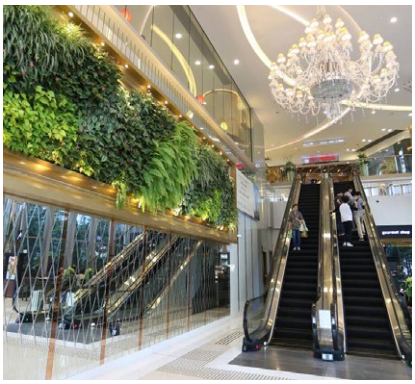


Figure 166 Interior green wall, Olympian City, West Kowloon (Source: Sino Group)

9.1.7 Promotion of sustainable practice

It is important to promote and support sustainable customer behaviour. It is important to encourage customers not to waste food:

Provide food and drinks in different serving portions at different prices so that customers will order the amount of food and drink that they can actually consume without creating unnecessary food waste.	Provide food and drinks only when specially ordered. When providing free deserts and free appetisers, always ask for customers' decision before serving.

- Encourage customers to use their own non-disposable food containers for take-away food to avoid use of disposable containers and reduce waste.
- Promote sustainable practices among staff – educate, monitor, recognise and reward staff following sustainable practices.
- Provide menus that offer food with low oil, low salt and low sugar options to promote a healthy eating lifestyle and reduce the use of cooking oil.

TECHNICAL NOTE

Know more about green practice in restaurants

Shop owners and tenants should be aware of different green projects in restaurants, in order to implement the green measures effectively. The following are some more useful references:

1. **HK3030 – A vision for a Low Carbon Sustainable Built Environment in Hong Kong by 3030 published by Hong Kong Green Building Council.**
   Hong Kong Green Building Council. (2012). HK3030 – A vision for a Low Carbon Sustainable Built Environment in Hong Kong by 3030.
   http://www.hkgbc.org.hk/HK3030
2. **BCA Green Mark for Restaurants published by Building and Construction Authority (BCA) of Singapore in 2011.**
   The Government of Singapore. Building and Construction Authority (BCA). (2011). BCA Green Mark for Restaurants Retrieved 8 April 2013, from
   http://www.bca.gov.sg/GreenMark/others/GM_R_v1.pdf
3. **CLP Power Hong Kong Limited (CLP)'s Green Enterprise Info Pack.**
   CLP Power Hong Kong Limited. (n.d.). Green Enterprise Info Pack. Retrieved 8 April 2013, from
   https://www.clponline.com.hk/Documents/CLP_Enterprise_Eng.pdf

9.1.8 Professional help

It is important to engage professionals for detailed consultation on the implementation of green projects in restaurants and food courts. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

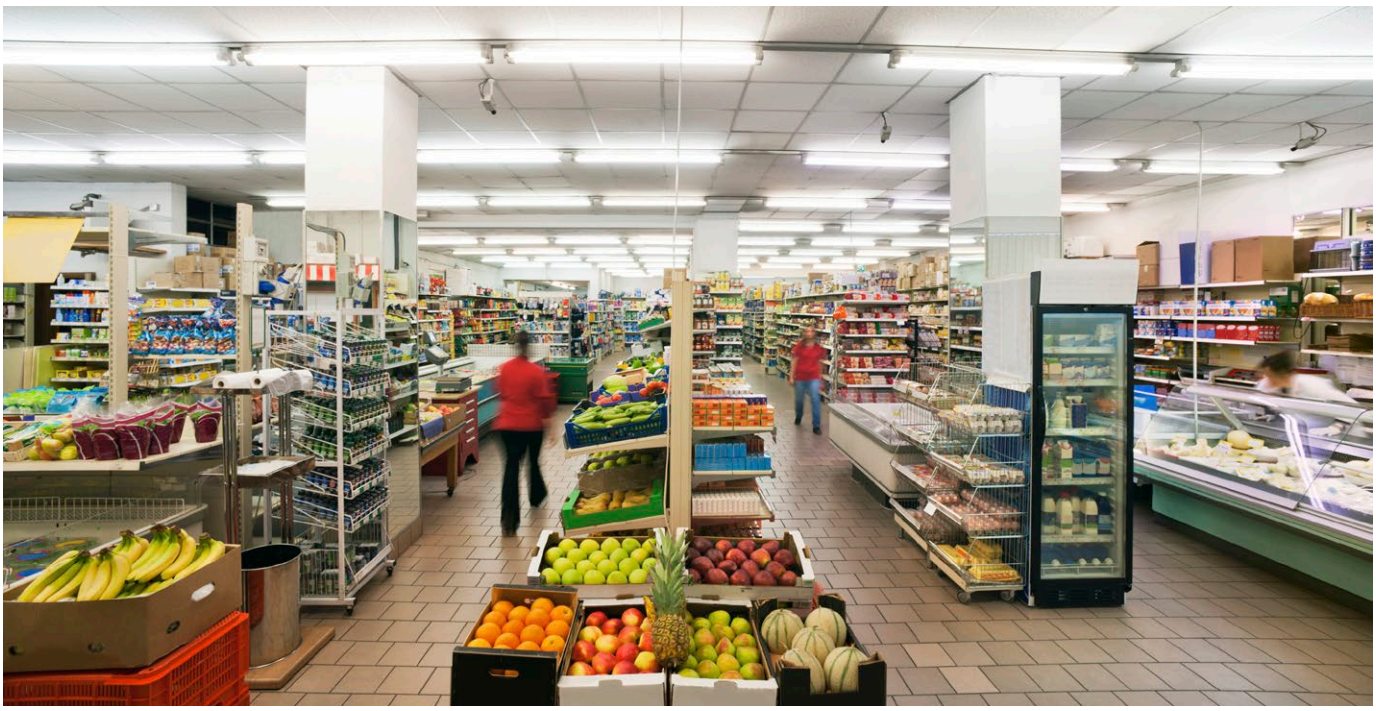


Figure 167 Supermarkets

9.2 Supermarkets

Compared with general retail shops, the identifying features of supermarkets include:

Large leasing areas	Longer business hours	Lot of refrigerators	Some super stores will have food preparation areas, such as a bakery, kitchen, etc.

Due to the usage requirements, a supermarket will consume significant amounts of energy. Therefore, the following green practices are recommended for supermarkets:

1. Use energy efficient systems and equipment as per the Building Energy Code.
2. Design the lighting circuitries and air conditioning by zone to facilitate further implementation of energy management opportunities.
3. Use cooled condenser water for refrigerators. Supermarkets should negotiate with the landlord to provide condenser water for cooling purpose as most new retail development will use water-cooled system.
4. Provide physical separation of food preparation areas to avoid air contamination as well as an increase in the air-conditioning load due to hot cooking processes.

GREEN TIPS

Green practices in supermarkets

The recommended green practices include:

- Comply Building Energy Code
- Multiple light and air conditioning control zone
- Condenser water cooled for freezer/refrigerator
- Physical separation for food preparation area

Ways to reduce energy use in supermarkets

Wellcome

Wellcome has implemented many green measures in its daily operations, and is enjoying successful returns from the energy saving and an enhanced reputation among its customers. Shared here is its successful story of green projects:

Refrigerators with doors

- Refrigerators with doors can help to save much energy by preventing any leakage of cool air.

Figure 168 Refrigerators with doors, Wellcome at Causeway Bay

LED lights

- Wellcome is using LED tubes for general lighting in store areas.

Figure 169 LED Lights, Wellcome at Causeway Bay

Source: Wellcome

9.2.1 Professional help

It is important to engage professionals for detailed consultation on the implementation of green projects at supermarkets. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

Figure 170 Hair salon in Nanfung Plaza, Hang Hau

9.3 Hair salons

9.3.1 Indoor air quality management

Hair salons use hair products that often contain volatile organic compound (VOC) which is a major source of an air contaminant that is harmful to health. As such, maintaining good indoor air quality is important in hair salons. The following measures should be considered:

- Provide an adequate supply of fresh air.
- Consider a mechanical filtration/extraction system to remove the VOC emitted during the hairdressing process.
- When split air-conditioning systems are used, ensure that a separate fresh air intake system and mechanical ventilation system are installed as the split type air-conditioning only lowers the air temperature and does not provide fresh air or extract exhaust air.
- Provide natural hair care product alternatives for customers. This will reduce air contaminants at source.
- It is noted that hair dye products also may contain chemicals that are harmful to health (for both the hairdresser and the customer).
- Avoid use of renovation materials that contain VOC. Use paints with no VOC or low VOC (such as water-based paints). Avoid use of formaldehyde as an adhesive for furniture and finishings.
- Fragrance in hair care products may also be considered as a VOC. Provide hair care products without fragrance as alternatives where possible.

