Sustainable Hotel
Siting, Design and Construction

Conservation International

International Tourism Partnership

The industry guide to good practice

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ARCHITECTURAL AND PHYSICAL DESIGN

Communicating the overall sustainable vision to members of the planning, design and construction teams will help them to think of the hotel as a complete, interdependent system with specific features and performance requirements and not as a collection of electrical, mechanical and structural engineering disciplines.

The design process requires an interactive approach where everyone involved in the use, operation, construction and design of a hotel interacts closely to understand the issues and concerns of all the other parties, and then makes decisions based on the sustainability principles that have been defined for the project.

A sense of place: The Kasbah de Toubkal in the High Atlas, Morocco, appears to have always been part of the landscape despite the fact that most of it is only ten years old.

See Case Study 6, Appendix 1.

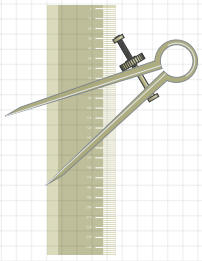
4.1 General considerations

A

The **main factors** which affect the sustainability of a hotel property at the design stage are described in Section 2 and include:

- Whether the **design and scale** of the development are appropriate when assessed using economic, cultural and ecological criteria.
- The **layout** and orientation of the buildings on site and the **aesthetic** sensitivity with which they are designed.
- The priority given to preservation and enhancement of **natural and cultural elements** of the location, including external landscaping.
- The extent to which all **stakeholders** are considered and the quality of the consultation process. This will involve ensuring that the building is **inclusive and welcoming to all visitors and guests** including those with visual, hearing and dexterity impairments and other disabilities,[29] not only through wheelchair accessibility in public areas, but also in the ease of use of room features.

[29] Between 10 and 20% of every country's population are disabled and many more people, including friends and carers, are affected by disability. Source: World Bank, www.worldbank.org/disability. In the USA alone, disabled travellers take 31.7 million trips, spending $13.6 billion annually. Source: Open Doors Organisation, **www.opendoorsnfp.org**



- How the design will affect **water, energy, waste, indoor air quality, chemical and noise** management both during construction and operation.
- The design of **general service requirements**, including HVAC, plumbing, electrical services.
- The selection and use of **materials** including the ability to reuse or **recycle** selected materials and reduction of the total volume of materials required.
- The impact of the design on **construction requirements** including access issues and existing infrastructure.

B The overall design, materials and building systems should be all evaluated for **capital and operational cost, future flexibility, efficiency, environmental** and **societal** impact and **quality of life** for the building's occupants. *See* ***Section 3.1.9.b*** *Whole Life Costing.*

C **Multi-functional use** of parts, features and systems will maximise cost effectiveness, efficiency and building functionality. This ranges from simple multi-use of cables, grouping a building's infrastructure into single trenches and tunnels, to more complex multifunctional use of structural features and technical equipment.

More information

European Institute for Design and Disability
www.design-for-all.org

Business Disability Forum
http://businessdisabilityforum.org.uk

UN Global Programme on Disability
www.un.org/esa/socdev/enable

World Bank
www.worldbank.org/disability

4.2 Promoting a sense of place

The hotel building should be designed to promote a 'sense of place' which sits comfortably with cultural and historical features of the region and local traditions so that the establishment blends into its surroundings and reflects the identity of the local culture and environment.

A Identify **appropriate environmental and social design standards** from the first stages of the design process.

B Where possible use **local cultural motifs** and **traditional styles and materials** both in the construction and for interior design.

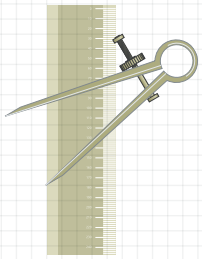
C **Follow the main features** and contours of the surrounding landscape. Limit the height of buildings so they fit within the topography. In coastal developments ensure that developments are set well back from the shoreline.

D Build from the natural features and **ecological services** (fresh water, air quality, etc.) provided by the site.

