HBEAS

HOTEL BUILDING ENVIRONMENTAL ASSESSMENT SCHEME
酒店建築環境評估計劃

An Environmental Assessment for Existing Hotels

Industry Department, The Government of The Hong Kong Special Administrative Region
香港特別行政區政府工業署

HONG KONG HOTELS ASSOCIATION
香港酒店業協會

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ihra INTERNATIONAL HOTEL & RESTAURANT ASSOCIATION

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HBEAS 2000

Hong Kong Hotels Association

Hotel Building Environmental Assessment Scheme (HBEAS)

An environmental assessment for existing hotels

Version 1/00

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Copies of this document may be downloaded from: http://www.bse.polyu.edu.hk/

1 Hotel Building Environmental Assessment Scheme

1.1 INTRODUCTION TO HBEAS

The overriding purpose of the HBEAS scheme is to encourage actions that improve the environmental performance of *existing* hotels. This is broadly interpreted to mean reducing the consumption of natural resources, reducing waste and effluents, whilst maintaining a comfortable, healthy and productive indoor environment.

HBEAS recognises that hotel buildings and their engineering systems are unlikely to be optimised in terms of their design, and that their performance deteriorates over time. Consequently, the scheme recognises management efforts to achieve good performance within financial and operational constraints. In addition, the scheme allows the benchmarking of performance against established standards, codes, and local performance indices.

Environmental issues are of fundamental importance world-wide. In Hong Kong there is growing concern about the quality of the local environment. Environmental impacts should be minimised, and residents and visitors should enjoy a cleaner environment. Buildings, including hotels, have significant impact on the global and local environments. Good building design and operation can reduce such impacts, whilst providing good quality indoor environments.

Both government and the private sector is being urged to improve the quality of Hong Kong's building stock, buildings of all types, both old and new. Improved environmental performance of buildings is economically justified, for society as a whole, for owners, managers, and users.

To demonstrate its commitment to reducing environmental impact, the Hong Kong Hotels Association (HKHA), commissioned the Department of Building Services Engineering to develop an environmental assessment scheme for hotel buildings.

The Hotel Environmental Assessment Scheme (HBEAS) is similar to the Hong Kong Building Environmental Assessment Method (HK-BEAM) developed on behalf of The Real Estate Developers Association of Hong Kong. The HK-BEAM scheme currently embraces both new[1] and existing[2] air-conditioned office premises, and new residential buildings.[3] As for HK-BEAM the criteria in HBEAS are set at a level over and above standards that are legally required.

HBEAS incorporates some of the features of HK-BEAM version 2/99R Existing Office Buildings, in that it focuses on the management, operation, and maintenance of hotel buildings. However, unlike most office buildings, hotel operators have control over the entire accommodations of the hotel, so it is possible to undertake a more detailed assessment of the indoor environment. HBEAS assessment includes consideration of the hotel's environmental management system in relation to ISO recommendations,[4] and incorporates elements of the Hong Kong Government's building energy-labelling scheme,[5] and the new guidance note on the management and assessment of indoor air quality.[6]

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1 Centre of Environmental Technology, Limited. HK-BEAM 1/96R An Environmental Assessment for New Office Designs. September 1999.

2 Centre of Environmental Technology, Limited. HK-BEAM 2/96R An Environmental Assessment for Existing Office Buildings. September 1999.

3 Centre of Environmental Technology, Limited. HK-BEAM 3/99 An Environmental Assessment for New Residential Buildings. September 1999.

4 International Standards Organisation. ISO14004 Environmental Management Systems - General Guidelines on Principles, Systems and Supporting Techniques.

5 Electrical & Mechanical Services Department. The Government of the Hong Kong Special Administrative Region. The Hong Kong Energy Efficiency Registration Scheme for Buildings. October 1998.

1.2 AIMS OF HBEAS

HBEAS seeks to reduce a building's environmental impact using the best available techniques and within manageable cost and available human resources. Some of the actions needed to improve performance may have an economic return that justifies the action, for instance, the cost of investment in measures that reduce water consumption and sewage charges.

HBEAS specifies criteria for a range of environmental issues. Its main aims are to:

- raise awareness of the large contribution which buildings make to global warming, acid rain and depletion of the ozone layer, as well as the local environmental impacts;
- reduce the long-term impact that hotels have on the environment;
- promote the adoption of environmental management systems in hotels;
- promote and encourage energy efficient hotels, building services systems and equipment;
- reduce the unsustainable use of increasingly scarce resources such as water and timber;
- improve the quality of the indoor environment and hence the health and well-being of hotel guests and employees;
- set targets and standards which are independently assessed and so help to minimise false claims or distortions; and
- enable owners and operators of hotels to respond to a demand for hotels which have less impacts on the environment, and to help stimulate such a market.

1.3 ASSESSMENT APPROACH

The assessment covers two aspects:

- environmental management, operations and maintenance practices: and
- facilities and building performance.

The scheme addresses aspects[7] for which there is evidence of the environmental problems they cause, and for which effective performance criteria can be defined. These criteria have been developed so that they can be readily assessed or prescribed during a review of hotel management and operation & maintenance practices, and a survey of the hotel building and engineering services. The assessment process also provides an opportunity for achieving improved performance.

The scheme allows self-assessment, to evaluate the current state of performance and to identify requirements to improve the performance. The scheme allows for an independent declaration of performance by a hotel, or independent certification by a suitably qualified auditor (such as Centre of Environmental Technology, Limited).[8]

It is not practical to assess all the issues covered in HBEAS on a common scale. There is insufficient information available for an objective weighting of all of the issues because of the difficulty in assigning costs and relative environmental impacts. It is not expected that a hotel will meet all of the target requirements. However, meeting one or more means that the hotel has less environmental impact than one in which the requirements have not been met.

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6 Indoor Air Quality Management Group. The Government of the Hong Kong Special Administrative Region. Indoor Air Quality Certification Guide. August 2000. Draft.

7 Many issues cannot at present be included, either because the environmental problems they cause are not yet well enough understood or because effective performance criteria have not yet been established. Additional issues may be included in future updates of HBEAS, as information that enables their objective assessment becomes available.

8 www.cet.com.hk

1.4 ISSUES CONSIDERED IN AN HBEAS ASSESSMENT

The environmental issues covered are grouped under two categories:

- management, operations and maintenance practices; and
- facilities and building performance.

Management, Operations and Maintenance

Assessment considers actions by the hotel in endeavouring to reduce environmental impacts through more effective operating practices. This takes account of the fact that hotel buildings and engineering systems are subject to design inadequacies, ageing, etc., and resources are not necessarily available for significant capital investment.

- Environmental policy.
- Environmental purchasing practices.
- Waste management.
- Management of ozone depleting substances.
- Energy management.
- Water conservation
- Building maintenance.
- Operations and maintenance of building services systems.
- Biological contamination.
- Mineral fibres.
- Radon.

Facilities and Building Performance

Assessment of building performance is set against environmental performance criteria for indoor conditions, local codes of good practice, and benchmarked performance for consumption of energy and water.

Benchmarking assesses hotel building performance in relation to other hotel buildings in Hong Kong and allows hotel management to gauge performance on more objective criteria. The assessment of hotel building performance covers facilities and resource 'inputs' to the hotel, and that part of the 'output' that is the indoor environment.

- Facilities for servicing the building.
- Metering and monitoring equipment.
- Energy management system
- Energy efficiency of air-conditioning installations.
- Energy efficiency of lighting systems.
- Energy efficiency of electrical installations.
- Energy consumption.
- Water conservation equipment.
- Water consumption.
- Thermal comfort conditions.
- Indoor air quality.
- Interior lighting.
- Indoor noise.
- Noise emissions.

1.5 CRITERIA FOR THE AWARD OF CREDITS

The baseline for the award of credits is legal compliance.	Under HBEAS assessment there is no penalty for non-compliance with legal requirements. Credits are given for good environmental management practices, and it is expected that compliance with local environmental legislation will have been fully embraced.(9)
Credits are awarded for meeting performance standards appropriate to hotel buildings in Hong Kong.	The performance standards relate to choice of materials, and meeting standards for indoor environmental conditions (thermal comfort, lighting, noise, etc).
Credits are awarded for compliance with local 'good practice' guides and codes.	For example, compliance with relevant aspects of the local voluntary building energy codes.
Additional credits are awarded for exceeding the requirements of local 'good practice' guides and codes.	Performance, which exceeds the benchmarks provided in local codes, receives additional credits. Performance, which is above average for local hotels, will receive additional credits. There is no penalty for performance that is below average.

1.6 ASSESSMENT PROCESS

HBEAS offers hotel management the option of SELF-ASSESSMENT or INDEPENDENT CERTIFICATION.

A hotel whose staff is competent to verify compliance with the various assessment criteria can undertake self-assessment. For some technical issues, outside assistance may be required, such as the hiring of equipment for detailed monitoring and measurement.

HBEAS certification comprises two ratings, one for hotel management, and one for hotel building performance. The ratings are based on the percentage of available credits achieved in each of the two categories.

	Management	Performance
Fair	11 - 15	18 - 24
Good	16 - 20	25 - 31
Very Good	21 - 25	32 - 37
Excellent	26+	38+

Information on how to participate in the scheme is available from the Hong Kong Hotels Association.

Independent certification can be undertaken by a suitably certified agency, such as the Centre of Environmental Technology, Limited (CET).(10)

In addition to the HBEAS rating the hotel can include an assessment under the Hong Kong Government's voluntary Energy Efficiency Registration Scheme for Buildings.(11) The requirement of the energy-labelling scheme are incorporated within HBEAS, and by gaining all applicable credits, as identified in Table I, will demonstrate compliance and allow application for the energy efficient labels. Assessment of the indoor air quality in HBEAS will enable hotels to assess compliance with the Government's IAQ scheme.(12)

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9 Guide to Environmental Legislation for Hotel Operators in Hong Kong. Department of building Services Engineering, The Hong Kong Polytechnic University. Available at http://www.bse.polyu.edu.hk/bep/

10 The HK-BEAM scheme is owned and operated by the Centre of Environmental Technology, Limited (CET). CET will arrange to meet the hotel management to discuss the details of the assessment process. The CET Assessor will subsequently undertake a provisional assessment based on the information gathered from the questionnaire and the discussion, and produce a provisional report. This report will identify which credits have been achieved, and also outline changes necessary to obtain further credits. At this stage the hotel management may wish to take action changes to improve matters. The actions may then be re-assessed before a Final Report and a Certificate is issued.

11 Electrical & Mechanical Services Department. The Government of the Hong Kong Special Administrative Region. The Hong Kong Energy Efficiency Registration Scheme for Buildings. October 1998.

12 Indoor Air Quality Management Group. The Government of the Hong Kong Special Administrative Region. Indoor Air Quality Certification Guide. August 2000. Draft.

1.7 SUMMARY OF CREDITS

Sect:	Credit requirement:	Available Credits:	Credits Obtained:
2	**MANAGEMENT, OPERATION & MAINTENANCE**	**32**	
2.1	**Environmental Policy:**	**1**	
	for having an established policy to minimise the impact of the hotel's operations on the environment.	**1**	
2.2	**Environmental Purchasing Practices:**	**5**	
a)	for a purchasing practice which encourages the use of timber only from well-managed and identified sources, for use in partitions, doors, floors, skirting and other fittings used in the hotel	**1**	
b)	for specifying particleboard, fibreboard, and similar composite boards which conform to European Standard EN 321-1, or alternative equivalent standards; and excluding the use of treated timber where it is not recommended in any relevant codes and standards; and specifying all preserved timber shall be pre-treated ready for finishing on site.	**1**	
c)	for avoiding the use of paints that contain lead; and avoiding the use of paints containing volatile organic compounds (VoC), or ensuring that any paint containing VoC conforms to European or similar equivalent standards relating to solvent content.	**1**	
d)	for purchasing practices which excludes the use of: insulation materials manufactured using or containing CFCs or HCFCs; aerosol sprays containing CFCs or HCFCs; and equipment containing CFCs or HCFCs, such as air-conditioners and refrigerators	**1**	
e)	for purchasing practices that specifies that energy efficient office equipment, appliances and energy efficient electrical equipment are purchased whenever practicable.	**1**	
2.3	**Waste Management:**	**1**	
	for a management system that provides for the collection and sorting of waste.	**1**	
2.4	**Management of Ozone Depleting Substances:**	**6**	
a)	where the refrigerants employed in the air conditioning system have an average ozone depletion potential of less than 0.06.	**1**	
	where the refrigerants employed in the air conditioning system have an average ozone depletion potential of less than 0.03.	**2**	
	where the refrigerants employed in the air conditioning system have an ozone depletion potential of zero.	**3**	
	alternatively: for demonstrating a phased programme of refrigerant replacement to an average ozone depletion potential of less than 0.03.	**1**	
	for demonstrating proper management of the refrigerant replacement programme	**1**	
b)	for specifying automatic refrigerant leak detection for indoor chiller plant, or specifying monthly manual checking for leakage for outdoor plant.	**1**	
c)	where full refrigerant recovery during maintenance is undertaken using approved refrigerant recovery equipment and containers.	**1**	

d)	where no halon-based fixed or portable fire protection systems are used in the building, or a schedule of maintenance and testing of fixed halon fire protection systems has been drawn up with the specific aim of minimising unnecessary emissions of halon, and where a decommissioning programme of existing halon systems is in place	**1**	
2.5	**Energy Management:**	**4**	
a)	for having an energy policy and an action plan, with the responsibility for implementation vested in a senior executive.	**1**	
b)	for having carried out an energy audit of the hotel within the previous two years, or for undertaking an ongoing energy audit.	**1**	
c)	for an energy monitoring and targeting system which sets targets and quantifies savings, together with an energy efficiency improvement investment budget and suitably trained staff to undertake its implementation.	**1**	
d)	for adoption of the practices given in the 'Good Practice Guide to Energy Conservation in Hotels' in respect of non-technical hotel operations.	**1**	
2.6	**Water Conservation:**	**4**	
a)	for having a water conservation policy and an action plan, with the responsibility for implementation vested in a senior hotel executive.	**1**	
b)	for having carried out a water audit of the hotel within the previous two years, or for undertaking an ongoing water audit.	**1**	
c)	for an water use monitoring and targeting system which sets targets and quantifies savings, together with a water conservation investment budget and suitably trained staff to undertake implementation.	**1**	
d)	Adoption of the practices given in the 'Good Practice Guide to Water Conservation in Hotels' in respect of non-technical aspects of hotel operations.	**1**	
2.7	**Building Maintenance:**	**1**	
	where a planned programme of regular maintenance, cleaning and inspection of the building's fabric is in operation.	**1**	
2.8	**Operation and Maintenance of Building Services Systems:**	**3**	
a)	for having an easy-to-follow regularly updated manual detailing the operating methods, instructions, and standard control settings for HVAC services equipment.	**1**	
b)	for an established programme of regular inspections, cleaning and maintenance of the building services engineering systems under the authority of a senior executive.	**1**	
c)	for an established programme of continuous commissioning to maintain the initial design intent of systems and maintain the optimal operation of existing systems.	**1**	
2.9	**Biological Contamination:**	**3**	
a)	for complying with the recommendations described in the Code of Practice for the Prevention of Legionnaires Disease that is applicable to indoor HVAC equipment.	**1**	
b)	for complying with the recommendations described in the Code of Practice for the Prevention of Legionnaires Disease that are applicable to domestic water systems.	**1**	
c)	for a building in which: wet cooling towers are not used; or the wet cooling towers use seawater; or the wet cooling towers use water from an acceptable source and are designed and maintained as specified in the Code of Practice for the Prevention of Legionnaires Disease.	**1**	