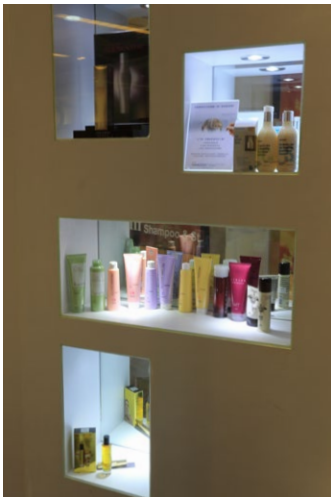


Figure 171 Use of organic hair care products and avoid using products with VOC

9.3.2 Greenery

Use of indoor plants can help to reduce air pollution and provide more oxygen. It is important to introduce natural indoor plants to enhance the indoor air quality. More details are discussed in **Section 4.4.3 – Plants**.

9.3.3 Energy efficiency

Energy efficient systems and appliances will help to reduce energy use and save on costs. The following considerations are important:

A. Air conditioning system

- Make sure that the air-conditioning system is regularly cleaned and serviced. It can help prevent costly heating and cooling bills.
- Optimise the indoor temperature.

Figure 172 Regular cleaning of the air conditioning system

B. Styling appliances

- Unplug styling appliances when not in use, as they still pull energy and generate heat when plugged in.
- Use equipment with an energy efficient label.

C. For lighting system

- Use energy efficient lighting (LED, T5 fluorescent lighting or CFL).
- Consider circuitry to create flexibility in lighting intensity.
- Zone lighting to allow the ability to control switching off or dimming lights to suit usage.
- Turn off lights in areas that are not in use.
- Dimming control of lighting.

Figure 173 Use of LED lights

D. For water usage

- Ensure water heaters are fitted with timers that switch off half an hour before the salon closes.
- Turn down the hot water temperature where possible. For example, reduce hot water temperature from 60°C to 48°C whenever appropriate and practical.
- Good insulation of water heater and hot water pipes to prevent heat loss.
- Lower hot water temperature.
- Use of heat recovery unit and heat pump.

Figure 174 Zoning of lights allows some lights to be turned off in areas that are not in use

E. Other aspects in hair salons

- Only use tumble dryer when there is a full load.
- Install occupancy sensor where people seldom go (e.g. toilets).

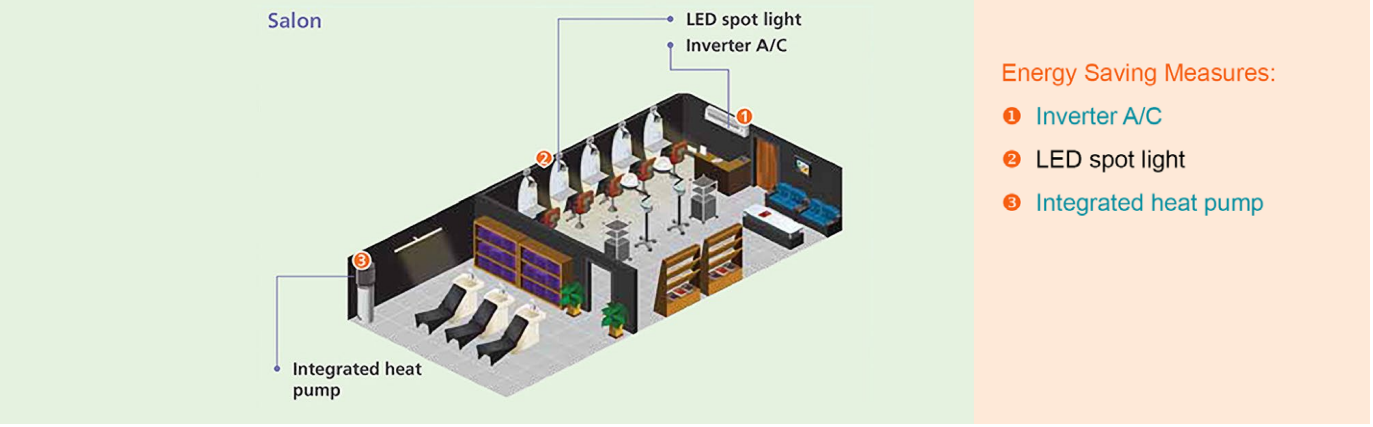


Figure 175 Energy saving measures in hair salons (Source: CLP Power Hong Kong Limited)

9.3.4 Water efficiency

The hair washing process will consume lots of water. Therefore, measures to enhance efficient use of water such as the following should be considered:

- Specify water efficient faucets for hair washing.
- Use water efficient water fittings.
- Regularly check water fittings to prevent water leakage.
- Consider recycling of grey water.
- Use appropriate amount of shampoo to suit the amount of hair for different customers to avoid excessive use of shampoo and waste of water for hair washing.

9.3.5 Use sustainable materials

Use of sustainable materials is good for the environment as well as good for the indoor environmental quality. The following should be considered:

- Use environment friendly materials for renovations and fitting out.
- Avoid use of PVC for furniture coverings.
- Avoid use of plastic furniture that emit toxic gas.
- Where wood is used for renovations or for furniture, use recycled wood or wood from a sustainable resource (such as FSC certified wood).

9.3.6 Waste management

Waste generated is basically hair cuttings, chemicals from hair care and hair dye products, and used magazines. It is important to consider the following:

- Provide waste sorting and recycling bins.
- Do not flush the residue of hair care or hair dye products into the water closet or the basin drains which can cause water pollution and will be harmful to the environment.

9.3.7 Operation and maintenance

Green measures in terms of operations and maintenance can be implemented to save energy. The following should be considered:

- Carry out regular checks of equipment
- Consider establishing the following housekeeping rules for the staff: turn off taps and hoses quickly, switch off all equipment during non-working hours, assign staff for checking taps and equipment at the end of each working day.

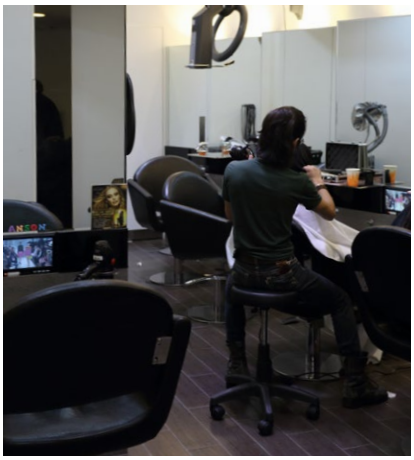


Figure 176 Operation and maintenance

9.3.8 Professional help

It is important to engage professionals for detailed consultation on the implementation of green measures in hair salons. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

Figure 177 Cinema with skylight in Cityplaza, Island East

9.4 Cinemas

9.4.1 Heating, ventilation and air-conditioning (HVAC) system

Due to high variations in the audience pattern, it is recommended that the fresh air supply to each cinema house be equipped with a demand control system (such as CO_2 sensors and modulating dampers) to avoid over-supply, which will lead to a saving of chiller energy for pre-cooling the fresh air.

In order to achieve an acceptable acoustical environment, the maximum permissible background noise level generated by building services installations in a cinema is recommended to be a noise rating (NR) in the range of 25 to 30 [1].

9.4.2 Acoustical considerations in cinemas

Sound isolation

Care must be taken to avoid sounds from one cinema being heard in another within the same cinema complex, as well as disruptive noise from the lobby area. It could be irritating to watch a movie while hearing a booming sound from the movie next door.

- **Sound isolation wall:**

Walls between adjacent theaters must be well designed to ensure sufficient sound insulation. A typical weighted sound reduction index (Rw) is required as follows:

Location	Weighted sound reduction index (Rw)
Cinema to lobby/corridor	≥ 60
Cinema to cinema	≥ 70

There are a number of double wall and single concrete block wall constructions that satisfy these requirements. Consult an acoustical engineer and consultants with a knowledge of these matters.

- **Sound lobby:**

The access area to a cinema is another location from where sound can leak into the cinemas. Doors to different cinemas should be placed well away from each other to minimise any chance of noise contamination. Double doors and thick curtains are usually provided to minimise indirect noise leakage through the foyer. Doors with a sound transmission class (STC) of 45 is recommended.

[1] Chartered Institution of Building Services Engineers (CIBSE) Guide A: Environmental design, January 2006, 7th Edition

TECHNICAL NOTE

Control of reverberation

To address the reverberation and echoes within the cinema itself, it should be understood that the design of the sides of the house in a concert hall is rather different from the design in a cinema. Pronounced initial reflections from any direction should be eliminated in a cinema.