E Employ **local crafts people** to advise on concepts and make use of **traditional skills** they possess.

F **Honour local traditions** by 'designing-in' areas within the property that can, for example, cater for traditional ceremonies and religious events where appropriate.

G Seek to **reuse and adapt** existing buildings where possible. Consider allowing for façade preservation and the reuse of existing structures during renovation or redevelopment.



4.3 Conserving biodiversity

Insensitive hotel development can destroy vegetation and wildlife and the ecosystems that sustain them. Biodiversity is the term used to describe the variety of all forms of life, from genes and species to ecosystems, and protecting these natural assets is increasingly recognised as an important element of sustainable development.

If the hotel development is in an area of high biodiversity, it is most likely that this is a prime reason why people are visiting. It is therefore in the hotel developers' best interest to protect the biodiversity as a key part of the product.

Biodiversity depends upon the ecological integrity of the entire site and its relationship with the surrounding ecosystems. Ecosystem processes generally operate on a large scale and maintaining their integrity requires linkages between on-site and off-site natural systems. Biodiversity protection therefore requires regional and site-wide analysis.

Many businesses have an impact on biodiversity, either directly or indirectly through their supply chains. The development of more sustainable tourism is recognised as a way of providing significant benefits in biodiversity conservation.[30]

A

Identify **sensitive habitats** and incorporate protection measures such as buffer zones or corridors to maintain linkages of natural systems within and beyond the site and **avoid disturbing** irreplaceable ecological areas at all costs.

B

Design to **avoid unnecessary fragmentation of large habitat blocks** and to maintain natural processes and cycles.

C

Preserve existing species diversity and habitats by retaining and **integrating natural vegetation features**.

D

Buildings should be connected by **elevated walkways** (boardwalks) and, in highly sensitive areas, **electrical wiring and water pipes** should be secured to the underside of the decking to reduce soil disruption.

E

Use vegetated surfaces such as **open-grid paving** instead of hard surfaces for parking lots, pavements and patios in order to lessen the building's footprint, absorb rainwater peaks and help retain groundwater.

F

Consider incorporating a **roof garden** or **green roof** *(see **Section 4.4**)* to create an additional habitat. This technique can be particularly beneficial in urban developments.

G

Minimise the creation of **linear features** such as roads and firebreaks in the natural landscape.

H

Reduce the impact of the hotel development on **nocturnal environments** by avoiding lighting that extends off site or into the night sky.

I

After construction, restore habitats through use of **native plants** in landscaped areas and avoid the introduction of new species.

[30] 'Decision VII/14: Biological Diversity and Tourism', Seventh Meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 7), 2004, **www.cbd.int/decisions/cop/?m=cop-07**

More information

Business & Biodiversity: The Handbook for Corporate Action
Earthwatch Institute (Europe), World Conservation Union, WBCSD, 2002
www.wbcsd.org/pages/edocument/edocumentdetails.aspx?id=26

Guidelines on Biodiversity and Tourism Development: Decision VII/14: Biological Diversity and Tourism
Seventh Meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 7), 2004
www.cbd.int/decisions/cop/?m=cop-07

The Green Host Effect: An Integrated Approach to Sustainable Tourism and Resort Development
Conservation International, 1999
http://nsgl.gso.uri.edu/washu/washuw99003/7-Bruner_et_al.pdf

4.4 Green roofs

The green roof at the Seattle City Hall, Seattle, USA, consists of low-maintenance plants, lightweight soil, storm water collectors, insulation, root barrier, and waterproofing. The City Hall is a LEED registered project and also includes a rainwater harvesting system and an under-floor HVAC system.