2.10	**Mineral Fibres:**	**3**	
a)	where the original building specification specifically excluded the use of asbestos in the building; or for having carried out a professional asbestos survey, keeping written record of the location of all asbestos, and taking appropriate action to deal with all asbestos identified.	**1**	
b)	for demonstrating that the following conditions are satisfied: fibrous duct liners are not used inside the ventilation duct; or equipment, excepting coated or uncoated sound attenuation liners up to 4 m in length, o fibrous duct liners inside the ventilation ducts or equipment are covered with durable polymer or foil or similar fibre control, and fibre release is confined to the return air ducts; and uncoated duct liners are not used in supply air ducts.	**1**	
	where no significant quantities of unconfined man-made mineral fibre materials are located in the air handling plant rooms or air plenums.	**1**	
2.11	**Radon:**	**1**	
	for having undertaken a radon assessment survey, and for having taken appropriate action where the levels shown to be in excess of 200 Bq/m^3.	**1**	
TOTAL CREDITS OBTAINED UNDER MANAGEMENT, OPERATION & MAINTENANCE			
Performance Rating:			

Sect:	Credit requirement:	Available Credits:	Credits Obtained:
3	**FACILITIES AND BUILDING PERFORMANCE**	**50**	
3.1	**Facilities for Servicing the Building:**	**2**	
a)	for the provision of space for the collection and sorting of waste.	**1**	
b)	for providing access for delivery vehicles and waste collection vehicles to the service areas of the building which lies within the site boundary and which are enclosed and/or segregated from pedestrian access routes.	**1**	
3.2	**Metering and Monitoring Equipment:**	**5**	
a)	for metering that allows measurement of the electrical energy consumed by the major building services systems.	**1**	
b)	for metering which allows separate monitoring of electricity use by the main chiller plant and auxiliaries, and for metering which allows separate monitoring of cooling energy output from the main chiller plant.	**1**	
c)	for metering, which allows separate monitoring of electrical energy consumed by airside equipment of the HVAC system.	**1**	
d)	for having adequate instrumentation in boiler plant such that the combustion and operating efficiency of the boiler plant can be determined.	**1**	
e)	for having adequate meters allowing measurement of the water use by major consumers in the hotel.	**1**	
3.3	**Energy Management System:**	**4**	
a)	for providing in every guestroom a master switch, such as a key tag operated switch, which performs the prescribed energy saving functions upon activation.	**1**	
	if the master switch provides additional prescribed functions.	**1**	
b)	for having a computerised building management system (BMS) and network for data acquisition, transmission and retrieval; which allows data analysis for evaluating system performance.	**1**	
	for demonstrating automatic energy management functions for major energy consuming systems/equipment using the BMS system.	**1**	

3.4	**Energy Efficiency of Air-conditioning Installations:**	**6**	
a)	where the total fan motor power: for a constant air volume supply system, does not exceed 1.6 W per L/s of supply air quantity; or for a variable air volume supply system, does not exceed 2.1 W per L/s of supply air quantity, at maximum flow and no more than 55% of the maximum fan motor power at 50% of the design flow.	**1**	
	where the pumping system enables variable water flow to the air handling equipment down to less than 50% of the design flow, at reduced pressure head and pump power.	**1**	
	where the electrical-driven refrigeration equipment of capacity above 10 kW has a minimum coefficient of performance in compliance with the specifications and conditions described in the Code of Practice for Energy Efficiency of Air Conditioning Installations.	**1**	
b)	where heat recovery is provided on the general exhaust from the air-conditioned spaces.	**1**	
	for providing heat reclaim on chillers for winter space heating or other hot water requirements.	**1**	
	for the use of condenser rejected heat for hot water preheating in boiler/calorifier.	**1**	
3.5	**Energy Efficiency of Lighting Installations:**	**4**	
a)	for complying with the requirements of the Code of Practice for Energy Efficiency of Lighting Installations in respect of lamp luminous efficacy, and control gear loss.	**1**	
	for complying with the requirements of the Code of Practice for Energy Efficiency of Lighting Installations in respect of maximum allowable lighting power density.	**1**	
b)	for demonstrating that the overall installed power density in back-of-the-house service areas and hotel public areas are at least 25% lower than the requirements set out in the Code of Practice for Energy Efficiency of Lighting Installations.	**1**	
	for demonstrating that the overall installed power density in guestrooms are at least 25% lower than the requirements set out in the Code of Practice for Energy Efficiency of Lighting Installations.	**1**	
3.6	**Energy Efficiency of Electrical Installations:**	**4**	
	for complying with the requirements of the Code of Practice for Energy Efficiency of Electrical Installations in respect of power distribution losses.	**1**	
	for complying with the requirements of the Code of Practice for Energy Efficiency of Electrical Installations in respect of efficient utilisation of power.	**1**	
	for complying with the requirements of the Code of Practice for Energy Efficiency of Electrical Installations in respect of power quality.	**1**	
	for complying with the requirements of the Code of Practice for Energy Efficiency of Lift and escalator Installations	**1**	
3.7	**Energy Consumption:**	**6**	
a)	for the electricity consumption less than: 300 kWh/m^2/year if gas or oil boilers are used for hot water supply; or 340 kWh/m^2/year if electric boilers are used for hot water supply.	**1**	
	for the electricity consumption less than: 270 kWh/m^2/year if gas or oil boilers are used for hot water supply; or 310 kWh/m^2/year if electric boilers are used for hot water supply.	**2**	
	for the electricity consumption less than: 240 kWh/m^2/year if gas or oil boilers are used for hot water supply; or 280 kWh/m^2/year if electric boilers are used for hot water supply.	**3**	

b)	for the annual gas consumption less than: 18 MJ/food cover if gas is consumed in kitchens only; or 35 MJ/food cover if gas is consumed in kitchens and central boilers; or 50 GJ/guest room if gas is consumed in kitchens and central boilers.	**1**	
	for the annual gas consumption less than: 12 MJ/food cover if gas is consumed in kitchens only; or 30 MJ/food cover if gas is consumed in kitchens and central boilers; or 42 GJ/guest room if gas is consumed in kitchens and central boilers.	**2**	
c)	if fuel oil consumption is less than 0.64 GJ/m^2/year if oil-fired boilers are used for hot water supply; or the total energy consumption less than 1.71 GJ/m^2/year if fuel oil is not used.	**1**	
3.8	**Water Conservation Equipment:**	**3**	
a)	for the reuse of water in a laundry, or new washing technology adopted to reduce water consumption.	**1**	
b)	for installing water flow control devices in showers and faucets in guestrooms.	**1**	
	for installing water flow control devices in kitchens.	**1**	
3.9	**Water Consumption:**	**2**	
	for water consumption based on Water use Index (WUI) between 3.5 and 5.5 m^3/m^2.	**1**	
	for water consumption based on Water use Index (WUI) below 3.5 m^3/m^3.	**2**	
3.10	**Thermal Comfort Conditions:**	**3**	
a)	where the operative temperature and humidity in guestrooms falls within the range of thermal comfort zone defined in the ASHRAE Standard 55-1992.	**1**	
	where the operative temperature and humidity in hotel public areas falls within the range of thermal comfort zone defined in the ASHRAE Standard 55-1992.	**1**	
b)	for the risk of draft (PD) to be less than 15% in guestrooms.	**1**	
3.11	**Indoor Air Quality:**	**4**	
a)	for demonstrating the ventilation rate in a representative sample of hotel guestrooms complies with Table 2 of ASHRAE 62-1999.	**1**	
	for demonstrating the ventilation rates in hotel public spaces complies with the relevant rates as given in Table 2 of ASHRAE 62-1999.	**1**	
	for demonstrating the ventilation rates in hotel back-of-the-house spaces complies with the relevant rates as given in Table 2 of ASHRAE 62-1999. ALTERNATIVELY	**1**	
b)	for demonstrating the indoor air quality in a representative sample of hotel guestrooms complies with Tables 1 and 3 of ASHRAE 62-1999.	**1**	
	for demonstrating the indoor air quality in hotel public spaces complies with Tables 1 and 3 of ASHRAE 62-1999.	**1**	
	for demonstrating the indoor air quality in hotel back-of-the-house spaces complies with Tables 1 and 3 of ASHRAE 62-1999.	**1**	
c)	for demonstrating the indoor air quality in restaurants complies with Level 2 IAQ Objectives for Hong Kong.		
3.12	**Interior Lighting:**	**3**	
a)	for demonstrating by calculation or measurement that for a typical area of each type of space in back-of-the-house services areas of the hotel building meets the maintained illuminance recommendation listed in the Lighting Schedule of CIBSE Code for Interior Lighting.	**1**	

	for demonstrating by calculation or measurement that for a typical area of each type of space in public areas of the hotel building meets the maintained illuminance recommendation listed in the Lighting Schedule of CIBSE Code for Interior Lighting.	**1**	
b)	for demonstrating that all lamps in guest rooms, office areas, business centre, conference rooms and kitchens have a CIE general colour rendering index 80 or above (i.e. colour rendering groups 1A or 1B).	**1**	
	for demonstrating background noise levels which below the following values:		
3.13	**Indoor Noise:**	**3**	
a)	for demonstrating background noise levels which below the following values: 45dBA $L_{eq,T}$ in offices and function rooms; 40dBA $L_{eq,T}$ in bedrooms (with maximum fan speed) at daytime; and 35dBA $L_{eq,T}$ in bedrooms (with maximum fan speed) at night.	**1**	
b)	for demonstrating less than 3 dB in sound transmission between guestrooms, between guestrooms and corridors, and between bathrooms:	**1**	
c)	for demonstrating less than 3 dB in sound transmission between function rooms.	**1**	
3.14	**Noise Emissions:**	**1**	
	for complying with the acceptable noise levels for neighbouring sensitive receivers in accordance with the Technical Memorandum for the Assessment of Noise from places Other Than Domestic Premises, Public Places or Construction Sites.	**1**	
TOTAL CREDITS OBTAINED UNDER FACILITIES AND BUILDING PERFORMANCE			
Performance Rating:			

2 Management, Operation & Maintenance

Apart from population growth the construction and use of buildings has a greater impact on the global environment than almost any other human activity. Environmental damage arises as a result of, for example, energy used for air-conditioning and lighting, the chemicals present in materials used in buildings, and waste streams arising during operation, refurbishment and demolition.

The first principle is to recognise environmental management to be among the higher corporate priorities and a key determinant to sustainable development. Enterprises should establish policies, programmes, and practices for conducting their operations in an environmentally sound manner. They should develop, design and operate facilities and conduct activities taking into consideration the efficient use of energy and materials, the sustainable use of renewable resources, minimise generation and ensure responsible disposal of wastes. They should also promote the adoption of these principles by contractors acting on behalf of the enterprise, encouraging, and where appropriate, requiring improvements in their practices, and to encourage the wider adoption of these principles by suppliers.

The assessment aspects presented in this section may be embraced within a hotel's Environmental Management System (EMS) or otherwise.

2.1 ENVIRONMENTAL POLICY

For an organisation to be successful in addressing environmental issues, it must set clear objectives at the highest level with a programme for their management, checking, and review. An environmental policy, endorsed by directorate level management, is a key element of such a programme.[13]

ISO 14004[14] sets out guidelines for establishing an environmental management system (EMS) and specifies the key features of an effective environmental policy as:

- being appropriate to the nature, scale and environmental impacts of the organisation's activities, products and services;
- committing to continual improvement and pollution prevention (e.g. in energy efficiency and the reduction of associated greenhouse gases);
- committing to comply with relevant environmental legislation (e.g. in the use of ozone depleting substances or other hazardous materials);
- providing a framework for setting and reviewing environmental objectives and targets (e.g. in energy or material consumption); and
- is documented and communicated to all employees, suppliers, and customers.

Corporate environmental policies naturally vary between organisations. The HBEAS criteria provide flexibility to embrace commitments to environmental protection and improvement where these can be demonstrated to be appropriate, practical, and achievable.