As indicative information, recommended mean reverberation times in relation to room volumes are listed below [1]:

Room volume (m^3)	Recommended mid-frequency reverberation time (s)
100	0.25
1000	0.4
10000	0.7

Read more at:
List of acoustics companies
Hong Kong Institute of Acoustics. (2011). List of acoustics companies. Retrieve 6 June 2013, from http://www.hkioa.org/ac.php

9.4.3 Scheduling of movie show-times to avoid congestion

It is not uncommon to have very long queues at the ladies room before or after a movie. The problem can be mitigated, at least partially, by proper scheduling of movie show-times to avoid simultaneous commencement or ending of movies at different cinemas within the same complex.

9.4.4 Energy efficiency

- Use of energy efficient lighting
- LED exit signs
- Apply natural lighting wherever possible
- Consider demand control ventilation (DCV)
- Optimise the indoor temperature
- Maintain good insulation for the ventilation system, and apply wall or door sealers if needed
- Encourage audiences to bring their own 3D glasses or for the cinema to provide “reusable” 3D glasses

GREEN TIPS

Reset of temperature

We would suggest having temperature reset of the supply air temperature:

When the audience is settled down and is seated for a while, e.g. Increase the space temperature by 1 – 2°C after 15 – 20 minutes start of the show/film.

9.4.5 Professional help

It is important to engage professionals for detailed consultation on the implementation of green measures in cinemas. The following is a list of references for obtaining professional help:

- Authorised persons (AP) – Appendix A (2)
- Acoustic consultants – Appendix A (8)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

[1] Standards Association of Australia (1987). Acoustics: Recommended design sound levels and reverberation times for building interiors. North Sydney, N.S.W.: The Association.

Figure 178 Ice rink in Cityplaza, Island East

9.5 Ice rinks

Ice rinks are great attractions in shopping malls. However, there are several design factors that need to be considered in order to operate a proper, energy-efficient and low cost ice rink inside a shopping mall. These include acoustics, insulation of walls, floor and ceiling, skylights, efficient refrigeration, mechanical ventilation and air dehumidification.

9.5.1 Refrigeration system

The refrigeration system for an ice rink will consume a significant amount of energy. When considering the energy benefits of a water cooled heat rejection system against an air cooled system, it is recommended that the retail design make the necessary provisions to facilitate the ice rink vendor's adopting a water cooled refrigeration system.

9.5.2 Acoustics

The skating experience can be intensified by playing music in the background. However the acoustics in and around the ice rink require careful design. The ice surface absorbs very little sound, reflecting most of the sound into the space in which the ice rink is located, which is usually very big. Speeches and broadcasts in this area can become blurred and speaking to each other may be quite difficult. The problem can be tempered through carefully located speakers and increasing the noise absorption of other surface areas.

Other than fast food or pubs where a high level of background noise is not a problem, restaurants overlooking an ice rink should be separated from the ice rink area by glass walls or partitions.

Figure 179 Restaurant next to an ice rink with glass wall partitions in Cityplaza, Island East

9.5.3 Insulation and dehumidification

It is important for ice rinks to maintain a temperature below zero to keep the ice from melting. Therefore, proper insulation should be provided in its floor, adjacent walls and ceiling to minimise heat gain from the surrounding area. Infiltration should be minimised to avoid overloading the dehumidification system, which prevents condensation on cold surfaces close to the ice.

9.5.4 Skylights and windows

Skylights and/or openings near the ice rink can help improve lighting conditions and reduce artificial lighting in the ice rink. However, as discussed in **Section 4.3**, natural daylight might also bring in heat and glare which is undesirable in terms of energy saving and even dangerous when the vision of skaters is affected by the glare. Careful design of windows and skylights at ice rinks become even more important.

Figure 180 Windows at an ice rink in Cityplaza, Island East

- Energy efficient lighting
- Optimize lighting intensity
- Highly reflective ceiling/low-e ceiling
- Proper insulation of walls and roof
- Adjust the set point temperature during unoccupied periods
- Use of environment friendly refrigerant
- Waste heat recovery from refrigeration process
- Use of desiccant dehumidification
- Optimise ice thickness
- Ice rink should be covered when the rink is not in use at night

9.5.5 Professional help

It is important to engage professionals for detailed consultation on the implementation of green measures at ice rinks. The following is a list of references for obtaining professional help:

- Authorised persons (AP) – Appendix A (2)
- Acoustic consultants – Appendix A (8)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

Figure 181 Tai Yuen Market, Tai Yuen Estate, Tai Po (Source: The Link Management Limited)

9.6 Wet markets

Making wet markets green can help transform the traditional “dirty and wet” image of wet markets into an environmental friendly shopping environment that can be attractive to shoppers.

9.6.1 Green ways to keep the floor dry

Wet and slippery floors are often a concern for shoppers in a wet market. Instead of using electric fans for drying, floors of a wet market can be kept dry and clean in the following ways:

- Adequate drainage provision – provide drainage channels within and at the perimeter of each market stall to minimise overflow to the common corridor.
- Use of non-slip floor tiles (R12).
- Providing water points and proper sinks for wet trades and food outlets.

Figure 182 Perimeter drainage channels (Source: The Link Management Limited)

9.6.2 Green ways to maintain hygiene

Many stalls in wet markets generate bad and disgusting smells which is also a big problem for the neighbourhood. Instead of using a large number of exhaust fans for discharging wet market odours, they can go greener by:

- Zoning those environmentally challenged trades, such as live poultry and seafood, to be close to loading and unloading areas.
- Ventilation provisions of negative pressure at environmentally challenged stalls for effective control of air quality.

Figure 183 Zoning of environmentally challenged trades around loading and unloading area
(Source: The Link Management Limited)

9.6.3 Green ways for lighting

- Introduction of skylights

Figure 184 Skylight in wet market
(Source: The Link Management Limited)

- Set back of tenancy partition walls to improve visibility

Figure 185 Recessed partition wall
(Source: The Link Management Limited)

9.6.4 Easy ways to minimise waste

Lots of waste is produced in wet markets every day, such as unsold fresh food that cannot last for long and stock that has gone bad and has to be thrown away daily. However, there are many easy methods to reduce and even recycle the waste:

A. Introduce roof organic farming

Set up farmlands on the roofs of wet markets so that there is no need to find companies to collect the unwanted food, which can be recycled here as good fertiliser. Roof farming is a self-sufficient activity and its products can be sold in the market afterwards. It is a good landscaping area as well and serves as an excellent educational example for our next generation.

Figure 186 Roof organic farming on the roof of a wet market (Source: The Link Management Limited)

B. Introduce complementary trades

The introduction of complementary trades can help to create more sale opportunities in the wet market as well as helping to enhance the wet market function (e.g. promotional venue, cooking studio, convenience store, food and beverage, etc).

Figure 187 Cooking studio in wet market (Source: The Link Management Limited)

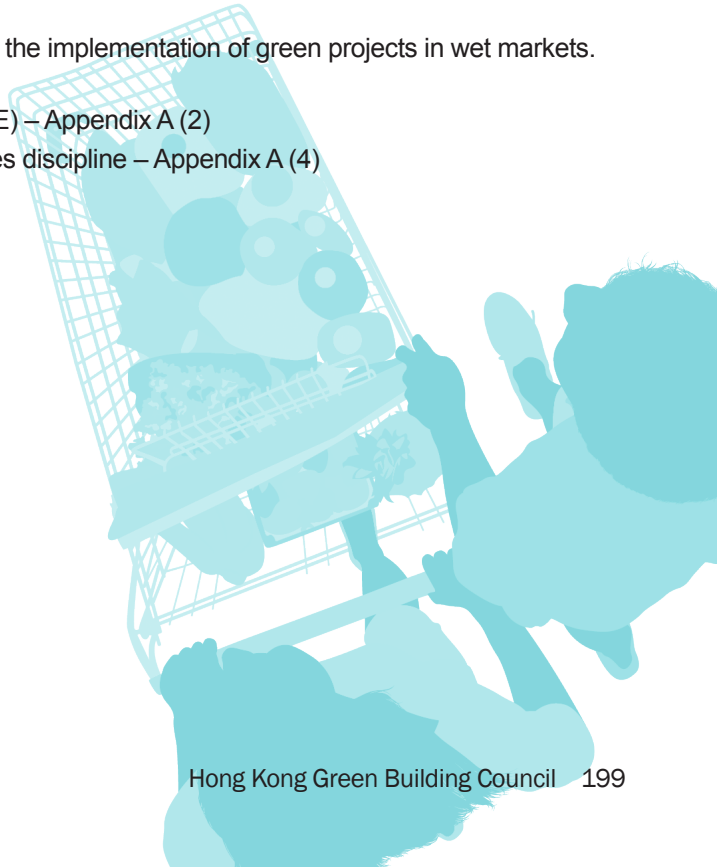
Principle of a self-sufficient recycling system in a wet market