Courtesy greenroofs.com

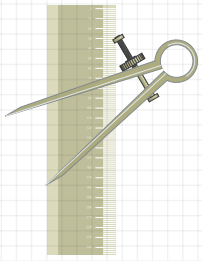
Consideration should be given to the use of a green roof to maintain biodiversity and enhance building performance whilst linking the building visually with surrounding green areas. Green roofs usually take one of the following forms:

- **Intensive**, where the aim is to provide garden space for people. This requires intensive management and usually irrigation of some kind. These are heavy systems and can have major structural implications for the building.
- **Extensive**, where the aim is not usually recreational and the planting style is more naturalistic in order to establish a self-sustaining plant community. Plants (such as sedums) should be chosen that will succeed with only minimal intervention and modification of the normal roof conditions. These systems are based on a much thinner layer of soil or substrate making them comparatively lightweight, with minimal structural implications for the building.

Green roofs offer a number of benefits for use by hotel and resort buildings including:

A **Low maintenance** with little or no artificial irrigation requirement.

B **Improved rain water management** by dramatically reducing the volume and rate of rainwater run-off from the roof.



C Improved **building thermal performance** as the building is insulated from heat loss in the winter and heat gain in the summer.

D **Air quality improvement** through removal of CO_2 and the release of oxygen and water vapour. The plants also provide a greater surface area to contain deposits of particulate pollutants and absorb organic volatiles which makes them particularly suitable for use in cities.

E **Reduction of the 'urban heat island effect'**.

F Provision of a **habitat** for wildlife.

G **Reduction in sound transmission** through the roof.

H **Visually attractive** means of blending the building in with the local environment.

I Provision of a novel '**talking point**' for guests and visitors.

More information

Centre for Green Roof Research, Pennsylvania State University
http://plantscience.psu.edu/research/centers/green-roof

Earth Pledge Green Roofs Initiative
www.greenroofs.com/projects/pview.php?id=17

greenroofs.com
www.greenroofs.com

4.5 Grounds and landscaping

4.5.1 Built areas

a Built surfaces, particularly dark, non-reflective surfaces such as those used in parking lots and walkways, absorb heat from the sun and radiate it back to surrounding areas. This creates '**heat islands**' which can significantly elevate the temperature around built areas. This will increase cooling demands in summer or hot climates, requiring more HVAC equipment and resulting in increased energy use. The effects of heat islands can also be problematic for wildlife and migration corridors. Heat islands can be minimised by the use of reflective materials, light colours and shading and vegetated areas.

b While ensuring safe lighting levels, **minimise the lighting profile** for the exterior of buildings; adjust illumination levels by using spotlights, low-reflective surfaces and shielding. Avoiding unnecessary outdoor lighting and the resulting light pollution will reduce the intrusive effect of a hotel on the surrounding environment and provide energy savings over the lifetime of the building.

c Design to accommodate **sustainable forms of transport**, for example buses and mini-vans that can carry several people at a time. Make provision for transport that uses renewable energy and non-polluting technologies (such facilities to recharge electric vehicles). Provide a covered area with racks for bicycles so that hotel staff can cycle to work and consider creating a facility so that bicycles can be hired out by guests.

Taj Lake Palace, Lake Pichola, Udaipur, India, is one of Taj Hotel's most majestic formal royal residences and has undergone complete and sympathetic restoration based on thorough research into traditional architecture and using local and traditional building skills.

See Case Study 8, Appendix 1.

4.5.2 Plants and irrigation

a Use **existing and new vegetation** to provide shading, a barrier from noise and undesirable views, protection from wind and rain, to minimise erosion, to create privacy barriers between rooms or between guest spaces and work places, and to filter waste water.

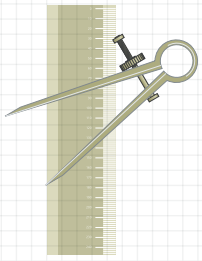
b Always use **indigenous and native plants** and avoid the introduction of alien or intrusive plant species. Native landscapes provide a sense of place and attract animal and bird life, which is not only important for biodiversity but is often attractive for guests. Native plants often require less irrigation, less fertiliser, fewer pesticides and less maintenance. This reduces maintenance costs and any potentially negative impacts on water quality.