HBEAS seeks to promote business practices that acknowledge and promote the need to protect the environment.

Maximum number of credits attainable: 1

Credit requirement

❖ 1 credit for having an established policy to minimise the impact of the hotel's operations on the environment.

Method of assessment

The hotel will be required to provide a copy of the hotel's policy with regard to the environment. HBEAS assessment focuses on the implementation of an effective Environmental Policy in respect of the most pressing environmental issues associated with existing hotel buildings; that is improving energy efficiency and providing a safe, healthy and comfortable indoor environment. In addition, at least TWO other suitable policy commitments should be included. Such commitments may, for example, seek to:

❑ reduce material consumption, and to reuse or recycle wastes whenever practicable;

❑ promote the use of recycled and recyclable materials which represent value for money;

❑ encourage suppliers to identify the impacts of their goods, and work on reducing them;

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13 A sample Environmental Policy is given in Environmental Management Manual for Hotel Operators in Hong Kong which is available for download from http://www.bse.polyu.edu.hk/bep/

14 International Organization for Standardization. ISO 14004 Environmental management systems – General guidelines on principles, systems and supporting techniques. 1996.

- require suppliers to avoid unnecessary packaging, and encourage to use returnable, recycled, recyclable, biodegradable and non-toxic packaging materials;
- ensuring operational plant is so designed as to minimise visual, noise and other impacts on the local environment; and
- provide a framework for setting and reviewing environmental objectives and targets.

Where such a document has been produced and the hotel management is able to demonstrate that it is published or openly available to customers, suppliers and staff, a credit shall be given.

If the hotel's EMS is currently certified under ISO 14001 then credit shall be awarded without further evidence of compliance.

2.2 ENVIRONMENTAL PURCHASING PRACTICES

A hotel's purchasing policy forms part of environmental management. Where major consumers include environmental considerations in purchasing decisions, the market place will respond. HBEAS targets purchasing activities for certain materials used in building maintenance and refurbishment, and the purchase of equipment.

Timber products:

All the timber used in Hong Kong is imported. Hong Kong is a major user of tropical timber, figuring in the top ten of importers worldwide.(15) Large quantities of tropical hardwoods are still specified for interior use, such as for parquet flooring, doors, framing, skirting, etc. Alternatives for fittings and interior use exist in the form of chipboard, medium density fibreboard, and suitably treated softwood. Non-load bearing, built-in wall panels, are often framed in hardwood timber, whereas non-timber framed proprietary wall panel systems are available.

Paints:

The use of paints containing organic solvents can contribute a significant health hazard if used in unventilated conditions. There may also be a small hazard and annoyance to occupants returning to recently painted areas or to the occupants of adjacent offices during application and drying out of the paint.

Whilst it is appreciated that the maintenance of hotel interiors and exteriors may require touch-up using products matching existing finishes, there are opportunities to change the types of paint used during refurbishment.

Ozone depleting substances:

CFCs and HCFCs have been identified as a cause of damage to the earth's stratospheric ozone layer and materials and products such as insulation and aerosol sprays that contain them, or require there use during manufacture, should be avoided where possible.(16)

Energy efficient equipment:

The Voluntary Energy Efficiency Labelling Scheme (EELS)(17) is an energy conservation initiative that the Government has adopted. Under the scheme, some common types of household appliances will incorporate an energy efficiency label that serves to inform consumers of the product's energy consumption and efficiency. Buyers should then be able to take those factors into account and make their own choice.

Under the Demand Side Management (DSM) Agreement signed with the Government in May 2000, Hongkong Electric(18) and China Light & Power(19) will offer cash rebate to non-residential customers for their purchase and use of the following energy efficient lighting measures effective from 1st July 2000 to 30th June 2003:

- Integrated/non-integrated Compact Fluorescent Lamps (CFLs);
- Energy Efficient Fluorescent Tubes (EEFTs); and
- Electronic Ballasts (EBs) for Tubular Fluorescent Tubes.

Lists of the eligible energy efficient lighting measures can be obtained by visiting EMSD's site.

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15 Friends of the Earth. Report on the use and waste of tropical timber by Hong Kong's construction industry. January 1992.
16 Building Research Establishment. CFCs in buildings. BRE Digest 358. October 1992.
17 Details are available from http://www.info.gov.hk/emsd/english/energy/registers/index.html
18 Details are available from http://www.info.gov.hk/emsd/english/energy/dsm/.
19 Details are available from http://www.clpgroup.com/dsm/.

HBEAS seeks to minimise the environmental impacts through choice of materials and products used in maintaining and refurbishing hotel buildings. To reduce health impacts from pollutants released indoors.

Maximum number of credits attainable: 5

Credit requirement

a) Timber products

- ❖ 1 credit for a purchasing practice which encourages the use of timber only from well-managed and identified sources, for use in partitions, doors, floors, skirting and other fittings used in the hotel.

b) Board and timber

- ❖ 1 credit for:
- ❑ specifying particleboard, fibreboard, and similar composite boards conforming to European Standard EN 312-1, or alternative equivalent standards; and
- ❑ excluding the use of treated timber where it is not recommended in any relevant codes and standards; and
- ❑ specifying all preserved timber shall be pre-treated ready for finishing on site.

c) Paints

- ❖ 1 credit for
- ❑ avoiding the use of paints that contain lead; and
- ❑ avoiding the use of paints containing volatile organic compounds (VOC), or ensuring that any paint containing VOC conforms to European or similar equivalent standards relating to solvent content.

d) Ozone depleting substances

- ❖ 1 credit for purchasing practices which excludes the use of:
- ❑ insulation materials manufactured using or containing CFCs or HCFCs;
- ❑ aerosol sprays containing CFCs or HCFCs; and
- ❑ equipment containing CFCs or HCFCs, such as air-conditioners and refrigerators.

e) Energy efficient appliances and equipment

- ❖ 1 credit for purchasing practices that specifies that energy efficient office equipment, appliances and energy efficient electrical equipment are purchased whenever practicable.

Method of assessment

a) The Hotel management will be required to provide details of the hotel's purchasing policy for timber used in repairs and refurbishment of the hotel premises for partitioning, doors, floors, skirting and other fixed internal fittings.

All softwood and hardwood timbers used in permanent solid joinery (such as lippings, framing, veneers) and all plywood shall originate from sustainable managed sources. Softwoods (such as Radiata Pine and Douglas Fir) and temperate hardwoods (such as Beech and China Oak) are considered to originate from sustainable sources. The use of softwoods and temperate hardwoods for permanent joinery is acceptable. Tropical hardwoods shall be considered to originate from unsustainable sources unless independent certification can be provided to demonstrate otherwise. Tropical hardwoods include species such as Meranti, Iroko, Sapele, Angre, Mahogany and Ramin. Solid timbers and plywood from tropical origins should be avoided.

General Manager can provide the following details:

- the species and country of origin;
- the name of the concession or plantation within the country of origin supplying the timber;

- a copy of the forestry policy being pursued for the plantation or concession;
- shipping documents confirming that the timber supplier has indeed obtained their timber from that concession.

b) Where particleboards, fibreboards or similar types of composite wood products are specified they shall comply with EN 312-1[20] or similar specification as far as formaldehyde emissions are concerned.

c) The materials specification must show the absence of paints containing lead. The materials specification must show that VOC in paints conform to British Standards[21,22] relating to solvent and using latex paint where possible in lieu of solvent based paint.

d) Details of the hotel's purchasing policy with respect to the materials listed shall be provided. The policy should identify acceptable products or materials for use and the names of the suppliers from whom they can be obtained. If the policy is to avoid these materials and products, credit will be given.

e) The hotel management shall provide evidence that the hotel purchases whenever possible:

- office equipment, such as computers, printers, etc., which are provided with 'power management' or 'energy saving' features that power down the equipment during idle periods whilst maintaining essential function;
- energy efficient electrical appliances which are registered under the EELS with energy efficiency grade 3 or better (or similar rating under another national energy labelling scheme); and
- energy efficient equipment such as lamps, motors, etc.

If the hotel's EMS is currently certified under ISO 14001 then credit shall be awarded without further proof of compliance.

[20] European Standard EN 312-1:1997. Particleboards – Specifications. Part 1. General requirements for all board types.

[21] British Standards Institution. Mineral solvents (white spirit and related hydrocarbon solvents) for paints and other purposes. British Standard BS 245:1992. Specification for mineral solvents (white spirit and related hydrocarbon solvents) for paints and other purposes. London, BSI, 1992.

[22] British Standards Institution. Specification for primers for woodwork. British Standard BS 7956:2000. London, BSI, 2000.

2.3 WASTE MANAGEMENT

The Waste Reduction Framework Plan was implemented in 1998. The Plan is based on the hierarchy of approaches to waste management, that is, in order of priority - Avoid, Minimise, Reuse, Recycle, Treat, Dispose.

In Hong Kong most solid waste is disposed of at landfill sites, the capacity of which is quickly being exhausted. Landfills are likely to be exhausted by 2015 and another 860 hectares of land for new sites will be required within the next 20 years[23]. On an average day, landfills in Hong Kong receive around 9,000 tonnes per day of municipal solid waste, and up to 1,000 tonnes per day of special wastes. Some of this waste, such as paper decomposes forming methane, a powerful greenhouse gas contributing to global warming. It is therefore important to reduce the amount of waste requiring disposal. Initiatives are being taken by the Waste Reduction Committee which has established various task groups, including one for the hotel sector.[24]

Hotels generate quantities of waste paper, toner cartridges, glass and plastic bottles, metal cans etc., much of which could be recycled. Day-to-day consumables such as paper and glass are more likely to be recycled if suitable separation and storage provision is made (see also Section 3.1). Eleven of Hong Kong's largest hotels began recycling plastic bottles in June 2000 as part of a programme by the Friends of the Earth (FoE). FoE intends other recycling initiatives, such as to recycle used textiles.

HBEAS seeks to reduce to reduce pressure on landfill sites, and to help to preserve non-renewable resources by promoting recycling of waste materials.

Maximum number of credits attainable: 1

Credit requirement

- 1 credit for a management system that provides for the collection and sorting of waste.

Method of assessment

The General Manager shall provide details of the management system that provides for the collection and sorting of waste from hotel premises. The system shall provide information to staff as to what constitutes good practice in recycling wastes, and encourage departments to separate their waste by providing appropriate containers and a regular system of collection. The management system should monitor the waste collection and disposal system, including the practices of the waste collection contractor to ensure recycling takes place within the hotel's available resources.[25]

If the hotel's EMS is currently certified under ISO 14001 then credit shall be awarded without further proof of compliance.

23 Environmental Protection Department. Waste reduction framework plan. 1998. http://www.pelb.wpelb.gov.hk/wrfp/chl.htm

24 Details of the activities of the Waste Reduction Committee are available at http://www.info.gov.hk/wrc.

25 Good Practice Guide to Waste Management for Hotels in Hong Kong. The Department of building Services Engineering, The Hong Kong Polytechnic University. Available at http://www.bse.polyu.edu.hk/

2.4 MANAGEMENT OF OZONE DEPLETING SUBSTANCES

The stratospheric ozone layer reduces the amount of short-wavelength ultraviolet radiation from the Sun that reaches the Earth's surface. Exposure to this radiation can have harmful effects on plants, agricultural crops and marine organisms, and cause skin cancer and eye cataracts. A number of natural and man-made trace gases are known to decompose ozone in the stratosphere. Chlorofluorocarbons (CFCs), hydrochloro-fluorocarbons (HCFCs) and halons are man-made gases which have been released in increasing concentrations since the 1950s, and these have contributed to the holes in the ozone layer above the polar regions.

Buildings have contributed to this depletion partly through leaks of CFC and HCFC refrigerants from air conditioning systems. In addition CFCs and HCFCs have also been used as blowing agents for some thermal insulation materials, whilst halons have been used in fire protection systems. Alternative materials and systems are available which avoid ozone-depleting substances.

HBEAS seeks to encourage proper management of the phase-out of ozone depleting substances, through replacement, conversion and good maintenance of refrigeration and air-conditioning plant. To significantly reduce the release of CFCs, HCFCs and halons into the atmosphere and thus reduce damage to the Earth's stratospheric ozone layer.

Maximum number of credits attainable: 6

Credit requirement

a) Refrigerants in air conditioning and refrigeration equipment

Where all refrigerants used are classified as having low ozone depletion potential (ODP):

- ❖ 1 credit where the refrigerants employed in the air conditioning system have an average ozone depletion potential of less than 0.06.
- ❖ 2 credits where the refrigerants employed in the air conditioning system have an average ozone depletion potential of less than 0.03.
- ❖ 3 credits where the refrigerants employed in the air conditioning system have an ozone depletion potential of zero.

Alternatively,

where only part of the refrigerants used are classified as having low ozone depletion potential (ODP) and the remainder are being replaced in a phased programme:

- ❖ 1 credit for demonstrating a phased programme of refrigerant replacement to an average ozone depletion potential of less than 0.03.
- ❖ 1 credit for demonstrating proper management of the refrigerant replacement programme.

b) Refrigerant leak detection

- ❖ 1 credit for specifying automatic refrigerant leak detection for indoor chiller plant, or specifying monthly manual checking for leakage for outdoor plant.

c) Refrigerant recovery

- ❖ 1 credit where full refrigerant recovery during maintenance is undertaken using approved refrigerant recovery equipment and containers.

d) Halon fire protection

- ❖ 1 credit where:
- ❑ no halon-based fixed or portable fire protection systems are used in the building, or
- ❑ a schedule of maintenance and testing of fixed halon fire protection systems has been drawn up with the specific aim of minimising unnecessary emissions of halon; and
- ❑ where a decommissioning programme of existing halon systems is in place.