Figure 188 Cycle of food in wet market (Source: The Link Management Limited)

9.6.5 Professional help

It is important to engage professionals for detailed consultation on the implementation of green projects in wet markets. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)



Green upgrading of a wet market

Tai Yuen Market

Many of the green features mentioned in this section have been implemented in the upgrading of the Tai Yuen Market at Tai Yuen Estate, Tai Po:

- Food waste composting system
- Organic farming, cooking studio
- Green wall
- Carefully tailored stall design, catering for the needs of different trades
- Interior design enhancing its permeability and visibility

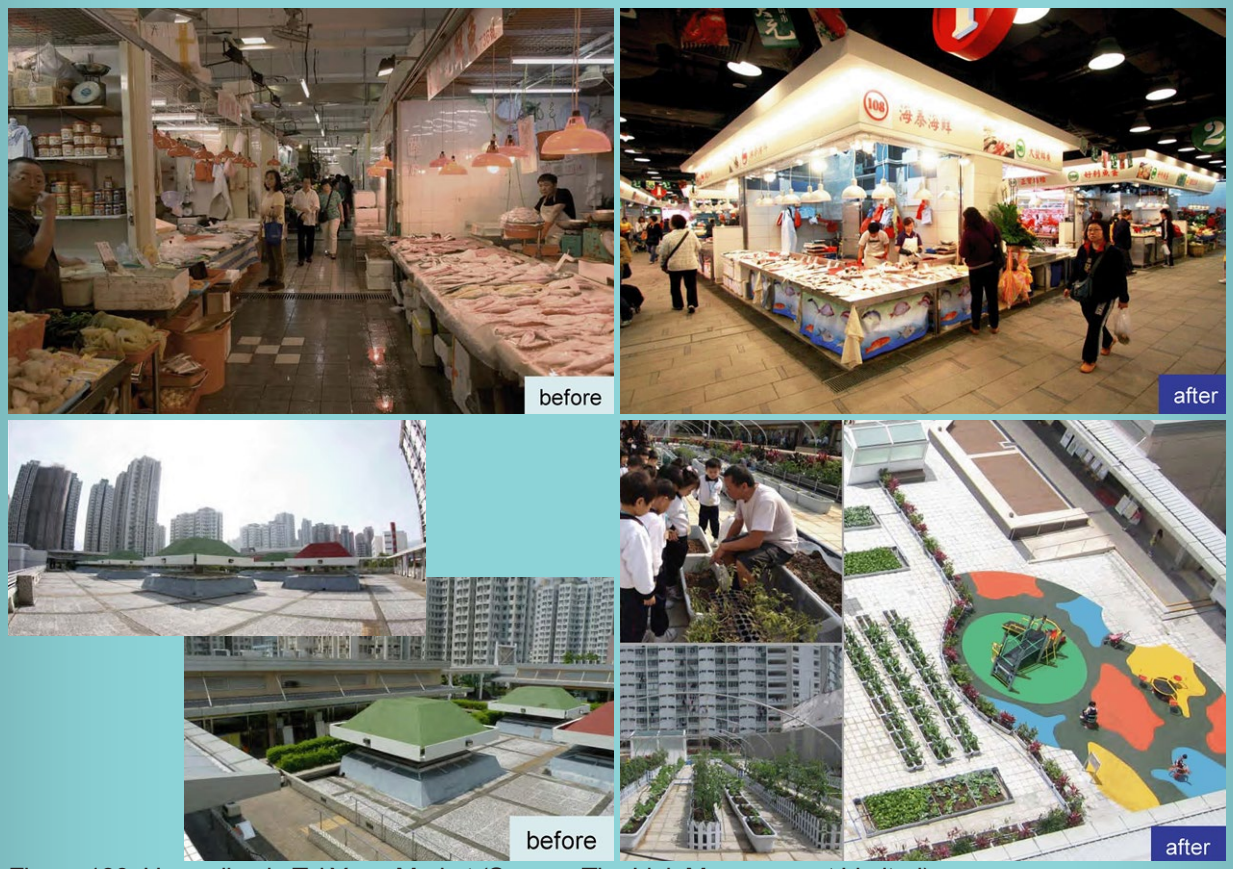


Figure 189 Upgrading in Tai Yuen Market (Source: The Link Management Limited)

Source: The Link Management Limited

9.7 Lighting levels for different uses

Based on the Electrical and Mechanical Services Department's Hong Kong Energy End-use Data 2012, retail lighting consumed over one-fourth of total energy consumption in 2010. Notwithstanding that lighting helps to attract customers, facilitate sales, enhance store environments and promote brand images to shoppers, it is a crucial element in energy saving.

9.7.1 Recommended lighting levels for different retail areas

It is recommended that illuminance levels in all internal areas of a development be kept at a sufficient level to maintain a good visual environment and avoid excess energy usage. In doing so, refer to the table below.

Type of areas	Zones	Maintained illuminance (lux)
General building areas	Outdoor roads, footways & footpaths	5 – 10
	Toilets	100
	Circulation areas & corridors	100
	Escalators/passenger conveyors	150
	Entrance halls/lobbies	200
	Waiting areas/rooms	200
	Atrium	300
Indoor retail	Arcades & shopping malls	50 – 300
	Bookshops	500
	Jewelers	500
	Small shops/department stores	500 or 1000 (based on comfort requirements of staff)
	Supermarkets	750 (general) or 1000 (check-out areas)
Outdoor retail	Outdoor sales areas with low district brightness	50
	Outdoor sales areas with high district brightness	200
Catering	Food courts	300
	Restaurants	50 – 200 (dimming normally required)
	Bars/lounge	100 – 200 (dimming normally required)
	Commercial kitchens	500
Banks, building societies & post offices	Public areas	300
	Counters	500
Offices	General	500
Ice rinks	Ice rinks	200
Art galleries	Display	200
Garages	Parking areas & traffic lanes	75
Cinemas	Auditoria	100
	Booking offices	300
Stairs	Staircases	120
Lift cars	Lift cars	150
Escape routes	Escape routes	200

Figure 190 Recommended maintained illuminance in common areas

Source:

1. The Chartered Institution of Building Services Engineers. (1994). The Chartered Institution of Building Services Engineers (CIBSE) Code for Interior Lighting.
2. The Chartered Institution of Building Services Engineers. (2006). The Chartered Institution of Building Services Engineers (CIBSE) Guide A Environmental Design.
3. European Committee for Standardisation. (2003). British Standard European Standard (BS EN) 12464-1: 2002 Light and Lighting – Lighting of Work Places - Part 1: Indoor Work Places.

9.7.2 Other environmental guidelines for outdoor lighting design

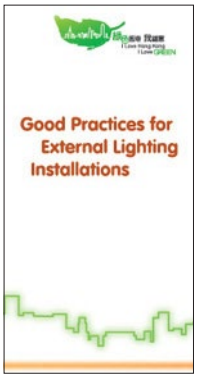


Figure 191 Good practices for external lighting installations (Source: Environmental Protection Department)

Other than the recommended optimal illuminance levels, design of outdoor lighting, such as that on façades and for advertising, cannot be neglected. The design of lighting systems encompasses a lot of knowledge – minimising upward lighting, reducing unnecessary light pollution, energy saving – all these can be referred to in the guidelines below:

- Guidelines on Industry Best Practices for External Lighting Installation, Environmental Protection Department, The Government of Hong Kong Special Administrative Region (2012)
- Chartered Institution of Building Services Engineers (CIBSE) Publication: Guide to Limiting Obtrusive Light (2012)
- CIBSE Publication: Society of Light and Lighting (SLL) Lighting Handbook (2009)
- CIBSE Lighting Guide 06: The Outdoor Environment (1992)
- International Commission on Illumination (CIE) Publication: Guide for Floodlighting (1993)
- CIE Publication: Guidelines for Minimising Sky Glow (1997)
- CIE Publication: Guide for Lighting Exterior Work Areas (1998)
- The Institution of Lighting Engineers (ILE): Guidance Notes for the Reduction of Light Pollution (2000)
- ILE General Publication 09: Lighting the Environment – A Guide to Good Urban Lighting (1995)
- The Institution of Lighting Professionals (ILP) General Publication 02: Laser, Festival and Entertainment Lighting Code (2012)
- ILP Technical Reports 05: Brightness of Illuminated Advertisements (2001)

9.7.3 Professional help

It is important to engage professionals for detailed consultation on the implementation of lighting designs at shopping malls and in shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

9.8 Case study for energy saving

The cost savings from implementation of energy saving measures depend on the existing energy performance of the shopping mall, the scope of the saving measures, and other factors such as the mall size, usage pattern, site constraints, etc.