c **Select species** that root vertically and deeply rather than species that root horizontally to avoid damage to foundations, walkways and other structures. Note that purchasing mature root-balled trees is not a good alternative to leaving trees in place. They are expensive to transplant, are subject to sudden death and can take many years to establish themselves.

d Integrate **water re-use strategies** into the landscaping design. Recycled grey water or captured rain water and storm water can be used for irrigation. Check that the local legislation permits this and that the system to be used for waste water treatment will provide water of a sufficiently high quality not to pose a danger to health.

e Use **water-efficient technologies** such as moisture sensors, weather database controllers or micro-irrigation systems for watering the grounds. These can be up to 35% more efficient than conventional irrigation systems depending on the climate.

f **Reduce irrigation requirements** through mulching and composting.



4.6 Golf courses

The development of golf courses involves a wide range of environmental issues particularly with regard to their interaction with biodiversity, landscape and cultural heritage. Their management involves the use of water resources, chemicals, machinery and energy and creates waste disposal and noise issues. There are also health and safety, working environment, training and education considerations as well as the relationship with the community to take into account.

4.6.1 Design

a In recent years, **ecology** has become a key consideration in golf course development and management throughout the world. No new golf course development should be carried out without first undertaking an **EIA**.

b The guiding principle should be to **protect and improve** the natural amenity. Properly planned courses can provide valuable habitats for a variety of flora and fauna, especially birds and support and enhance rather than detract from the natural ecosystem.

c Where possible, ensure that the design involves no **net loss of woodland**.

d Seek advice from recognised and **specialist organisations** (see sources of more information listed below) and national golf associations which may be able to suggest proven designers with an established **environmental track record**.

e Design to interconnect areas that will form **natural habitats**. There should be areas of natural vegetation which are 'out-of-play' and extensive deep rough. Keep maintained and 'manicured' areas to a minimum.

f Golf courses generally require large amounts of water for irrigation. Choose varieties of turf grass and other vegetation which require **less water** and are best adapted to the local climate. Limit irrigation to where it is absolutely necessary to maintain the playing turf and avoid using mains water for irrigation wherever possible.

g The design should incorporate various methods of **capturing and retaining water** so that as little needs to be drawn off the grid as possible. Open bodies of water such as reservoirs or lakes are not necessarily the best option for climates with very high rates of evaporation.

h Consider whether **grey water** from the hotel guest bathrooms, laundry or cooling towers can be treated on site and re-used for irrigation. Alternatively, find out if it can be brought onto the site from elsewhere. It is most important to ensure that the grey water has been treated properly and meets internationally recognised standards.

i Ask the course designer to consider **soil improvements** that will reduce water consumption.

j Associated facilities, such as the **club house**, should be sited with care and built **with traditional materials** so that they blend into the landscape. Use timber that has been produced **sustainably** or source **reclaimed** wood.

k Create **walkways for non-players** and provide opportunities to educate them about wildlife protection and nature conservation. The course should be a hotel amenity for all guests, not only golfers.

Over a seven year period the Duke's Course near St Andrews, Scotland has transformed former agricultural land into a variety of natural habitats.

Picture courtesy Scottish Golf Environment Group

See Case Study 9, Appendix 1.

4.6.2 Construction

a Construction is a critical time when damage to existing sensitive habitats can occur and care should be taken to protect them while work is in progress. For example, **avoid felling trees and earth-moving** during the months when birds are nesting and rearing their young.

b **Stop work** when the weather conditions deteriorate to avoid soil damage.

c **Control traffic** to ensure that areas where construction is not taking place are not affected.

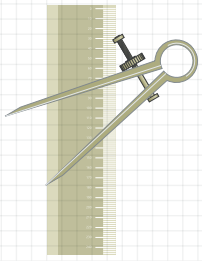
d Plant **indigenous trees** and, for colour and interest, use **wild flowers** instead of bedding plants.

e Areas to be left **undisturbed** should be cordoned-off so that building contractors do not enter them by accident.