Method of assessment

a) The hotel management shall provide documentation detailing the refrigerant(s) used in the air conditioning system(s). This shall include details of quantities of each refrigerant by trade name, chemical composition, and ODP. Where the refrigerant replacement programme has not been completed the hotel shall provide details of the replacement programme. This shall include details of all existing plant, quantities of each refrigerant by trade name, chemical composition and ODP, and similar details upon planned completion of the programme. A refrigerant replacement programme shall ensure that appropriate measures are taken for the environmentally safe and effective storage, management and disposal of recovered CFCs.

b) A credit will be given where sensors have been installed to sample the air at various points around the refrigeration system with the specific aim of detecting small refrigerant leaks. The sensors should be situated in the main compressor housing, in ducts carrying refrigeration pipework and adjacent to the condensers. The sensors should be linked to alarm signals in the plant room and preferably the reception area and designed to trigger the alarm when refrigerant gases are detected. The intention of the system must be to detect leaks and therefore the sensors will need to be set to raise an alarm at refrigerant concentrations lower than those considered to be hazardous to health. The hotel management shall provide details of the system used.

   For circumstances where automatic refrigerant detection systems may prove unreliable, such as air cooled chillers or chillers with remote air cooled condensers, suitable alternatives can be considered. For example, the use of a fluorescent dye added to the refrigerant to allow leaks to be detected using an ultra-violet lamp, and where checks are carried out on a regular basis. The hotel management shall provide details of the system used.

c) Where the total weight contained within any single system exceeds 15 kg, refrigerant recovery must be available on site for use during maintenance. The recovery equipment should consist of either a fixed or a portable recovery unit with suitable connections to match the valves on the refrigeration system. Portable refrigerant storage cylinders must also be provided, with sufficient capacity to hold the full refrigerant charge from the largest refrigeration circuit. These cylinders should be correctly labelled to match the refrigerant in the system. Alternatively, if the hotel can demonstrate compliance through an acceptable maintenance agreement with a qualified contractor, then credit can be awarded.

d) Halon fire protection systems may take the form of either hand-held extinguishers or fixed fire protection systems serving, for example electricity switch rooms. Where either hand-held or fixed halon fire protection systems are present in the building, the hotel management will be asked to provide written details of their practices for ensuring that emissions are reduced to a minimum. The practices covering any maintenance, filling or decommissioning of the systems shall be carried out in accordance with the guidelines given in ISO Standard 72101-2[(26)]. Testing and inspection procedures for portable fire extinguishers should be carried out according to British Standard BS 5306: Part 3:1985: Section 8.12[(27)]. For total flooding systems the fan pressure testing procedure set out in British Standard BS 5306: Section 5: 1992[(28)] should be specified. Written agreements will need to have been drawn up with any contractor undertaking work on the system, to ensure that these requirements are being met. Where staff are trained in the use of hand-held extinguishers, the policy should require that training does not proceed to discharge of the halon contents. The policy should also require that all halon contained within the fire protection system is recovered for recycling or proper disposal at the end of its life or when equipment is replaced. If a decommissioning programme of existing halon systems is in place, the hotel shall demonstrate that appropriate measures are taken to ensure proper recovery, storage, management and destruction of halons.

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[26] International Standard ISO 72101-2: 1991. Fire extinguishing media – Halogenated hydrocarbons – Part 2: Code of practice for safe handling and transfer procedures of halon 1211 and halon 1301. (Identical with BS EN 27201-2: 1994).

[27] British Standards Institution. Fire extinguishing installations and equipment on premises. Part 3. Code of practice for selection, installation and maintenance of portable fire extinguishers. British Standard BS 5306: Part 3: 1985.

[28] British Standards Institution. Fire extinguishing installations and equipment on premises. Part 5. Halon systems. Section 5.1. Halon 1301 total flooding systems. British Standard BS 5306: Part 5: Section 5.1: 1992.

2.5 ENERGY MANAGEMENT

The management and operation of a hotel building and the way the staff and guests use the facilities can have a major impact on the hotel's energy consumption. Energy management should:

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

Staff awareness of the importance of energy costs and efficiency is important if efficiency is to be improved through operational procedures. The practices of hotel staff in respect of energy using appliances can have a significant impact on consumption. The implementation of 'good housekeeping' practices by staff in all departments, technical and non-technical can achieve up to 10% energy saving. Involving guests in energy conservation programmes can be effective in reducing energy use.

Financial support for an action plan for implementing energy-saving measures is essential, either by a budget allocation or by allocation of all or part of savings in fuel bills. It is also vital that an appropriate person in the organisation is responsible for energy saving.

HBEAS seeks to encourage concerted action by senior management to improve the utilisation of energy used in the hotel. This covers actions aimed to improve system and equipment performance, i.e., improved energy efficiency, and to promote energy conservation, i.e., reduce wastage of energy., and the adoption of 'good housekeeping' practices in respect of energy efficiency and energy conservation by all departments and staff in a hotel.

Maximum number of credits attainable: 4

Credit requirement

a) Energy policy and action plan

❖ 1 credit for having an energy policy and an action plan, with the responsibility for implementation vested in a senior hotel executive.

b) Energy audit[29]

❖ 1 credit for having carried out an energy audit of the hotel within the previous two years, or for undertaking an ongoing energy audit.

c) Energy monitoring and targeting

❖ 1 credit for an energy monitoring and targeting system which sets targets and quantifies savings, together with an energy efficiency improvement investment budget and suitably trained staff to undertake its implementation.

d) Good housekeeping practices

❖ 1 credit for adoption of the practices given in the 'Good Practice Guide to Energy Conservation in Hotels' in respect of non-technical hotel operations.

Method of assessment

a) The hotel management shall submit documentation demonstrating the commitment to responsible energy management, and an action plan aimed at achieving greater energy efficiency throughout the hotel building, and its main building services engineering systems

[29] See for example: http://www.info.gov.hk/emsd/english/energy/codes/index.html

and equipment. The energy policy shall include commitment to control energy consumption, such as:[30]

- avoiding unnecessary expenditure;
- improving cost-effectiveness, productivity and plant operating condition;
- investing in the clean, energy efficient technologies;
- to reduce as far as practicable the impact on the environment; and
- reducing the consumption of fossil fuels.

The action plan shall include:

- details of the channels of communication for staff at all levels responsible for energy use;
- monitoring of consumption; and
- quantification of savings.

The action plan and regular review shall be integrated into management and operations structure and have clear delegation of responsibility for energy consumption.

b) The hotel management shall provide a written report, endorsed by a Registered Professional Engineer or person with similar professional qualifications, confirming that an audit has been completed essentially in accordance with the practice outlined in CIBSE Applications Manual AM5.[31] The hotel shall provide evidence from energy consumption records, operation and maintenance records, and other documentation, to verify actions to improve energy efficiency were identified, those that have been completed, and those that are in progress. The audit may exclude energy consumption by retail tenants in the hotel.

c) The hotel management shall provide details of the energy monitoring and targeting system, details of the investment in energy efficiency improvements, and the credentials of the staff who are undertaking implementation.

e) The hotel management shall demonstrate through the submission of documents pertaining to standard operating instructions to non-technical staff of the hotel, that the check-lists contained in the Good Practice Guide to Energy Conservation in Hotels[32] are adopted.

If the hotel's EMS is currently certified under ISO 14001 then credit shall be awarded without further proof of compliance.

30 UK Department of the Environment's Energy Efficiency Best Practice programme. BRESCU. Building Research Establishment. http://www.bre.co.uk/bre/otherprg/eebp/default.html. Good Practice Guide 186. Developing an effective energy policy. June 1996.

31 The Chartered Institution of Building Services Engineers. Energy audits and surveys. Applications Manual AM5. 1991.

32 Good Practice Guide to Energy Conservation in Hotels. The Department of building Services Engineering, The Hong Kong Polytechnic University. Available at http://www.bse.polyu.edu.hk/

2.6 WATER CONSERVATION

The management and operation of a hotel and the way the staff and guest use the facilities can have a major impact on water consumption, and consequent sewage discharge. Credits are achieved when water conservation forms part of the hotel's environmental policy. Water conservation practices should:

- be fully integrated into the organisation's management systems;
- have monitoring and targeting systems in place based on sub-metering of water use;
- include regular reports and reviews of the monitored data;
- set targets for efficient utilisation of water; and
- be supported by an action plan.

Staff should be aware of the need for water conservation if utilisation of water is to be improved. The practices of hotel staff in respect of water using appliances can have a significant impact on consumption. The implementation of 'good housekeeping' practices by staff in all departments, technical and non-technical can achieve significant water saving. Involving guests in water conservation programmes can be effective in reducing water consumption.

Reducing the cost of water, sewage charges and trade effluent charges will add to the profitability of hotel operations. Financial support for an action plan for implementing water conservation measures is essential. This may derive from existing budgets or adoption of a 'payment by saving' scheme. It is also vital that an appropriate person in the organisation is responsible for monitoring water conservation practices in the hotel.

HBEAS seeks to encourage concerted action by senior management to improve the utilisation of water in the hotel. This covers actions aimed to improve system and equipment performance, and to promote water conservation, i.e., reduce wastage of water through the adoption of 'good housekeeping' practices by all departments and staff in a hotel.

Maximum number of credits attainable: 4

Credit requirement

a) Water conservation policy and action plan

❖ 1 credit for having a water conservation policy and an action plan, with the responsibility for implementation vested in a senior hotel executive.

b) Water audit

❖ 1 credit for having carried out a water audit of the hotel within the previous two years, or for undertaking an ongoing water audit.

c) Water monitoring and targeting

❖ 1 credit for a water use monitoring and targeting system which sets targets and quantifies savings, together with a water conservation investment budget and suitably trained staff to undertake implementation.

d) Good housekeeping practices

❖ Adoption of the practices given in the 'Good Practice Guide to Water Conservation in Hotels' in respect of non-technical aspects of hotel operations.

Method of assessment

a) The hotel management shall submit documentation demonstrating the commitment to responsible water management, and an action plan aimed at achieving water conservation throughout the hotel building, and its main building services engineering systems and equipment.

The action plan shall include:

- details of the channels of communication for staff at all levels responsible for major water consumption;
- monitoring of consumption; and
- quantification of savings.

The action plan and regular review shall be integrated into management and operations structure and have clear delegation of responsibility for energy consumption.

b) The hotel management shall provide a written report, endorsed by a Registered Professional Engineer or person with similar professional qualifications, confirming that an audit has been completed. The hotel shall provide evidence from water consumption records, operation and maintenance records, and other documentation, to verify actions to reduce water consumption were identified, those that have been completed, and those that are in progress. The audit may exclude water consumption by retail tenants in the hotel.

c) The hotel management shall provide details of the water use monitoring and water conservation targeting system, details of the investment in water conservation measures, and the credentials of the staff who are undertaking implementation.

d) The hotel management shall demonstrate through the submission of documents pertaining to standard operating instructions to non-technical staff of the hotel, that the check-lists contained in the Good Practice Guide to Water Conservation in Hotels[33] are adopted.

If the hotel's EMS is currently certified under ISO 14001 then credit shall be awarded without further proof of compliance.

[33] Good Practice Guide to Water Conservation in Hotels. The Department of building Services Engineering, The Hong Kong Polytechnic University. Available at http://www.bse.polyu.edu.hk/

2.7 BUILDING MAINTENANCE

Where buildings are not properly maintained, they may start to deteriorate, in extreme cases requiring major refurbishment or demolition. In such cases the process of refurbishment or reconstruction will require a large consumption of both energy and materials, thus putting an unnecessary burden on natural resources.

Appropriate planned maintenance is necessary to retain a building's value as an asset, sustain utility, and to ensure compliance with legal requirements, such as health and safety regulations, and it will assist owners and occupiers to manage the building in a more efficient and hence environmentally conscious way. Regular building fabric inspections should be carried out by to set up and subsequently to monitor a long-term planned maintenance programme and to ensure that all maintenance will continue, to retain asset value of the building and meet the set environmental requirements.

HBEAS seeks to encourage proper planned maintenance of the building's fabric and structure, thus prolonging its life and avoiding unnecessary use of resources resulting from premature replacement. An associated benefit will be to reduce the risk of hazards resulting from poorly maintained structures.

Maximum number of credits attainable: 1

Credit requirement

❖ 1 credit where a planned programme of regular maintenance, cleaning and inspection of the building's fabric is in operation.

Method of assessment

The General Manager of the building will be asked to provide details of their maintenance programme for the building fabric, which shall include:

- a list of the elements of the building fabric that require maintenance, for example window frames, sealants, roof cladding and membranes, etc.;
- a description of the planned maintenance procedures to be adopted for each item, including frequency of inspection and maintenance, and the name of the person or company responsible for undertaking the maintenance;
- a log book or computer system for recording and monitoring maintenance visits.

Where a planned programme of maintenance has been drawn up and documented in the form of an easy-to-follow manual and where it is being implemented, credit will be given.

Guidance on the management and selling up of a building maintenance programme is given in British Standard BS 8210[34]. British Standard BS 7543[35] sets auto standard procedure for documenting the expected durability and hence maintenance requirements for the components of a building.

[34] British Standards Institution. Guide to building maintenance management. British Standard BS 8210: 1986.
[35] British Standards Institution. Durability of buildings and building elements, products and components. British Standard BS 7543: 1992.

2.8 OPERATION AND MAINTENANCE OF BUILDING SERVICES SYSTEMS

Effective maintenance and operation of the building services can have a significant effect on both indoor environmental performance and energy efficiency. It will also help to prevent unexpected breakdowns and prolong the life of equipment, avoiding unnecessary use of resources in premature replacement.

To ensure the correct operation of the building's engineering services an easy-to-follow manual is required. This should list all the services contained within the building, giving for each a description of its function, operating instructions and the standard control settings to be adopted. Where controls require manual alteration, either daily or seasonally, the person or contractor responsible for making these adjustments should be identified and a schedule of visits arranged.