For a better understanding, a case study of a typical shopping mall in Hong Kong has been carried out. Estimated cost savings from implementation of various energy saving measures are highlighted for reference.

The basic information about the shopping mall in this case study is listed below:

- Total GFA: 10,000m^2
- Leasing area: 60% of GFA
- Landlord area (front of house): 30% of GFA
- Landlord area (back of house): 10% of GFA
- Annual operating hours: 5800 Hours
- Year of the mall: 15 Years (with minor renovation only)

The shopping mall is now undergoing major renovation works and the various energy saving measures relating to lighting and MVAC will be carried out. The following table summarises the estimated cost savings and the payback period.

Lighting saving measures	Annual cost saving (HK$)	Simple payback
Adopt energy efficient lighting - T5 Instead of T8 c/w electronic ballast - CFL instead of Incandescent lamp	$200,000	3 – 5 years
Proper lighting control zones	$35,000	3 – 5 years
Lux sensor to dim parameter lighting or lighting under/adjacent to skylight	$35,000	3 – 5 years
Use self-luminous EXIT sign vs. traditional fluorescent EXIT sign	$15,000	4 – 7 years
Occupancy sensor control for infrequent occupied	$15,000	4 – 7 years
TOTAL :	**$300,000**	

Saving measures for air conditioning system	Annual cost saving (HK$)	Simple payback
Use of water cooled chiller (against air cooled chiller)	$300,000	1 – 3 years
Variable speed chiller	$100,000	1 – 3 years
Variable chilled water flow	$30,000	3 – 5 years
Variable speed air handling units	$150,000	3 – 5 years
Increase space temp by 2°C	$30,000	3 – 5 years
Increase chilled water supply temp. by 2°C	$20,000	3 – 5 years
Optimum fresh air flow rate	$10,000	3 – 5 years
Regular maintenance of chiller (e.g. tube cleansing, water treatment)	$30,000	4 – 7 years
Free cooling design	$100,000	4 – 7 years
Optimum chilled water pipe diameter	$20,000	4 – 7 years
Optimum chilled water pipe insulation	$10,000	4 – 7 years
TOTAL :	**$800,000**	

The estimated annual energy cost for a shopping mall is about HK$3,000,000. Based on the above, the implementation of the saving measures can reduce the annual energy cost by around HK$1,100,000 (i.e. 37% saving).

9.8.1 Professional help

It is important to engage professionals for detailed consultation on the implementation of energy saving projects in shopping malls and shop spaces. The following is a list of references for obtaining professional help:

- Authorised persons (AP) & registered structural engineers (RSE) – Appendix A (2)
- Registered professional engineers (RPE) in the building services discipline – Appendix A (4)
- BEAM Professionals (BEAM Pro) – Appendix A (7)

APPENDIX

Appendix A

List of registered professionals

1) The Hong Kong Institute of Architects (HKIA)
http://www.hkia.net/en/LookingForArchitects/LookingForArchitects_01.htm

2) Authorised Persons' Register (AP) & Registered Structural Engineer (RSE)
http://www.bd.gov.hk/english/inform/index_ap.html

3) The Hong Kong Institute of Landscape Architects (HKILA)
http://www.hkila.com/

4) Engineers Registration Board – Registered Professional Engineers (RPE)
http://www.erb.org.hk/search.htm

5) Registered Architects (RA)
http://www.arb.org.hk/
http://218.188.25.84/ARB/English/TheRegister-A.php#

6) Registered Energy Assessors (REA)
http://www.beeo.emsd.gov.hk/en/rea/search_rea.php

7) BEAM Professionals (BEAM Pro)
http://www.hkgbc.org.hk/eng/BeamProDirectory.aspx

8) Hong Kong Institute of Acoustics (HKIOA)
http://www.hkioa.org/member.php

9) Surveyors Registration Board – Registered Professional Surveyors (RPS) General Practice
http://www.srb.org.hk/cgi-bin/ss_division2.pl

10) The Law Society of Hong Kong
http://www.hklawsoc.org.hk/pub_e/lawfirmdirectory/

Appendix B

Contractors' contact information

1) Development Bureau – List of Approved Suppliers of Materials and Specialist Contractors for Public Works
http://www.devb.gov.hk/Supplier.aspx?section=83&lang=1&id=80

2) Electrical and Mechanical Services Department – Survey on Green Building Technologies Services Providers and Recycled Building Products Suppliers
http://gbtech.emsd.gov.hk/english/gen/suppliers.html

3) Buildings Department – Registered Minor Works Contractors (Company)
https://mwer.bd.gov.hk/REGISTER/RegistrationSearch.do?method=PageRegistration&regType=MWC

4) Electrical and Mechanical Services Department – Registered Electrical Contractors
http://www.emsd.gov.hk/emsd/eng/pps/electricity_reg_ec.shtml

5) Water Supplies Department – Licensed Plumbers
http://www.wsd.gov.hk/en/plumbing_and_engineering/licensed_plumber/index.html

6) Renewable Energy System Suppliers
http://energy.sourceguides.com/

7) Electrical and Mechanical Services Department – Renewable Energy Equipment Suppliers Survey Returns Summary
http://re.emsd.gov.hk/english/gen/gother/gother_equ.html

8) Buildings Department – Registered General Building Contractors
http://www.bd.gov.hk/english/inform/e_gbc_1.html

9) Electrical and Mechanical Services Department – Registered Lift and Escalator Contractors
http://www.emsd.gov.hk/emsd/eng/pps/le_reg.shtml

Appendix C

Useful references for green related ordinances in Hong Kong

C1 Air Pollution Control Ordinance

- **A Guide to the Air Pollution Control (Dry-cleaning Machines) (Vapour Recovery) Regulation**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2008). A Guide to the Air Pollution Control (Dry-cleaning Machines) (Vapour Recovery) Regulation. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/wn8_dry_info.html

- **A Guide to the Air Pollution Control (Volatile Organic Compounds) Regulation**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). A Guide to the Air Pollution Control (Volatile Organic Compounds) Regulation. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/air_guidelines.html

- **Environmental Asbestos Control**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). Environmental Asbestos Control. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_air.html

- **Asbestos Removal of Unauthorised Building Works**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2009). Asbestos Removal of Unauthorised Building Works. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/asbestos_removal.html

C2 Waste Disposal Ordinance

- **Waste Control**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). Waste Control. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_waste.html

- **Chemical Waste Control**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). Chemical Waste Control. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/guide_cwc.html

- **A Guide to the Chemical Waste Control Scheme**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2008). A Guide to the Chemical Waste Control Scheme. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/guide_cwc_sub1.html

- **A Guide to the Registration of Chemical Waste Producers**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2010). A Guide to the Registration of Chemical Waste Producers. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/guide_cwc_sub2.html

C3 Water Pollution Control Ordinance

- **A Guide to the Water Pollution Control Ordinance**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2010). A Guide to the Water Pollution Control Ordinance. Retrieved 25 May 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/water/guide_ref/guide_wpc_wpco.html

- **Grease Traps for Restaurants and Food Processors**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2009). Grease Traps for Restaurants and Food Processors. Retrieved 25 May 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/water/guide_ref/guide_wpc_gt.html

- **Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters**

  The Government of Hong Kong Special Administrative Region. Department of Justice. (n.d.). Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters. Retrieved 25 May 2013, from http://www.legislation.gov.hk/blis_ind.nsf/WebView?OpenAgent&vwpg=CurAllEngDoc*358.29*0*358.38#358.38

C4 Noise Control Ordinance

- **A Concise Guide to the Noise Control Ordinance**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). A Concise Guide to the Noise Control Ordinance. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_noise.html

- **Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_noise.html

- **Technical Memorandum on Noise from Construction Work in Designated Areas**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). Technical Memorandum on Noise from Construction Work in Designated Areas. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_noise.html

- **Technical Memorandum on Noise from Construction Work Other Than Percussive Piling**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). Technical Memorandum on Noise from Construction Work Other Than Percussive Piling. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_noise.html

- **Technical Memorandum on Noise from Percussive Piling**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). Technical Memorandum on Noise from Percussive Piling. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_noise.html

C5 Ozone Layer Protection Ordinance

- **A Concise Guide to the Ozone Layer Protection Ordinance**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). A Concise Guide to the Ozone Layer Protection Ordinance. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_air.html