4.6.3 Operational management

a The principles of energy and water conservation and waste management are just as important on the course and in the club house as they are in the hotel itself. Establish an **environmental management** programme at the design stage.

b Staff should be trained and guests, golfers and walkers informed about **'no go' areas** so that wildlife can thrive. Make sure they are clearly signed.



c **Chemical and pesticide use** should be kept as low as possible, carefully controlled and confined to greens and tees. Adopt a biological rather than chemical-based approach to keeping down pests. Strive to achieve a year-on-year reduction in the amount of pesticides applied while maintaining or improving the quality of the course.

d **Golf carts** should be solar or battery powered rather than petrol-fuelled.

e Consider using **solar-powered lawn mowers** for the greens.

f **Composted waste** from turf clippings and the hotel's kitchens can be used as a soil enhancer in planted areas.

More information

An Environmental Management Programme for Golf Courses
European Golf Association Ecology Unit, 1996
www.golfecology.co.uk

Audubon International
www.audubonintemational.org

Committed to Green Foundation (incorporates the European Golf Association Ecology Unit)
www.golfecology.co.uk/articles/commit.html

Ecological Approaches Towards Best Management Practice for Golf Courses
European Golf Association Ecology Unit and Audubon International, 1996
www.golfecology.co.uk

Environmental Principles for Golf Courses in the United States
United States Golf Association (USGA), 1996
www.usga.org

Scottish Golf Course Wildlife Initiative
www.scottishgolf.com/environment

Sustainable Golf Courses: A Guide to Environmental Stewardship
Ronald G. Dodson, 2005
www.wiley.com

4.7 Swimming pools

The key environmental issues concerning the operation of swimming pools are water consumption, the energy used to heat the water (and, for indoor facilities, the building itself) and the form of treatment used for sanitising and balancing the water to ensure the health and safety of users.

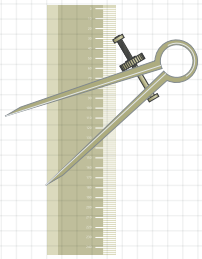
4.7.1 Water use

In a large hotel, a swimming pool can increase freshwater consumption by as much as 10%,[31] so consideration should be given as to whether it is a necessity. This is particularly the case if the hotel establishment is located where water is not readily available, and where there is a risk of causing shortages for others in the community. Even where water is plentiful, there is no excuse for wasting it:

a Install a **water meter** to help monitor leaks and for operational practices such as the frequency of backwash, overflow, cleaning etc.

b Design the system in order to **capture and reuse backwash water** to irrigate the grounds and consider **collecting and storing rain water** for replacing pool water lost through evaporation and backwashing.

[31] Hotel and Catering International Management Association, **www.hcima.org.uk**



c In coastal areas, consider installing a **salt water** pool as an alternative to a **reverse osmosis (RO)** plant for converting sea water for use in pools. Although RO plants help to conserve fresh water, they are very energy intensive and the concentrated brine must be disposed of properly. In addition, the acids and caustic substances required to keep the system clean create a waste stream that must be neutralised before being discharged so care should be taken with siting. Most good RO systems incorporate waste neutralisation, making the process simple and efficient.

d Using RO-produced water as a **top-up** reduces the level of total dissolved solids (TDS) in the water and in turn reduces the amount of water that has to be dumped to drain to maintain water quality. It can also reduce heating costs.

e Fit **water-saving** shower-heads, dual-flush toilet cisterns and push button taps in all changing facilities.