All documentation, including operating manuals and maintenance instructions should be clearly written, detailing the design approach and describing the actual systems and equipment and controls installed. Unfortunately, there is much evidence to show that this is not always adequate and that this lack of care for detail can have significant negative impact on the indoor environment and/or efficiency of energy use.

HBEAS seeks to enable building operators to fully implement the design intent, maintain the indoor environmental performance, and the efficiency of the building services engineering systems.

Maximum number of credits attainable: 3

Credit requirement

a) Operations & maintenance manual

❖ 1 credit for having an easy-to-follow regularly updated manual detailing the operating methods, instructions, and standard control settings for HVAC services equipment.

b) Operations & maintenance programme

❖ 1 credit for an established programme of regular inspections, cleaning and maintenance of the building services engineering systems under the authority of a senior executive.

c) Continuous commissioning programme

❖ 1 credit for an established programme of continuous commissioning to maintain the initial design intent of systems and maintain the optimal operation of existing systems.

Method of assessment

a) A credit shall be given when the General Manager can confirm in writing that an original (or properly updated) set of O&M manuals exist, which details the following:

- overview of each system and their integration;
- modes of operation;
- schematic diagram of major systems;
- automatic controls diagram and description;
- record drawings of the installations as built, or as subsequently altered;
- safety procedures and instructions;

- manufacturers information on all major equipment (not just catalogue copies);
- relevant statutory regulations and codes of practice;
- commissioning results;
- the operating and maintenance strategy for the installation;
- the indoor environmental conditions for which the building is designed, covering seasonal variations;
- the control strategies to achieve this objective;
- equipment operating parameters and control settings to be monitored.;
- full maintenance instructions with access points, monitoring points, etc., identified; and
- maintenance schedules.

Material should be arranged in order of ascending detail, and with appropriate indexing. The final documentation should be capable of being used without other reference material.[36,37]

The General Manager shall confirm in writing that the original set of O&M manuals have been maintained and updated.

b) A credit is given where an established O&M programme exists and is placed under the authority of the Chief Engineer. The O&M programme document shall provide:

- a list of all building services equipment and control systems requiring maintenance, e.g., fans, pumps, dampers, etc.;
- a description of the maintenance procedures adopted for each item of equipment, including frequency of inspection and maintenance, and the name of the person(s) or company responsible for undertaking the maintenance; and
- details of the system used for recording and monitoring maintenance activities.

The maintenance activities, either in-house or under external contract, shall address on a regular basis HVAC system efficiency and the setting and operation of controls for ventilation and air-conditioning. Means of checking the performance need to be in place and to be readily understandable by the organisation's management through regular reports. The Heating and Ventilating Contractors Association (HVCA) standard maintenance specifications for mechanical services[38] give guidance on suitable maintenance procedures to be adopted.

c) A credit is given where established objectives and procedures of continuous commissioning are placed under the accountability of the Chief Engineer. The continuous commissioning processes either in-house or under external contract, shall be organised based on equipment and systems existing in a hotel, e.g. chillers, air distribution system, boiler plant, lighting systems, etc. The processes shall address rectifying deterioration of existing systems to upkeep the initial design intent and ensuring optimum after functional changes of spaces, and shall be oriented towards total building performance.

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36 American Society of Heating, Air-conditioning, and Refrigerating Engineers. Preparation of Operating and Maintenance Documentation for Building Systems. ASHRAE Guideline 4. Atlanta(USA), ASHRAE, 1993.

37 J H Armstrong. The Building Services Research and Information Association. Operating and Maintenance Manuals for Building Services Installations. Application Guide 1/87.1. 1990.

38 Heating and Ventilating Contractors Association. Standard maintenance specification for mechanical services in buildings, Parts 1-5. 1992.

2.9 BIOLOGICAL CONTAMINATION

Biological contaminants of concern in indoor air are suspended particles, suspended allergens and other biologically derived suspended materials having impact on the health and well-being of building occupants. Micro-organisms: fungal spores, bacteria and viruses occur virtually everywhere as part of the normal environment. They are found in buildings, in the air, on surfaces and in materials. These micro-organisms should be regarded as contaminants as their presence can be harmful. The various types of contaminants are: transient bioaerosols, airborne infectious agents, contamination of water systems, microbial growth on surfaces or within structures. Growth is regulated by the availability of moisture. The main principle to control contamination is the control of moisture in the buildings and it's engineering systems, coupled with adequate ventilation. The most dramatic microbial contaminant in air conditioning and water systems is the bacterium Legionella.

Free-standing water may occur in air conditioning ductwork where the system has been badly designed or maintained. Particular areas where this is likely to occur are in the condensate drip trays of cooler coils. Water systems containing stagnant water can also reach over 30°C in Hong Kong buildings. Legionella organisms have been found in many water samples taken from air conditioning systems and fresh water supplies in buildings in Hong Kong.

Legionnaires' disease[39] is an illness characterised by pneumonia, and can be fatal if not adequately treated. The causative agent is Legionella pneumophila, one member of a large family of bacteria, the Legionellaceae. It also causes a self-limiting influenza-like illness without pneumonia, called Pontiac fever. Lochgoilhead fever, caused by Legionella micdadei, is similar to Pontiac fever. Risk of infection is dependent upon the presence of legionellae bacteria, the ability of the water system to generate aerosols, the concentration of bacteria and size of aerosol, and the susceptibility of the people exposed to the aerosol. Factors contributing to the growth of legionellae include temperature, stagnation and presence of contamination's that serve as a nutritional source within the system.

Cooling towers and evaporative condensers are potential breeding grounds for Legionella, as their temperature is ideal for growth. Water that is poured or sprayed over the filler pack also generates water spray, and it is this spray that has been the cause of a number of outbreaks elsewhere. The risk increases with the number of illness causing bacteria in the air and the length of time a person is exposed. The concentration of bacteria in the air is determined by the amount of contaminated water dispersed into a given air volume. Contamination from cooling towers can be drawn into air intakes and reach street levels over distance of several hundred meters. The duration of exposure for occupants depends on the operating time of the cooling tower.

Where cooling towers form part of an air conditioning system and are not properly maintained, Legionella bacteria can be dispersed in airborne droplets up to several hundred metres from the building, with a risk of causing Legionnaires' disease. This risk can be eliminated by the appropriate design of the cooling towers and their proper operation and maintenance.

HBEAS seeks to significantly reduce biological contamination from air conditioning and water systems, and the risk of diseases, particularly Legionnaires' disease. To minimise the threat of Legionnaires' disease arising from wet cooling towers associated with air conditioning systems.

Maximum number of credits attainable: 3

Credit requirement

a) HVAC systems and equipment

- ❖ 1 credit for complying with the recommendations described in the Code of Practice for the Prevention of Legionnaires Disease that is applicable to indoor HVAC equipment.

b) Domestic water systems

- ❖ 1 credit for complying with the recommendations described in the Code of Practice for the Prevention of Legionnaires Disease that are applicable to domestic water systems.

[39] http://www.info.gov.hk/emsd/english/leg_disease/prevent/index.html

c) Wet cooling towers

❖ 1 credit for a building in which:

❑ wet cooling towers are not used; or

❑ the wet cooling towers use seawater; or

❑ the wet cooling towers use water from an acceptable source and are designed and maintained as specified in the Code of Practice for the Prevention of Legionnaires Disease.

Method of assessment

The General Manager shall be required to demonstrate that a regular survey is being carried out on the building's indoor HVAC and domestic hot water services by a Registered Professional Engineer, and that appropriate action and maintenance schedules are in use which satisfy the recommendations described in relevant sections of the Code of Practice Prevention of Legionnaires Disease.[40] The survey is required to confirm that regular cleaning, inspection and maintenance is carried out on HVAC equipment, including:

- drain trays at AHUs and FAUs (to prevent blockages and the build up of stagnant water);
- air breaks and U-traps at AHU and FCU condensate drains (to prevent back flow at drain);
- air ducts, bends, branches, heaters, mixing boxes, VAV boxes, humidifiers, fans, dampers, silencers, etc, (to avoid the build up of standing water and corroded materials); and
- filters and thermal insulation for air ducts, AHUs and FCUs.

The survey shall confirm that operation and maintenance of domestic water systems (DWS) meets the following requirements:

- where hot water storage devices (HWSD) of capacity above 300 litres in use, should be:
- ♦ able to be purged regularly at 60^{o}C or above and hot tap outlets at 50 ^{o}C or above;
- ♦ drained and cleaned at least once a year as required to avoid accumulation of sludge and rust, etc (drain outlets should be at the lowest point) ; and
- ♦ capable to provide secondary pumped circulation to reduce stratification of temperature.
- regular flushing (at least one minute each month) of hot water outlets which are infrequently used or connected to stagnant water pipe work;
- thermostatic mixing valves to be maintained as recommended by manufacturer with fail-safe testing after servicing checks of outlet temperature
- cold water tanks and cisterns to be regularly inspected, drained and scrubbed; and
- original cistern covers to be made / and corroded covers to be replaced by neoprene or other suitable materials to avoid microbial growth and these materials to be also used for washers, joints and other parts of the domestic water system.

For both HVAC and DWS systems O&M staff shall maintain the following records:

- maintenance logs, schedules and instructions for inspections, cleaning and remedial work
- monitoring of temperature, total dissolved solids, conductivity and suspended solids.
- contact details, equipment description, schematics and maintenance programmes

When wet cooling towers are used they shall be constructed and maintained to the specifications given the Code of Practice Prevention of Legionnaires Disease. This shall be confirmed in writing by the General Manager, based on a survey conducted by a Registered Professional Engineer. The Assessor may check the appropriate maintenance records.

[40] Prevention of Legionnaires' Disease Committee, Electrical and Mechanical Services Department, Hong Kong Government. "Code of Practice for the Prevention of Legionnaires' Disease in Hong Kong". 2000. http://www.info.gov.hk/emsd/english/leg_disease/code/index.html

2.10 MINERAL FIBRES

Mineral fibres released from the building fabric, ducts, pipe laggings, etc., have potential to cause annoyance and can be a health brisk. In particular there is concern about asbestos fibres released from poorly maintained or damaged surfaces.[41]

HBEAS seeks to minimise health risks resulting from the presence of fibrous materials potentially hazardous to health.

Maximum number of credits attainable: 3

Credit Requirement

a) Asbestos

- ❖ 1 credit
- ❑ where the original building specification specifically excluded the use of asbestos in the building; or
- ❑ for having carried out a professional asbestos survey, keeping written record of the location of all asbestos, and taking appropriate action to deal with all asbestos identified.

b) Mineral Fibres

- ❖ 1 credit for demonstrating that the following conditions are satisfied:
- ❑ fibrous duct liners are not used inside the ventilation ducts or equipment, except coated or uncoated sound attenuation liners up to 4 m in length; or
- ❑ fibrous duct liners inside the ventilation ducts or equipment are covered with durable polymer or foil or similar fibre control, and fibre release is confined to the return air ducts; and
- ❑ uncoated duct liners are not used in supply air ducts.
- ❖ 1 credit where no significant quantities of unconfined man-made mineral fibre materials are located in the air handling plant rooms or air plenums.

Method of Assessment

a) Where the hotel management is able to provide a copy of the original specifications for the building and where they specifically excludes the use of asbestos and asbestos-based products, a credit will be given. Where this is not the case, the General Manager will be required to provide records of any past survey of asbestos in the building. Where a full professional survey has been carried out by a registered consultant[42] within the past 3 years and appropriate decisions and any necessary actions have been taken, a credit will be given. The General Manager must have the results of the survey available, enabling them to implement both of the following:

- a system of management which would provide information when asbestos may be encountered in the future, for example when maintenance work is being considered, including suitable precautions to be taken when asbestos is likely to be disturbed, AND
- a system of review to assess the need for action at this time.

b) A survey shall include a visual inspection of air supply paths at a selection of duct access points. Duct liners using coatings that have been retrofitted in-situ or those containing biocidal agents will not normally qualify as they are not a proven solution. This includes sprayed acoustic coatings and thermal insulation with exposed fibre materials, etc., but does not include fabric-covered panels showing no signs of deterioration. If hotel management can provide evidence that in the levels of mineral fibres in hotel rooms is less than 1000 fibres/m^3 then both credits shall be awarded. This survey should embrace at least one typical floor layout with the ventilation system in full operation.

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41 Environmental Protection Department. Environmental Asbestos Control. http://www.info.gov.hk/epd/air/asbestos/control/eindex.htm

42 Environmental Protection Department. Code of Practice on the Handling and Disposal of Asbestos Waste. January 1993.

2.11 RADON

Indoor radon comes from several major sources, principally building materials and the soil and rock underlying and surrounding building foundations. Surveys in buildings have shown that relatively high radon levels can be found in rooms with low ventilation rates. Surveys can be carried out using integrating dosimeters in the rooms of interest, but the duration for measurement and the prevailing ventilation rates need to be carefully considered for meaningful conclusions to be drawn.[43,44] There are no internationally agreed safe limits for exposure to radon. For HBEAS remedial action is to be taken when the levels of radon in hotels buildings exceed 150 Bq/m^3.

HBEAS seeks to minimise the potential risk to health arising from exposure to radon.

Maximum number of credits attainable: 1

Credit Requirement

- 1 credit for having undertaken a radon assessment survey, and for having taken appropriate action where the levels shown to be in excess of 200 Bq/m^3.

Method of Assessment

Where the General Manager can provide evidence of a survey undertaken within the past three years by a suitably qualified consultant using an appropriate methodology, which demonstrates that the radon levels measured are less than 150 Bq/m^3 under normal operating conditions, a credit shall be awarded. Where they are greater than this, credit will only be given if it can be demonstrated that appropriate measures have been taken to reduce the levels below 100 Bq/m^3.