- **A Concise Guide to the Ozone Layer Protection (Controlled Refrigerants) Regulation**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). A Concise Guide to the Ozone Layer Protection (Controlled Refrigerants) Regulation. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_air.html

- **VOC Content Limits for Regulated Products**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). VOC Content Limits for Regulated Products. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/voc_reg.html#point_1

C6 Dumping At Sea Ordinance

- **Guidance Notes for Licence Application**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Guidance Notes for License Application. Retrieved 25 May 2013, from http://www.epd.gov.hk/epd/english/application_for_licences/guidance/application_maincontent35.html

C7 Environmental Impact Assessment Ordinance

- **Cyber Help Bench for Environmental Impact Assessment**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). Cyber Help Bench for Environmental Impact Assessment. Retrieved 25 May 2013, from http://www.epd.gov.hk/eia/hb/content/index.htm

- **Technical Memorandum on Environmental Impact Assessment Process**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). Technical Memorandum on Environmental Impact Assessment Process. Retrieved 25 May 2013, from http://www.epd.gov.hk/eia/english/legis/index3.html

C8 Hazardous Chemicals Control Ordinance

- **Pamphlet for Hazardous Chemicals Control Ordinance**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). Pamphlet for Hazardous Chemicals Control Ordinance. Retrieved 25 May 2013, from http://www.epd.gov.hk/epd/english/laws_regulations/comp_guides/cg_hazardous_chemical.html

C9 Product Eco-responsibility Ordinance

- **Environmental Levy Scheme on Plastic Shopping Bags**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2012). Environmental Levy Scheme on Plastic Shopping Bags. Retrieved 25 May 2013, from http://www.epd.gov.hk/epd/psb/

C10 Building Energy Efficiency Ordinance

- **Buildings Energy Efficiency Ordinance – Chapter 610**

  The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services. (2012). Department. Buildings Energy Efficiency Ordinance. Retrieved 8 April 2013, from http://www.beeo.emsd.gov.hk/

- **Building Energy Code (2012)**

  The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services. (2012). Department. Building Energy Code. Retrieved 8 April 2013, from http://www.beeo.emsd.gov.hk/en/pee/BEC_2012.pdf

- **Energy Audit Code (2012)**

  The Government of Hong Kong Special Administrative Region. Electrical and Mechanical Services Department. (2012). Energy Audit Code. Retrieved 8 April 2013, from http://www.beeo.emsd.gov.hk/en/pee/EAC_2012.pdf

C11 Motor Vehicle Idling (Fixed Penalty) Ordinance

- **The Statutory Ban Against Idling of Motor Vehicle Engines**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). The Statutory Ban Against Idling of Motor Vehicle Engines. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/idling_prohibition.html

Appendix D

Useful references for green guidelines in Hong Kong

D1 Indoor Air Quality (IAQ) Certification Scheme

- **A Guide on Indoor Air Quality Certification Scheme for Offices and Public Places**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2003). Indoor Air Quality Information Centre. A Guide on Indoor Air Quality Certification Scheme for Offices and Public Places. Retrieved 5 April 2013, from http://www.iaq.gov.hk/second.asp?page=scheme&sub=form

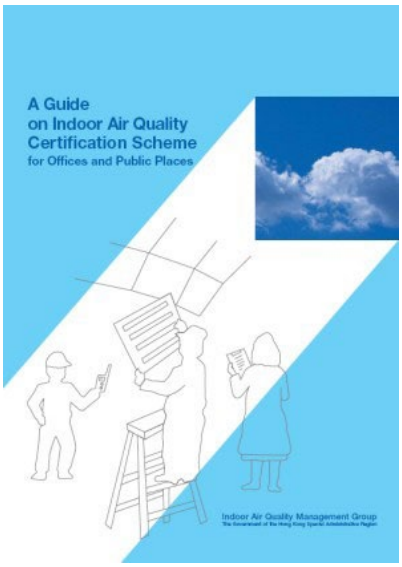


Figure 192 A Guide on Indoor Air Quality Certification Scheme for Offices and Public Places (Source: Indoor Air Quality Information Centre, Environmental Protection Department)

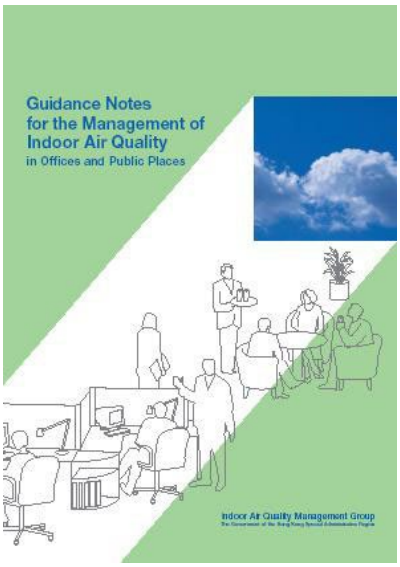


Figure 193 Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places (Source: Indoor Air Quality Information Centre, Environmental Protection Department)

- **Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2003). Indoor Air Quality Information Centre. Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places. Retrieved 5 April 2013, from http://www.iaq.gov.hk/second.asp?page=scheme&sub=form

- **Directory of Indoor Air Quality Certificate Issuing Bodies**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2013). Indoor Air Quality Information Centre. Retrieved 8 April 2013, from http://www.iaq.gov.hk/second.asp?page=scheme&sub=cib&content=&number=0&language=en

- **Professional Persons Environmental Consultative Committee Practice Notes – Control of Air Pollution in Car Parks**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). Professional Persons Environmental Consultative Committee Practice Notes. ProPECC PN2/96 Control of Air Pollution in Car Parks. Retrieved 5 April 2013, from http://www.epd.gov.hk/epd/english/resources_pub/publications/pub_propeccpns.html

- **Professional Persons Environmental Consultative Committee Practice Notes – Control of Radon Concentration in New Buildings**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2011). ProPECC PN1/99 Control of Radon Concentration in New Buildings. Retrieved 5 April 2013, from http://www.epd.gov.hk/epd/english/resources_pub/publications/pub_propeccpns.html

D2 Quality Water Recognition Scheme for Buildings

- **Quality Water Recognition Scheme for Buildings Official Website**

  The Government of Hong Kong Special Administrative Region. Water Supplies Department.(2013). Quality Water Recognition Scheme for Buildings. Retrieved 5 April 2013, from http://www.wsd.gov.hk/en/customer_services_and_water_bills/application_for_licence_certificate/quality_water_recognition_scheme_for_buildings/index.html

- **Water Supplies Department Circular Letter**

  The Government of Hong Kong Special Administrative Region. Water Supplies Department. (2013). Circular Letter No. 4/2002 Fresh Water Plumbing Quality Maintenance Recognition Scheme (renamed as "Quality Water Recognition Scheme for Buildings" since 1.1.08). Retrieved 5 April 2013, from http://www.wsd.gov.hk/en/plumbing_and_engineering/circular_letters/index_archive.html

D3 Environmental Management System and Audit

- **Carbon Audit**

  The Government of Hong Kong Special Administrative Region. Environmental Protection Department. (2010). Carbon Audit. Retrieved 8 April 2013, from http://www.epd.gov.hk/epd/english/climate_change/ca_intro.html

- **Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings in Hong Kong**

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Appendix E

Technical support and services from power utility companies

To provide a comfortable environment to the consumers, the restaurants and food courts often rely heavily on the ventilation, heating and air conditioning during operation, which lead to a large amount of energy consumption and increase the operating cost.

The two power utility companies in Hong Kong, CLP Power Hong Kong Limited (CLP) and the Hongkong Electric Company Limited (HK Electric) have provided the following technical support and services on energy saving to their customers. Shop owners and tenants may contact the power utility companies for relevant services:

CLP:

- GREEN^{PLUS} Experience Centre: an exhibition area with ambassadors to analyse the particular needs of visitors and tailor solutions to achieve energy consumption savings, enabling SMEs to get a preliminary plan on integrating energy saving schemes into green business.
  Read more at:
  https://www.clponline.com.hk/MyBusiness/Documents/2012_GP_BillInsert_en.pdf

- Energy audit service: an audit service to assess the energy efficiency performance of retailers' system/equipment and to recommend energy savings solutions.
  Read more at:
  https://www.clponline.com.hk/MyBusiness/EnergyManagement/InformationHub/EASandEELS/Pages/EnergyAuditService.aspx?lang=en

- Energy efficiency loan scheme: a loan scheme under preferential interest rate (currently interest free) as finance assistance for the implementation of energy efficient projects.
  Read more at:
  https://www.clponline.com.hk/MyBusiness/EnergyManagement/InformationHub/EASandEELS/Pages/EnergyEfficiencyLoanScheme.aspx?lang=en

- GREEN^{PLUS} Energy Billboard benchmarking tool: a user-friendly online portal for shop owners to input and estimate their energy consumptions and also compare their business ranking against their industry norm up to five quarters.
  Read more at:
  https://www.clponline.com.hk/Documents/Common/En/ENERGY_BILLBOARD%20_EN.pdf

Figure 194 CLP GREEN^{PLUS} Experience Centre offers a 4-Dimensional demonstration of energy saving and renewable energy applications for Shop owners. The ambassadors can also help visitors with tailor-made solutions to save energy. (Source: CLP Power Hong Kong Limited)

HK Electric:

- Enterprise Advisor Service: a service platform at customer centre providing shop owners energy efficient advices.
  Read more at:
  http://www.hkelectric.com/web/CommercialAndIndustrialServices/ServicesForSME/BusinessStart-Up/Index_en.htm
- Pre-check installation or existing building inspection: an installation or inspection services for the new and existing shop building owners. This can help shop managers and owners to check for better energy management.
  Read more at:
  http://www.hkelectric.com/web/CommercialAndIndustrialServices/ServicesForSME/BusinessStart-Up/Index_en.htm
- Smart Power Centre: an exhibition area to introduce energy-efficient devices, window film, low emissivity glass or intelligent panel to shop owners.
  Read more at:
  http://www.hkelectric.com/NR/rdonlyres/184A214B-1434-4588-983C-D35FAAB5D1A4/0/PowerPulse_02_customer_corner.pdf

Towngas:

- One-stop Free Advisory Services: a free professional consultation service to advise businesses how to use Town Gas in the most efficient way. The advisory team will make site visits to the businesses, and can prepare an optimum fuel utilisation plan, and design piping systems for individual needs with cost estimates.
  Read more at:
  http://www.towngas.com/eng/cust/business/commerceindustry/proservices/onestopadvisoryservices.aspx

Figure 195 One-stop Free Advisory Services offered at the Towngas North Point Customer Centre and Green Kitchen (Source: The Hong Kong and China Gas Company Limited)

Appendix F

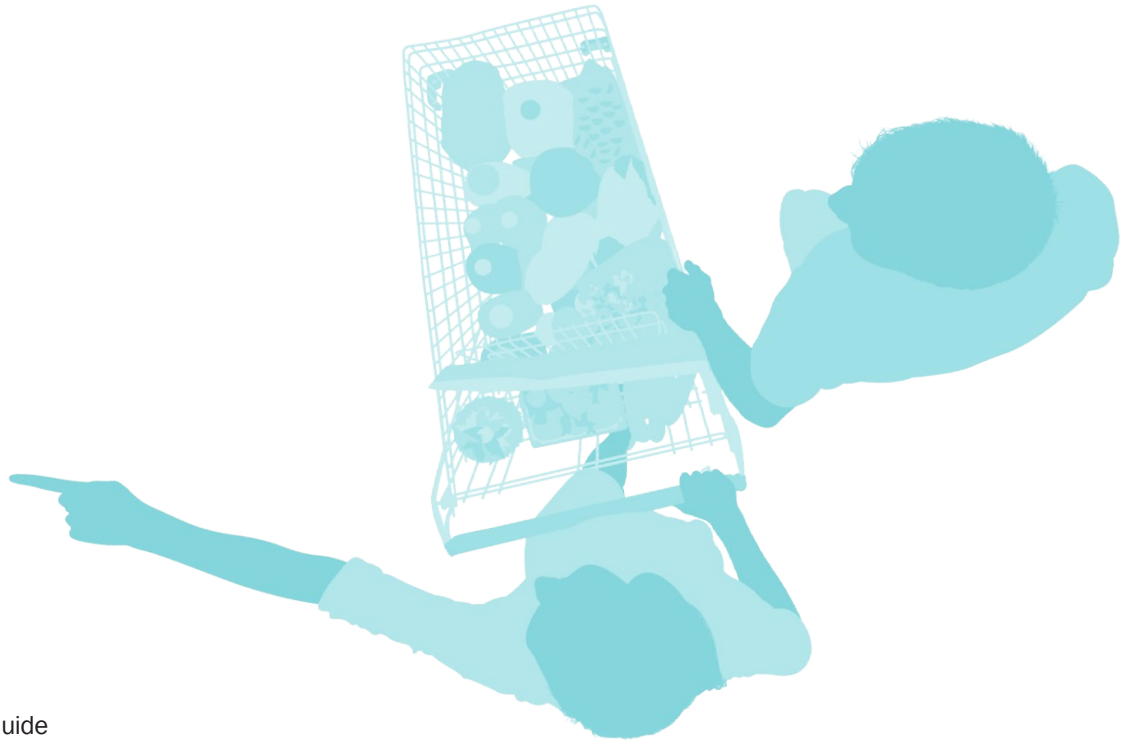
Glossary

Item	Term	Definition
1	Acoustic linings	Insulating materials secured to the inside of ducts to attenuate sound which is transmitted along the ducts and provides thermal insulation.
2	Acoustic louvers	A series of streamlined, perforated metal baffles having an air foil shape, which are filled with a sound-absorptive material such as fiberglass.
3	Air handling units	An air handling unit consists of a fan or fans and coils for cooling, dehumidification, heating and filtration used for space air conditioning.
4	BEAM Professional (BEAM Pro)	Also known as “BEAM Pro”, a green building professional accredited by the Hong Kong Green Building Council in the various aspects of the green building life cycle. One key role of a BEAM Pro is to integrate the latest green building standards and practices into everyday building planning, design, construction and operation.
5	Building integrated photovoltaic (BIPV) panels	A building Integrated photovoltaic panel is a photovoltaic panel that has been integrated into the design of the building or structure.
6	Carbon footprint	A form of carbon calculation that measures the amount of carbon dioxide equivalent that a country, a business, industry or an individual is responsible for.
7	Carbon neutral	The maintenance of a balance between carbon emissions and a reduction in carbon dioxide.
8	CFL	A compact fluorescent lamp (CFL) is an energy efficient lamp that can be used instead of a incandescent lamp and uses less energy with a longer life.
9	Charge controllers	A charge controller is a voltage and/or current regulator to keep batteries from overcharging.
10	Daylight factor (DF)	The percentage ratio of the instantaneous illumination level at a reference point in the interior space to that occurring simultaneously outside in an unobstructed position, in a unit of %.
11	Daylight colour rendition	Daylight colour rendition is a quantitative measure of the ability of a light source to reproduce the colors of various objects faithfully in comparison with an ideal or natural light source. Light sources with a high CRI are desirable in colour-critical applications such as photography and cinematography.
12	Desiccant dehumidifiers	A desiccant dehumidifier is a device that employs a desiccant material to produce a dehumidification effect. It consists of a fan to move the air to be dehumidified (process air) through the desiccant holder, a fan to move the low humidity air for drying the desiccant through the desiccant holder and a heater to heat the air that will be used to dry the desiccant (regeneration air).
13	Direct digital control	Direct digital control (DDC) is the automated control of a condition or process by a digital device.
14	Double glazing	Insulated glazing (IG), more commonly known as double glazing (or double-pane, and increasingly triple glazing/pane) are double or triple glass window panes separated by an air or other gas filled space to reduce heat transfer across a part of the building envelope.
15	Energy audit	Energy audit is a regular review of the usage of energy in a building to increase effectiveness of energy. The auditors examines the energy account of energy consuming equipment, checks the way energy is used in its various components and identifies savings opportunities.
16	Fan coil unit (FCU)	Fan coil unit consists of a small fan or fans and a coil for cooling, dehumidification, heating and filtration used for space air conditioning.