[43] Environmental Protection Department. Radon and you. http://www.info.gov.hk/epd/air/indoor/radon.html

[44] Environmental Protection Department. Practice Note for Professional Persons. Control of Radon Concentration in New Buildings. ProPECC PN 1/99. December 1999. http://www.info.gov.hk/epd/pub/propecc/home.htm

3 Facilities and Building Performance

The ability of hotel staff to improve on hotel building performance is often compromised by the lack of physical resources, such as space for waste sorting for reuse and recycling, metering for energy end-use auditing meters to monitor water consumed by major users, etc. It has been demonstrated from various studies on buildings that such facilities do enable hotel staff to reduce environmental impacts of the hotels operations through conservation of resources, efficiency improvements, and improvements in the indoor environment.

A significant amount of natural resources is required for a hotel's daily operations. A recent study[45] on energy use in hotel buildings in Hong Kong indicated that on average, electricity use accounted for about 75% of total energy used in a hotel. Electricity operates most building services installations, including air conditioning, lighting, vertical transportation (lifts and escalators) and miscellaneous users such as small power in offices, kitchens and laundries, etc. In some instances electricity is used for water heating. In Hong Kong gas is mainly used for cooking, and sometimes for water heating and for generating steam. Fuel oil is used for water heating and generating steam. A large amount of water is also required for the daily operation of a hotel for guest floors, kitchens, and laundries.

Energy use in hotel buildings in Hong Kong exhibits a clear pattern of seasonal variation. In general, electricity consumption reaches its peak in summer when outdoor weather is hot and humid. In February, normally the coldest month, electricity consumption is the lowest. On the other hand, fuel oil and gas consumption, especially when used for water heating, has an opposite pattern, i.e., lower consumption in winter, higher in summer. The variation pattern of total energy use in a local hotel would follow that of electricity, which is significantly related to outdoor weather changes, but is not clearly influenced by the levels of occupancy.

[45] S.M. Deng and J. Burnett. A Study of Energy Performance of Hotel Buildings in Hong Kong, Energy and Buildings, Volume 31(1), 2000, pp.7-12

3.1 FACILITIES FOR SERVICING THE BUILDING

The Hong Kong Government and environmental groups encourage recycling schemes. Day-to-day consumables such as paper, aluminium cans and plastics are more likely to be recycled if suitable separation and storage provision are available.

Traffic densities in Hong Kong are often very high. Traffic congestion and pollution from exhausts is made worse by vehicles queuing to enter buildings. Providing suitable access for vehicles can help alleviate local traffic congestion.

HBEAS seeks to reduce energy consumption during manufacture, to reduce pressure on landfill sites, and to help to preserve non-renewable resources by promoting recycling of waste materials. It also seeks to reduce traffic congestion caused by vehicles queuing to enter buildings through management of service vehicles requiring access to the building for the purposes of deliveries and waste disposal, etc.

Maximum number of credits attainable: 2

Credit requirement

a) Facilities for waste management

❖ 1 credit for the provision of space for the collection and sorting of waste.

b) Access for deliveries and waste collection

❖ 1 credit for providing access for delivery vehicles and waste collection vehicles to the service areas of the building which lies within the site boundary and which are enclosed and/or segregated from pedestrian access routes.

Method of assessment

a) The hotel management shall provide details of the storage space(s) provided for collection, sorting and separate storage of recyclable materials such as paper, plastics, glass and aluminium cans. The guideline is that 2 square metres of storage space shall be provided for each 1000 m^2 of floor area solely for the purpose of storage, with a maximum requirement of 20 m^2. The storage space shall be clearly labelled as a recycling store and have good access for cleaners, and for removal of materials by recycling contractors or the local authority. It should be enclosed and adequately ventilated.

b) The building will be checked to ensure that a system is provided which allows for delivery of goods and removal of waste, etc., which does not require waiting or parking on streets adjacent to the hotel building, and which does not impact on pedestrian access to the hotel.

3.2 METERING AND MONITORING EQUIPMENT

Following surveys of a large number of buildings in Hong Kong, including hotel buildings, it is clear that in general buildings are inadequately equipped with devices for the measurement and monitoring of performance of systems and equipment. Often the practice is to install the minimum of metering equipment, but even when installed it is generally of relatively low accuracy and reliability. This makes it particularly difficult when attempting to improve the energy efficiency of buildings and major equipment, such as central chiller plant. Maintenance and calibration of transducers such as pressure sensors, etc., is also important.

Monitoring can be useful in several important aspects. It provides opportunities for reducing energy consumption. Good monitoring systems can allow better control of part load performance, not only improving efficiency, but also improving the control of indoor comfort. Plant control can be altered and the results monitored to show how energy consumption changes. Unseen plant faults, which are not evident during routine maintenance, can be identified from analysis of performance trend data. Control problems can be detected and control strategies improved to match the building demand.

The cost of good quality instrumentation is not significant when compared to operating costs but the accuracy should be such as to provide meaningful readings. The payback on improved performance can be very high taking into account the reduction in electricity consumption and demand charges resulting from more efficient plant operation.

HBEAS seeks to enable building operators to measure, monitor and develop measures to improve the performance of the building's engineering systems, particularly concerning energy use and indoor environmental conditions.

Maximum number of credits attainable: 5

Credit requirement

a) Metering and monitoring of electricity consumption

- ❖ 1 credit for metering that allows measurement of the electrical energy consumed by the major building services systems.

b) Metering and monitoring of central chiller plant

- ❖ 1 credit for metering which allows separate monitoring of electricity use by the main chiller plant and auxiliaries, and for metering which allows separate monitoring of cooling energy output from the main chiller plant.

c) Metering and monitoring of air handling plant

- ❖ 1 credit for metering, which allows separate monitoring of electrical energy consumed by airside equipment of the HVAC system.

d) Boiler plant instrumentation

❖ 1 credit for having adequate instrumentation in boiler plant such that the combustion and operating efficiency of the boiler plant can be determined.

e) Water meters

❖ 1 credit for having adequate meters allowing measurement of the water use by major consumers in the hotel.

Method of assessment

a) Metering provision shall identify the electricity use pattern for each major system fed from the main switchboard(s). The hotel management shall confirm that metering provisions meet the requirement of the Government's electrical energy code.[46]

b) Monitoring of central chiller plants will be assessed on the basis of BSRIA Technical Note TN 7/94[47]. The monitoring system shall allow the overall performance of the plant and individual chillers to be determined for all operating modes and the full range of operating conditions.

c) Metering provision shall identify electricity use patterns for major air handling equipment, such as centralised air handling units for floors/zones, large designated areas, etc.

The hotel management shall provide details of the measuring equipment installed and commissioning records of consumption and chiller plant performance, to demonstrate that electricity use and performance can be monitored as stipulated.

d) Metering provision shall be able to monitor both the fuel input and heat output from a boiler plant, in order to evaluate the operating efficiency of a boiler. Depending on the installed boiler type, for fuel input, a gas or oil flow meter or an kWh meter should be provided as appropriate. For measuring heat output, a hot water flow meter and temperature sensors, for measuring supply and feed water temperatures, or a steam flow meter and a pressure sensor, for measuring the steam pressure should be provided as appropriate.

The hotel management shall provide details of the type of boiler installed (output: steam or hot water, fuel type: gas, oil or electricity), the installed metering provision as described above, calibration and maintenance records, and daily consumption logs.

e) Metering provision shall allow measurement of water consumption in major water end-use areas in the hotel. As a minimum this shall include kitchens, laundry (if any) and aggregate for guestrooms.

The hotel management shall provide details of the water meters installed, calibration and maintenance records, and daily water use logs in these major water end-use areas.

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46 Electrical and Mechanical Services Department, The Government of the Hong Kong Special Administrative Region. Code of Practice for Energy Efficiency of Electrical Installations. 1998.

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

3.3 ENERGY MANAGEMENT SYSTEM

Building Management or Automation Systems (BMS, BAS)) or Energy Management Systems (EMS) can provide a valuable resource for maintaining a building's engineering systems close to optimum efficiency. In order to achieve this it is necessary for the control system to be properly integrated with the building functions, and for the hardware and software to be fully maintained. Automatic controls in guestrooms can also provide for significant energy saving, whilst maintaining a satisfactory indoor environment. Various systems have been installed in a number of hotels with varying degrees of success. HBEAS acknowledges the improved performance of hotels in respect of energy savings when suitable controls are installed.

HBEAS seeks to encourage the installation of equipment that reduces energy consumption by guestrooms.

Maximum number of credits attainable: 4

Credit requirement

a) Guestroom master switching

- ❖ 1 credit for providing in every guestroom a master switch, such as a key tag operated switch, which performs the prescribed energy saving functions upon activation.
- ❖ 1 credit if the master switch provides additional prescribed functions.

b) Building management system

- ❖ I credit for having a computerised building management system (BMS) and network for data acquisition, transmission and retrieval; which allows data analysis for evaluating system performance.
- ❖ 1 credit for demonstrating automatic energy management functions for major energy consuming systems/equipment using the BMS system.

Method of assessment

a) The switching device shall perform the following functions:

- switch off all lights that were left on after a certain time delay; and
- turn-off the air-conditioning supply, except the fresh air supply; or
- reset the thermostatic setting to a higher level than the normal setting; or
- reset the thermostatic setting to a higher level than the normal setting and set the fan speed to a lower speed.

The second credit is awarded if the switching device also performs the following functions:

- shut-down periodically the fresh air supply to the room and exhaust from the bathroom; or:
- automatically draws the curtains to reduce solar heat gain.

The hotel management shall confirm in writing details of the master switching system installed, and which of the function listed are provided by the system.

b) As a minimum the BMS system should be capable of performing the following monitoring functions:

- monitoring the performance of major building services equipment, not least the central chiller plant, and major air handling plant (including chilled water flow rate, and its return and supply temperatures, supply and return air temperature);
- recording energy consumption by major electrical loads; and
- monitoring indoor comfort conditions in respect of temperature and humidity throughout the hotel building.

As a minimum the BMS system should be capable of performing the following control functions:

- automatic control of central chiller plant and auxiliaries for optimised performance (including appropriate chiller sequencing control, and automatic selecting chiller capacity combination in a chiller plant of unequal chiller capacity); and
- automatic switching of lighting systems where illumination is unnecessary (e.g. daylighting controls, time switching, etc).

The hotel management shall provide details of the BMS installation and the facilities provided in respect of monitoring and control functions. Credit shall be awarded on the basis of the potential for energy saving due to these provisions.

3.4 ENERGY EFFICIENCY OF AIR-CONDITIONING INSTALLATIONS

HBEAS encourages adoption of the Government's Energy Efficiency Registration Scheme for Buildings. The requirements of this section match that of the Code of Practice for Energy Efficiency of Air Conditioning Installations,[48] but emphasis is put on those parts relevant to the operational effectiveness of the air conditioning systems. HBEAS also encourages adoption of proactive energy saving measures through utilising heat recovery in air conditioning systems.

HBEAS seeks to reduce unnecessary energy use by adopting design-out improvement of the air conditioning systems by ensuring proper operation.

Maximum number of credits attainable: 6

Credit requirement

a) Compliance with energy efficiency code

- 1 credit where the total fan motor power:
  - for a constant air volume supply system, does not exceed 1.6 W per L/s of supply air quantity; and
  - for a variable air volume supply system, does not exceed 2.1 W per L/s of supply air quantity, at maximum flow and no more than 55% of the maximum fan motor power at 50% of the design flow.
- 1 credit where the pumping system enables variable water flow to the air handling equipment down to less than 50% of the design flow, at reduced pressure head and pump power.
- 1 credit where the electrical-driven refrigeration equipment of capacity above 10 kW has a minimum coefficient of performance in compliance with the specifications and conditions described in the Code of Practice for Energy Efficiency of Air Conditioning Installations.

b) Heat recovery

- 1 credit where heat recovery is provided on the general exhaust from the air-conditioned spaces.
- 1 credit for providing heat reclaim on chillers for winter space heating or other hot water requirements.
- 1 credit for the use of condenser rejected heat for hot water preheating in boiler/calorifier;

Method of assessment

a) Assessment criteria shall match that of the Code of Practice for Energy Efficiency of Air Conditioning Installations. The General manager shall provide details of the air distribution system, water-circulating system, specification of the fans, pumps, and refrigeration equipment, together with the operating characteristics and power consumption demonstrating compliance with the Code.

In the event that the hotel has obtained a certificate for compliance with the Code of Practice for Energy Efficiency of Air Conditioning Installations, credits shall be awarded without further evidence being provided.

b) For the assessment of heat recovery the General Manager shall provide details of the installed plant, together with a written confirmation that the plant is fully operational and evidence of energy savings are demonstrated. The installed plant and any records detailing operating performance may be subject to inspection.

Guidance on the interpretation of the Code is given in an accompanying Guide.[49]

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48 Electrical and Mechanical Services Department, The Government of the Hong Kong Special Administrative Region. Code of Practice for Energy Efficiency of Air-conditioning Installations. 1998.

49 Electrical and Mechanical Services Department, The Government of the Hong Kong Special Administrative Region. Guide to the Code of Practice for Energy Efficiency of Air-conditioning Installations. 1998 Edition.

3.5 ENERGY EFFICIENCY OF LIGHTING SYSTEMS

Lighting in a hotel typically accounts for between 15% and 18% of total electricity consumption. Energy efficient lighting can reduce electricity costs significantly. For example, compact fluorescent lamps use between 50% and 75% less energy than incandescent lamps for the same light output. Notwithstanding, it is important to apply energy efficient lamps correctly, taking into account the required light output quality as well as quantity.

HBEAS encourages adoption of the Government's Energy Efficiency Registration Scheme for Buildings. The requirements of this section match that of the Code of Practice for Energy Efficiency of Lighting Installations[50]. However, it is noted that the current requirements of the Code are based on average attainable performance and do not take account of the latest energy efficient equipment. HBEAS gives additional credits for performance that exceeds the Code requirements.