Item	Term	Definition
17	Formaldehyde	Formaldehyde is a toxic (a suspected human carcinogen), colourless gas with a pungent smell. It is often found in solvents in many building materials and fabrics, cleaning fluids and adhesives. The most common sources of formaldehyde emissions in buildings are particle boards, foam insulation, carpets, plywood and other pressed-wood products. Emissions of formaldehyde are highest among the first few months when products are new, then gradually released more slowly for a long period of time up to years. It can also be found in cigarette smoke and gaseous combustion products originated from gas appliances and kerosene heaters. Usually high concentrations of formaldehyde are known to cause eye, nose and respiratory irritation and sensitisation.
18	FSC certified wood	FSC certified wood is wood that is certified under the standards set by the Forest Stewardship Council (FSC). FSC-certification is given to companies and landowners to verify that they practice forestry that is consistent with FSC standards. The FSC label on wood or paper products guarantees that consumers can trust the sources.
19	Global warming potential	Global warming potential is a relative measure of how much heat a greenhouse gas traps in the atmosphere.
20	Greenhouse gases	The gases (carbon dioxide, water vapour, methane, nitrous oxide, ozone and various fluorocarbons) that blanket and circle the Earth preventing solar radiation from the sun being reflected back into space.
21	Green wall	A green wall is a wall, either free-standing or part of a building, that is partially or completely covered with vegetation and, in some cases, soil or an inorganic growing medium.
22	Green roof	A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane.
23	Grey water	Grey water is water with a quality between fresh water and sewage water. In a building, grey water is the water leftover from baths, showers, hand basins, kitchen sinks, floor drains, etc.
24	Illuminance levels	The amount of luminous flux falling on the surface of a unit area, measured in units of lux or lumen/m^2.
25	Independent commissioning authority	The individual designated to organise, lead and review the completion of commissioning process activities, and who facilitates communication between the owner, designer and contractor to ensure that complex systems are installed and function properly.
26	IAQ certificate issuing bodies (CIB)	Professionals who can issue and endorse IAQ reports and certificates, which serve as a proof of quality work, under the Hong Kong Inspection Body Accreditation Scheme (HKIAS).
27	Indoor air quality (IAQ)	Indoor air quality (IAQ) is a term referring to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants. Indoor pollution sources that release gases or particles into the air are the primary cause of indoor air quality problems. Inadequate ventilation can increase indoor pollutant levels by not bringing in enough outdoor air to dilute emissions from indoor sources, and by not carrying indoor air pollutants out of the building. High temperature and humidity levels can also increase concentrations of some pollutants, making the IAQ strongly associated with air conditioning and its inherent costs. Basic approaches to control indoor air pollution include source control, source isolation, increased ventilation, dehumidification and the use of filters.
28	Integrated heat pump	A heat pump that simultaneously can provide heating, hot water, and air conditioning within only one system.
29	Inverter A/C	An inverter air-conditioning system allows frequency conversion and adjustment of the compressor from low power to high power to meet cooling and heating needs.
30	ISO standard	The International Organisation for Standardisation, known as ISO, is an international standard-setting body composed of representatives from various national standards organisations.
31	Life cycle cost	Economic cost of a product or building over its expected life, including initial cost, operating cost and, when appropriate, cost of disposal or demolition.

Item	Term	Definition
32	Low-emissivity (low-e) double glazing products	Low emissivity (low-e or low thermal emissivity) double glazing products are characterised by a glass surface condition that emits low levels of radiant thermal (heat) energy.
33	Municipal solid waste	Solid waste produced by domestic, commercial and industrial sources.
34	Odour filters	Filters that can remove odour from an exhaust stream.
35	Overall construction waste	A mixture of waste and surplus materials arising from construction activities, such as site clearance, excavation, refurbishment, renovation, demolition and road works. It includes waste concrete that is generated from concrete batching plants and cement plaster manufacturing plants not set up inside the construction sites.
36	Ozone depletion potential	Ozone depletion potential (ODP) is the relative amount of degradation to the ozone layer caused by a chemical compound.
37	Photocells	Photocells can be used for automatic control of indoor lighting. A photocell is a type of resistor. When light strikes the cell, its resistance decreases and allows current to flow more freely. In contrast, its resistance increases when dark. Therefore, when applying in lighting control, a photocell can read the level of lighting, incorporating daylight influence, and automatically adjust the artificial lighting level of a single or a group of luminaries.
38	Power factor	Power factor is the ratio of the average power available and the actual amount of power used. Power factor is an indication of efficiency.
39	Prevailing wind	Prevailing wind is wind that blows predominantly from a single general direction over a particular point on the building
40	PVC content	Polyvinyl chloride, commonly abbreviated PVC, is the third-most widely produced plastic, after polyethylene and polypropylene. PVC is used in construction because it is more effective than traditional materials such as copper, iron or wood in piping and profile applications. It can be made softer and more flexible by the addition of plasticisers, the most widely used being phthalates. It emits gases and is potentially harmful to humans, and can cause irritating respiratory illnesses such as asthma.
41	Quality Water Recognition Scheme for Buildings	A voluntary scheme launched by the Water Supplies Department that encourages building owners to maintain their plumbing systems properly in order to ensure good quality of water at the taps.
42	Quality assurance	Quality assurance (QA) refers to the engineering activities implemented in a quality system so that requirements for a building or a space will be fulfilled.
43	Quality control	Quality control, or QC for short, is a process by which entities review the quality of all factors involved in construction and operation of a building.
44	Red meat	Meat that is red when raw, for example beef or lamb.
45	Renewable energy certificates	Tradable certificates that represent proof that 1 megawatt-hour of electricity is generated from an eligible renewable energy resource.
46	Reverberation time	At a given frequency or frequency band: (1) the time, in a unit of a second, that is required for the sound pressure level in the enclosure to decrease by 60 dB after the source has stopped. (2) the time is seconds given by T_{60} = 60 dB/R, where R is the rate of decay of sound in the room expressed in decibels per sound.
47	Radon	Radon is a radioactive gas that has no taste, smell nor colour which occurs naturally in rocks and soils, particularly granite. Granite is very widely used in concrete for building construction in Hong Kong. Radon is therefore emitted from the walls, floors or through cracks and openings in the ground. If a building is not well ventilated, radon gas will become trapped and accumulate, particularly at floor level owing to its heavy nature. Studies have revealed that long term exposure to radon may increase the risk of lung cancer.
48	Scrubbers	A scrubber is an air pollution control device that is used to remove particulates and/or gases from an exhaust stream.
49	Surge arrestors	A surge arrestor is a device that protects electrical power systems from damages caused by lighting.
50	Switchgear	Switchgear is the combination of electrical disconnecting switches, fuses or circuit breakers used to control, protect and isolate electrical equipment.

Item	Term	Definition
51	T5 fluorescent tube	T5 fluorescent tube is 16mm (5/8”) in diameter and is more efficient than the conventional T8 or T12 lamps.
52	Thin film photovoltaic (TFPV) panels	A thin-film photovoltaic panel is made by depositing microscopically thin layers of photovoltaic and conductive materials directly onto a pane of glass or other substrate.
53	Total harmonic distortion	Total harmonic distortion may lend to equipment failure and additional power loss.
54	UVC emitters	A UV emitter is a device to emit ultraviolet energy on the “C” wavelength which is the most germicidal in the UV spectrum.
55	Vinyl	Vinyl is a plastic made from polyvinyl chloride (PVC). It emits gases and is potentially harmful to humans, and can cause irritating respiratory illnesses such as asthma.
56	Volatile organic compound (VOC)	Volatile Organic Compounds (VOCs) are a diverse group of organic compounds that evaporate at room temperature. In a typical indoor environment, there are more than 100 compounds that can be classified as VOCs emitting from sources such as building materials, cleaning agents, cosmetics, waxes, carpets, furnishings, laser printers, photocopiers, adhesives, paints and lacquers. Certain VOCs at high levels are toxic and have adverse effects on the central nervous system, liver, kidney and blood of human bodies. Hypersensitive individuals can have severe reactions to a variety of VOCs at very low concentrations. Exposure to compounds such as benzene for long periods may also increase the risk of cancer. It is desirable to reduce exposure to VOCs, as the toxicological and sensory effects of VOCs are not completely known.
57	VOC products	Products containing VOCs can release these chemicals when they are being used and when they are stored. An odour may be noticed when using these products. Product labels often list VOC ingredients and recommend that they should be used in well ventilated areas. Ventilation means bringing in fresh, outdoor air to mix with indoor air.
58	Waste management plan	A plan that lists the work processes or activities that will generate construction waste and demolition materials during the course of the work and describes the measures to reduce/ minimise that waste.
59	Water cooled chiller	Water-cooled chiller is equipment that includes an evaporator, compressor, condenser and regulator control, and which serves to supply chilled water. The heat absorbed by the refrigerant in the chiller is expelled into the outdoor environment by evaporation through cooling towers, or by seawater discharge to the sea.



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If you are a shopping mall developer, a building owner or manager, or professional who is interested in sustainable design issues for shopping arcades in Hong Kong……

This guide provides information and resources that can help you create and operate a sustainable and environmentally friendly shopping mall. It encompasses a wide range of building sustainability issues which include reducing energy consumption, waste and water, improving human comfort and health. Discussions about site selection, planning and design of buildings, selection of building systems and also management and lease issues.

If you are a shop owner or tenant……

This guide aims to provide holistic guidelines about building design, leasing, operations and maintenance, as well as management aspects of a sustainable and energy efficient shopping mall.

If you are a shopper who is just interested in green building design and at the same time enjoys shopping……

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