HBEAS seeks to encourage the use of energy efficient lamps and control gear in hotels in order to reduce the environmental impacts of electricity use.

Maximum number of credits attainable: 4

Credit requirement

a) Compliance with the code of practice

- ❖ 1 credit for complying with the requirements of the Code of Practice for Energy Efficiency of Lighting Installations in respect of lamp luminous efficacy, and control gear loss.
- ❖ 1 credit for complying with the requirements of the Code of Practice for Energy Efficiency of Lighting Installations in respect of maximum allowable lighting power density.

b) Energy efficient lighting equipment

- ❖ 1 credit for demonstrating that the overall installed power density in back-of-the-house service areas and hotel public areas are at least 25% lower than the requirements set out in the Code of Practice for Energy Efficiency of Lighting Installations.
- ❖ 1 credit for demonstrating that the overall installed power density in guestrooms are at least 25% lower than the requirements set out in the Code of Practice for Energy Efficiency of Lighting Installations.

Method of assessment

a) To qualify for the credits based on overall installed power density the hotel management shall provide details of the lighting systems provided for each of the areas in the format given in Tables LG-1 and LG-2 of the Code. Given the variability of lighting needs in each type of space it is not intended to be too prescriptive as to the requirements for each, but the aggregated average installed lighting power density in all areas shall be equal to or less than the aggregated average given in the Code.

In the event that the hotel has obtained a certificate for compliance with the Code of Practice for Energy Efficiency of Lighting Installations, credit shall be awarded without further evidence being provided.

b) Where the overall installed power density is at least 25% less than the average required in the Code, credit shall be awarded.

Guidance on the interpretation of the Code is given in an accompanying Guide.[51]

50 Electrical and Mechanical Services Department, The Government of the Hong Kong Special Administrative Region. Code of Practice for Energy Efficiency of Lighting Installations. 1998.

51 Electrical and Mechanical Services Department, The Government of the Hong Kong Special Administrative Region. Guide to the Code of Practice for Energy Efficiency of Lighting Installations. 1998 Edition.

3.6 ENERGY EFFICIENCY OF ELECTRICAL INSTALLATIONS

HBEAS encourages adoption of the Government's Energy Efficiency Registration Scheme for Buildings. The requirements of this section match that of the Code of Practice for Energy Efficiency of Electrical Installations[52], and includes the Code of Practice for Energy Efficiency of Lift and Escalator Installations.[53]

HBEAS encourages the use of energy efficient electrical equipment, to reduce the environmental impacts of electricity generation, and to improve the life and reliability of the electrical equipment installed.

Maximum number of credits attainable: 4

Credit requirement

- 1 credit for complying with the requirements of the Code of Practice for Energy Efficiency of Electrical Installations in respect of power distribution losses.
- 1 credit for complying with the requirements of the Code of Practice for Energy Efficiency of Electrical Installations in respect of efficient utilisation of power.
- 1 credit for complying with the requirements of the Code of Practice for Energy Efficiency of Electrical Installations in respect of power quality.
- 1 credit for complying with the requirements of the Code of Practice for Energy Efficiency of Lift and escalator Installations.

Method of assessment

The Client shall provide evidence in the form of a report from a Registered Professional Engineer that the electrical distribution systems and equipment comply with the current edition of the Code of Practice.

Guidance on the interpretation of the Code is given in an accompanying Guide.[54]

In the event that the hotel has obtained a certificate for compliance with the Code of Practice for Energy Efficiency of Electrical Installations, credit shall be awarded without further evidence being provided.

52 Electrical and Mechanical Services Department, The Government of the Hong Kong Special Administrative Region. Code of Practice for Energy Efficiency of Electrical Installations. 1998 Edition.

53 Electrical and Mechanical Services Department, The Government of the Hong Kong Special Administrative Region. Code of Practice for Energy Efficiency of Lift and Escalator Installations. 2000 Edition.

54 Electrical and Mechanical Services Department, The Government of the Hong Kong Special Administrative Region. Guide to the Code of Practice for Energy Efficiency of Electrical Installations. 1998 Edition.

3.7 ENERGY CONSUMPTION

The environmental impact of electricity is both global, in terms of carbon dioxide (CO_2) emissions, and more localised, in terms of emissions of sulphur dioxide (SO_2) and nitrogen oxides (NO_x). Gaseous emissions from power stations depend on the amount and type of primary fuel used. However, delivered electricity does not directly reflect CO_2 production because CO_2 production per unit of electrical energy delivered depends on the fuel used and the efficiency of conversion at power stations.

For a typical Hong Kong hotel building 48-55% of the electrical energy consumed is for air conditioning depending on the type of heat rejection method, 15-18% for lighting, and 7-8% for lifts and escalators. The remainder is consumed by electrical equipment in kitchens, laundry and guestrooms. The main electrical energy saving that can be achieved is therefore associated with reducing the lighting and air conditioning loads. There is much that can be done in operating, controlling and maintaining the system to optimise the seasonal electrical energy consumption and maximum demand.

The other forms of energy consumption in hotels include diesel oil, town gas, and LPG, consumed by boilers and cooking appliances. For a typical hotel in Hong Kong, energy consumption of diesel oil and fuel gas is 30-40% of the total consumption of all energy sources. A hotel having electrical boilers will consume more electricity but no diesel, whereas a hotel having oil or gas boilers will consume less electricity.

HBEAS seeks to reward hotels that have achieved better than average levels of performance.

Maximum number of credits attainable: 6

Credit requirement

a) Electricity consumption

- ❖ 1 credit for the electricity consumption less than:
  - ❑ 300 kWh/m^2/year if gas or oil boilers are used for hot water supply; or
  - ❑ 340 kWh/m^2/year if electric boilers are used for hot water supply.
- ❖ 2 credits for the electricity consumption less than:
  - ❑ 270 kWh/m^2/year if gas or oil boilers are used for hot water supply; or
  - ❑ 310 kWh/m^2/year if electric boilers are used for hot water supply.
- ❖ 3 credits for the electricity consumption less than:
  - ❑ 240 kWh/m^2/year if gas or oil boilers are used for hot water supply; or
  - ❑ 280 kWh/m^2/year if electric boilers are used for hot water supply.

b) Town gas and LPG

- ❖ 1 credit for the annual gas consumption less than:
  - ❑ 18 MJ/food cover if gas is consumed in kitchens only; or
  - ❑ 35 MJ/food cover if gas is consumed in kitchens and central boilers; or
  - ❑ 50 GJ/guest room if gas is consumed in kitchens and central boilers.
- ❖ 2 credits for the annual gas consumption less than:
  - ❑ 12 MJ/food cover if gas is consumed in kitchens only; or
  - ❑ 30 MJ/food cover if gas is consumed in kitchens and central boilers; or
  - ❑ 42 GJ/guest room if gas is consumed in kitchens and central boilers.

c) Fuel oil

- 1 credit if:
  - fuel oil consumption is less than 0.64 GJ/m^2/year if oil-fired boilers are used for hot water supply; or
  - the total energy consumption less than 1.71 GJ/m^2/year if fuel oil is not used.

Method of assessment

The hotel management shall provide audit details based on energy bills or records of electricity, fuel oil, town gas and LPG consumption, and the number of food covers served. This shall be for a continuous period of 12 months, and within a period not more than 18 months prior to the submission for assessment.

Details of the air conditioning heat rejection method, the type of hot water or steam boilers, and the gross floor areas should be clarified.

The energy use will be normalised over the gross floor area for the assessment. It is the amount of energy use that is assessed, not the costs. Fuel oil, town gas and LPG consumption is to be converted into equivalent amount in GJ. The conversion factors used shall be:

Town gas:	1 metered unit	= 0.048 GJ
LPG:	1 kg	= 0.0463 GJ
Fuel oil:	1000 litre	= 37 GJ
Electricity:	1 kWh	= 0.0036 GJ

3.8 WATER CONSERVATION EQUIPMENT

There are various devices available in the market that can reduce water consumption in guestrooms. Flow rates can be controlled using restrictors or pressure balancing flow control valves. Various devices such as proximity detectors can reduce wastage from taps left open. In addition, there may be opportunities for reuse of grey water from laundries, for collecting rainwater for irrigation, etc.

The required quality of water delivery in international class hotels varies with the water use appliance. For guestrooms comfortable delivery for showers and washbasins depends on maintaining a reasonably constant temperature and flow rate. Guidelines from various organisations suggest a shower flow rate of around 12 l/min maximum, but a well-designed showerhead can deliver good quality showers as low as 8 l/min. For washbasins 6 l/min is generally acceptable. Flow rates for kitchen sinks should be around 12-15 l/min.

HBEAS seeks to encourage the installation of equipment that can lead to significant water savings.

Maximum number of credits attainable: 3

Credit requirement

a) Water use in laundry

- ❖ 1 credit for the reuse of water in a laundry, or new washing technology adopted to reduce water consumption.

b) Water savings equipment

- ❖ 1 credit for installing water flow control devices in showers and faucets in guestrooms.
- ❖ 1 credit for installing water flow control devices in kitchens.

Method of assessment

a) The hotel management shall provide details of any system or measures taken to conserve water use by the hotel laundry. Where the hotel can demonstrate water saving in excess of 15% of total consumption by the laundry as a result of the actions taken, a credit shall be awarded.

In the event that the hotel does not have its own laundry, credit shall be awarded if the hotel management can demonstrate that it selects and uses a laundry service provider that uses modern water efficient equipment, or employs measures to conserve water use in laundry operations.

b) The hotel management shall provide details of any system or measures taken to conserve water use in guestrooms. Where the hotel can demonstrate water saving in excess of 15% of total consumption in guestrooms as a result of the actions taken, a credit shall be awarded.

The same requirements shall apply to hotel kitchens.

3.9 WATER CONSUMPTION

Water is a precious natural resource and conservation in its use by all concerned should be encouraged. In a hotel building, a considerable amount of fresh water is required for its daily operation in various functional areas. Whilst many hotels flushing systems use seawater, there is an energy and sewage penalty for excessive consumption. Measures can be taken to restrict water usage in all aspects.

Based on a recent study[55] for water consumption in hotels in Hong Kong, the major water users in a hotel would be guest floors, kitchen and laundry. The study showed that the water consumption of the laundry in a hotel may dominate the total water use, while both kitchen and guest floors may dominate the total water use in a hotel without an in-situ laundry. On the other hand, a significant part of the total water used in a hotel is hot water, so that saving hot water saves not only water itself, but also energy to heat the water.

Occupancy levels influence the water consumption in guest floors. The water consumption by a laundry is related to laundry washing load, which in turn may be affected by hotel occupancy level. On the other hand, water consumption in kitchens is expected to correlate with the number of food covers made.

HBEAS seeks to reduce wastage of water, which is a valuable resource, and to increase awareness of its importance. To reduce the environmental impact of sewage discharged from office buildings.

Maximum number of credits attainable: 2

Credit requirement

- 1 credit for water consumption based on Water use Index (WUI) between 3.5 and 5.5 m^3/m^2.
- 2 credits for water consumption based on Water use Index (WUI) below 3.5 m^3/m^3.

Method of assessment

The General Manager shall provide evidence in the form of annual water consumption metering data for a period of not less than 3 years previous, together with details of the hotel's gross floor area. The WUI, which is defined as the total annual water consumption (m^3) divided by the total gross floor area (GFA, m^2) shall be calculated and credit awarded based on the calculation.[56]

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55 S.M. Deng and J. Burnett. An audit of water consumption in hotels in Hong Kong. Building Services Engineering Research & Technology. Vol. 21 (2). Pages 145-147. 2000.

56 The average WUI from auditing water consumption in 17 hotel was 4.5 m^3/m^2.

3.10 THERMAL COMFORT CONDITIONS

This assesses the maintenance of indoor thermal comfort conditions against design criteria for the hotel. The desirable thermal comfort conditions adopted in HBEAS follows the recommendations given in ANSI/ASHRAE 55-1992.[57] Parameters of the thermal environment include temperature, thermal radiation, humidity and air velocity. Excessive air speed, often referred as draft, may cause unwanted local cooling of the body. Because of individual preferences and differences in human physiology, it is impossible to specify a thermal environment that will satisfy everyone. The requirement is to achieve thermal environment acceptable for at least 80% of building occupants.

The assessment under HBEAS covers guestrooms, public areas and back-of-the-house facilities.

HBEAS seeks to promote proper operation of building services systems to meet user's expectation of thermal comfort without undue use of energy.

Maximum number of credits attainable: 3

Credit requirement

a) Thermal comfort conditions

- ❖ 1 credit where the operative temperature and humidity in guestrooms falls within the range of thermal comfort zone defined in the ASHRAE Standard 55-1992.
- ❖ 1 credit where the operative temperature and humidity in hotel public areas falls within the range of thermal comfort zone defined in the ASHRAE Standard 55-1992.

b) Air velocity

- ❖ 1 credit for the risk of draft (PD) to be less than 15% in guestrooms.

Method of assessment

a) Assessment shall base on criteria and method described in the ASHRAE Standard 55-1992. The operative temperature is the weighted average of the air temperature and the mean radiant temperature. In a space under cooling mode, the operative temperature is more or less as the air temperature, which is the common situation for commercial and hotel buildings in Hong Kong. Whilst there is a range of acceptable level of operative temperature and humidity, the optimum is 24.5°C at 50% RH in summer and 22°C at 50% RH in winter. The RH level is commonly acceptable to be within an upper limit of 60% and a lower limit of 2 °C dew point temperature.

   The number of sample guestrooms shall be based on at least 1 measurement per 500 m^2 of guestroom floor area.

   Corridors and other circulation areas are not included in the assessment of public areas.

b) The risk of draft (PD) is calculated from the following equation:

$$PD = (34 - t_r)(\bar{v} - 0.05)^{0.62} (0.37 \bar{v} \cdot Tu + 3.14)$$

   where t_r = room air temperature in °C
   $\bar{v}$ = mean air speed in m/s
   Tu = turbulence intensity in %

   In the assessment, measurements of air temperature, humidity and air speed in the occupied spaces are required. Method of measurement, measurement positions and periods shall follow the specification detailed in the ASHRAE Standard 55-1992.

   The number of sample guestrooms shall be based on at least 1 measurement per 500 m^2 of guestroom floor area.

[57] ASHRAE Standards Committee. ANSI/ASHRAE 55-1992 ASHRAE Standard, Thermal Environmental Conditions for Human Occupancy. American Society of Heating, Refrigerating and Air-conditioning Engineers, Atlanta, USA, 1992.

3.11 INDOOR AIR QUALITY

The management of indoor air quality (IAQ) is an important aspect of hotel management. It is to be expected that the higher the grade of hotel, the better the quality of the indoor environment. Air quality in the working environment for employees is covered by legislation under the Occupational Safety & Health Ordinance (OSHO), while IAQ Objectives are for better comfort and health conditions for all occupants inside the premises. If all the parameters of the IAQ Objectives are met, the likelihood of indoor air pollution leading to health problems is remote, and therefore hotel management should endeavour to achieve the IAQ Objectives as far as possible.

Assessment of IAQ for compliance with OSHO is based on measurement of carbon dioxide (as an indicator of ventilation performance), and minimum fresh air supply rates appropriate to various types of work activity. The Hong Kong SAR Government has issued a Consultation Paper on Managing Indoor Air Quality in Hong Kong[58], including office premises and other public places. Initially the private sector is invited to voluntarily participate in the IAQ certification programme[59]. In parallel, the Government will start reviewing the existing legislation or introducing new legislation to achieve satisfactory indoor air quality. The certification guide and accompanying Guidance Notes[60] provide details of the requirements.

Acceptable indoor air quality is defined in ASHRAE Standard 62-1999[61] as "air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction". The purpose of ASHRAE 62-1999 is to specify minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to minimise the potential for adverse health effects. It considers chemical, physical and biological contaminants that can affect air quality. The standard provides two alternative procedures to obtain acceptable air quality indoors:

- a *ventilation rate procedure*, whereby acceptable air quality is achieved by providing ventilation of the specified quality and quantity to a given space; and
- an *indoor air quality procedure*, whereby acceptable air quality is achieved within the space by controlling known and specifiable contaminants.

It should be noted that most hotel buildings will be designed based on a ventilation rate criteria, either complying with ASHRAE 62-1999 or other standards. The design ventilation rates for older hotels may differ from those given in ASHRAE 62-1999, and allowance should be made in the assessment of hotel performance. The ventilation rate procedure assumes that the outdoor air quality is acceptable for ventilation, i.e., the outside air meets the ambient-air quality standard. In Hong Kong this is defined under the HKAQO.[62]

HBEAS adopts Table 2 of ASHRAE 62-1999 as the guide to ventilation (outdoor air requirements) for hotel buildings. As an alternative, HBEAS adopts the indoor air quality procedure as defined in ASHRAE 62-1999. HBEAS awards additional credit for compliance with Level 2 Indoor Air Quality Objectives and full compliance with the Government's Certification Scheme. The assessment covers guestrooms, public areas and back-of-the-house facilities.

The prescribed ventilation rates are the minimum supply rates of acceptable outdoor air to dilute and exhaust odorous and sensory irritant contaminants from occupants, indoor activities and from the building systems, equipment, finishes and furnishings. Alternatively, adequacy of outdoor air supply can be assessed based on the indoor-to-outdoor differential concentration of CO_2. The purpose is to assure proper ventilation rate and indoor air quality that will be acceptable to occupants and to minimise the potential for adverse health effect.

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58 Indoor Air Quality Management Group, The Government of the Hong Kong Special Administrative Region. Managing Indoor Air Quality. A Consultation Paper. Available at http://www.info.gov.hk/efb/link/iaq/index.html

59 Indoor Air Quality Management Group, The Government of the Hong Kong Special Administrative Region. Indoor Air Quality Certification Guide. August 2000. Draft.

60 Indoor Air Quality Management Group, The Government of the Hong Kong Special Administrative Region. Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places. November 1999. Draft. Available at http://www.info.gov.hk/efb/link/iaq/index.html

61 ASHRAE Standards Committee. ASHRAE Standard 62-1999, Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, USA, 1999.

62 See for example http://www.info.gov.hk/efb/link/cleanair/index.html

Whilst insufficient outdoor air supply will result in poor indoor air quality, increase of outdoor air supply means consumption of more energy, particularly when the climate is hot and humid. HBEAS seeks to encourage a balance of adequate ventilation rate and energy conservation.

HBEAS seeks to promote the management of acceptable indoor air quality without undue increase of energy use.

Maximum number of credits attainable: 4

Credit requirement

a) Ventilation rate procedure

- ❖ 1 credit for demonstrating the ventilation rate in a representative sample of hotel guestrooms complies with Table 2 of ASHRAE 62-1999.
- ❖ 1 credit for demonstrating the ventilation rates in hotel public spaces complies with the relevant rates as given in Table 2 of ASHRAE 62-1999.
- ❖ 1 credit for demonstrating the ventilation rates in hotel back-of-the-house spaces complies with the relevant rates as given in Table 2 of ASHRAE 62-1999.

ALTERNATIVELY

b) Indoor air quality procedure

- ❖ 1 credit for demonstrating the indoor air quality in a representative sample of hotel guestrooms complies with Tables 1 and 3 of ASHRAE 62-1999.
- ❖ 1 credit for demonstrating the indoor air quality in hotel public spaces complies with Tables 1 and 3 of ASHRAE 62-1999.
- ❖ 1 credit for demonstrating the indoor air quality in hotel back-of-the-house spaces complies with Tables 1 and 3 of ASHRAE 62-1999.

c) Additional credits are awarded for compliance with the Government's Certification Scheme

- ❖ 1 credit for demonstrating the indoor air quality in restaurants complies with Level 2 IAQ Objectives for Hong Kong.

Method of assessment

a) To qualify for credits the hotel shall provide details of the ventilation systems in the hotel, and details of the control of outdoor air supply.

The actual amount of outdoor air intake or the indoor-to-outdoor differential concentration of CO_2 shall be measured for a number of guestrooms, in major public areas (excluding corridors), and in occupied back-of-the-house areas.

The number of sample guestrooms shall be based on at least 1 measurement per 500 m^2 of guestroom floor area.

b) To qualify for credits the hotel shall provide details of the pollutant measurements in terms of sampling method and equipment used.

The number of sample guestrooms shall be based on at least 1 measurement per 500 m^2 of guestroom floor area.

c) To qualify for credits the hotel shall provide a report, prepared by a suitably qualified person as defined in the Certification Guide, demonstrating compliance with the requirements of the Certification Guide and the Guidance Notes.

Where a hotel obtains certification under the certification scheme credits shall be awarded under both b) and c). For details, please see 'A Guide for Participation in the Indoor Air Quality Certification Scheme' available from the Environmental Protection Department.

3.12 INTERIOR LIGHTING

Interior lighting plays an important role in providing a comfortable environment for guests and an efficient working environment for employees. In the quest for energy efficiency it must not be forgotten that if the resulting quality of the lighting is poor, the lighting system is inherently inefficient and the energy efficiency initiative is counterproductive. Hotel staff will be aware of the lighting needs for a particular space and function, and should seek to maintain light output quality using more efficient lamps and luminaires, coupled with regular cleaning and maintenance.

HBEAS seeks to ensure that the quality of the lighting provided in various hotel spaces meets appropriate standards.

Maximum number of credits attainable: 3

Credit requirement

a) Maintained illuminance

- ❖ 1 credit for demonstrating by calculation or measurement that for a typical area of each type of space in back-of-the-house services areas of the hotel building meets the maintained illuminance recommendation listed in the Lighting Schedule of CIBSE Code for Interior Lighting.
- ❖ 1 credit for demonstrating by calculation or measurement that for a typical area of each type of space in public areas of the hotel building meets the maintained illuminance recommendation listed in the Lighting Schedule of CIBSE Code for Interior Lighting.

b) Light output quality

- ❖ 1 credit for demonstrating that all lamps in guest rooms, office areas, business centre, conference rooms and kitchens have a CIE general colour rendering index 80 or above (i.e. colour rendering groups 1A or 1B).

Method of assessment

a) A typical area of each type of space in the hotel shall be selected and either calculation or measurement described below will be used for assessment:

- For calculation:

  The 'lumen method' formula will be used to calculate the maintained illuminance over the horizontal surface according to the calculation procedure described in Section 4.5.3 of the CIBSE Code for Interior Lighting. The calculated maintained illuminance will be checked for compliance with the recommendations given in the Lighting schedule (Section 2.6.4) of the CIBSE Code for Interior Lighting.

- For measurement:

  The field survey method described in Section 5.3.3 of the CIBSE Code for Interior Lighting should be used for measurement of the average illuminance in a space. The measurement should be carried out after a group lamp replacement and cleaning of luminaires. The measured average illuminance should be corrected by multiplying with the maintenance factor for the lighting installation to obtain an estimation of the maintained illuminance. This maintained illuminance will be checked for compliance with the recommendations given in the Lighting schedule (Section 2.6.4) of the CIBSE Code for Interior Lighting.

b) The hotel management shall provide a design and fitting out specification for the lighting systems used in the hotel demonstrating that good colour rendering in guest rooms, office areas, business centres, conference rooms and kitchens.

3.13 INDOOR NOISE

Noise is unwanted sound. It affects the human comfort. Inside a hotel, noise comes from the operation of building services, normal housekeeping activities and activities of hotel guests. In order to provide a good environment for guests the noise level inside critical areas should be kept to a low level as acoustic privacy inside guest rooms, function rooms and conference rooms is important.

HBEAS seeks to achieve a satisfactory indoor noise environment for hotel guests.

Maximum number of credits attainable: 3

Credit Requirement

a) Background noise

- ❖ 1 credit for demonstrating background noise levels which below the following values:
  - ❑ 45dBA $L_{eq,T}$ in offices and function rooms;
  - ❑ 40dBA $L_{eq,T}$ in bedrooms (with maximum fan speed) at daytime; and
  - ❑ 35dBA $L_{eq,T}$ in bedrooms (with maximum fan speed) at night.

b) Sound transmission to guestrooms

- ❖ 1 credit for demonstrating less than 3 dB in sound transmission between guestrooms, between guestrooms and corridors, and between bathrooms:

c) Sound transmission between function rooms

- ❖ 1 credit for demonstrating less than 3 dB in sound transmission between function rooms.

Method of Assessment

a) The hotel management shall provide evidence in the form of suitable measurements. Measurements will be made using an integrating sound-level meter with an 'A' weighting filter. The instrument should at least be of type 2 or better according to British Standard BS 6698[63]. The measuring period shall be 5 minutes.

The sound level meter should be calibrated or at least compared with the sound from the sound level calibrator. The meter is to be supported firmly on a tripod during measurements.

b) The sound level inside the receiver room shall be measured:

- when the television in the source room is operated normally; and
- when any radio or other broadcasting in the bathroom is operated normally.

c) The sound level inside the receiver room shall be measured when there is a typical function (activity) in the source room.

For sound transmission tests, the noise level inside the receiver room with and without activity outside the room shall be measured. The difference is the sound transmission level, which is to be compared with the 3dB criterion stated above.

63 British Standards Institution. Specification for integrating-averaging sound level meters. BS 6698:1986. London, BSI, 1986.

3.14 NOISE EMISSIONS

Unwanted sound from equipment on office buildings can cause serious noise pollution and consequent problems for surrounding noise sensitive receivers, particularly residential premises, and schools. Minimal noise pollution can be achieved by ensuring that noise from fans and other plant associated with the building does not exceed the limits given in criteria published by the Environmental Protection Department. The purpose of the Noise Control Ordinance is to provide statutory controls to restrict and reduce the nuisance caused by environmental noise. The Ordinance deals also with noise from commercial premises.

Noise emanating from commercial premises is controlled by means of Noise Abatement Notices, which may be served on owners or occupiers of offending premises, if the noise emitted:

- does not comply with the Acceptable Noise Levels as set out in a technical memorandum[64];
- is a source of annoyance to any person other than persons on the premises;
- does not comply with any standard or limit contained in any Regulations which may be made in future.

There is no immediate requirement to achieve the Acceptable Noise Levels. The Authority will in practice respond to complaints and compliance with the Acceptable Noise Levels will be required only after a Noise Abatement Notice has been served. Non-compliance with such a notice will be an offence.

HBEAS seeks to reduce the nuisance caused by noise from building services plant and equipment, disturbing neighbouring householders, particularly at night.

Maximum number of credits attainable: 1

Credit requirement

- ❖ 1 credit for complying with the acceptable noise levels for neighbouring sensitive receivers in accordance with the Technical Memorandum for the Assessment of Noise from places Other Than Domestic Premises, Public Places or Construction Sites.

Method of assessment

The building services shall be so installed that the rating of the noise does not exceed the limits given in the Technical Memorandum. The Owner shall provide evidence that the building complies with the criteria given in the Technical Memorandum through a survey carried out by a Registered Professional Engineer. The general calibration and measurement procedures shall be in accordance with the Annex to the Technical Memorandum for the assessment of noise.

Alternatively, where the General Manager has been issued with a Noise Abatement Notice within the past three years and has taken steps to rectify the situation, the outcome of a satisfactory response to the Authority shall be accepted for compliance for this credit.

64 Environmental Protection Department. What to do when you receive a Noise Abatement Notice. Technical Memorandum for the Assessment of Noise from places Other Than Domestic Premises, Public Places or Construction Sites. May 1989.