4.7.2 Water treatment

Pool water must be sanitised to prevent the growth of micro-organisms that can cause stomach upsets and infections particularly in the ear, nose and throat. Correctly treated water will provide a healthy and visually appealing environment for users and prolong the life of the pool and equipment.

a The pool should have a **bathing load** appropriate to its size, use and turnover and this should not be exceeded. The **circulation rate** should be variable so that it can match the bathing load.

b Bacterial control is achieved by adding a **sanitiser** (usually chlorine-based), a **flocculant** to help mass together particulates and bacteria in the water, and **filtration** to remove them. The sanitiser must leave a '**residual**' in sufficient concentration to continue to protect against and destroy any bacteria entering the water. It is also important to balance:

- The **pH** or acidity of the water.
- **Total alkalinity (TA)**, which is a measure mainly of bicarbonates and carbonates.
- **Calcium hardness**—i.e. the amount of dissolved calcium in the pool.

c Various forms of pool treatment are available, the most common methods being:

- **Chlorine** (sodium and calcium hypochlorite).
- **Chlorinated isocyanurates**.
- **Salt chlorination** (also known as 'in-situ' chlorine generation or electrochlorination).
- **Ionisation** (enables use of chlorine to be reduced).
- **Ozone generation**.
- **Ultraviolet (UV) disinfection**.

Chlorine is a very effective sanitiser and is the traditional treatment for both pool and spa water. However there are health and safety concerns surrounding its use. It is believed to aggravate asthma, particularly in children who use chlorinated pools frequently. Chlorinated water can also contain trihalomethanes, chemical compounds known to be carcinogenic. For this reason it is worth considering other treatment methods such as ionisation, UV disinfection, salt chlorination and ozone generation. These systems enable chlorine use to be reduced (to varying degrees). Reference is made to the end of this section for sources of more detailed information on the environmental, health and safety issues involved in water treatment.

d Disinfection and dosing are best controlled continuously by **automatic systems**. Strict control of bathing load and monitoring every two hours should ensure that combined chlorine levels (chloramines) are minimised. These levels should be ideally zero, or at least under 1mg/litre and certainly less than half the free chlorine figure.

e To **avoid the use of chemicals** completely, consider installing a **natural swimming pool**. Such pools are designed to look like a natural lake or pond and incorporate a wall below the surface dividing the body of water into two zones—one for swimming and the other for water cleaning. The bottom of the pool is sealed with a heavy-duty rubber liner. The 'regeneration' zone includes marsh plants in a substrate of washed gravel, lime (to maintain pH), loamy sand and nutrient bond. The pool water is pumped through the substrate, which acts as a natural filter for small particles. Most of the water cleaning takes place in the micro-organisms and microbes, which break down pollutants into basic elements. The plants use nutrients from the water as food, which helps to prevent algae. The cost to build is roughly comparable with a conventional pool but they can save on operating costs as no chemicals are involved at all. The proportion of the regeneration zone of the total system alters with the size of the pool, and in percentage terms, smaller pools require larger regeneration areas. Technologically-supported pool facilities are more suitable for coping with short-term peak loads such as in hotels and public facilities.

The natural swimming pool at the Hotel Dietlgut, Hinterstoder, Austria.

See Case Study 10, Appendix 1.

4.7.3 Energy

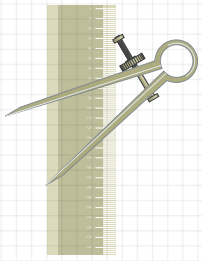
a Whether it is an indoor or an outdoor pool, the choice of **heating system** will have a major effect on both environmental impact and operating cost.

b When designing an **indoor pool**, consider opportunities to save energy such as:

- Using high quality **insulation** and **glazing systems** to minimise heat loss and reduce condensation (this has a direct bearing on the energy required to maintain humidity levels).
- Ensuring that **entrances and ventilation points** are sheltered from prevailing winds.
- The use of **condensing boilers** which are particularly suitable for indoor pools and can provide underfloor heating. For larger pools, a **cogeneration** or CHP plant could be used to supply heat.

c **Solar panels** (in the form of unglazed collectors) are simple and inexpensive and are used extensively for heating outdoor pools. Once the system is installed there is little maintenance and the heating is free. They do however require a large area of panelling to achieve a significant rise in temperature. Typically, this should be equivalent to at least half the area of the pool.

d **Heat pumps** offer water heating and air cooling from one plant. They are mechanical refrigeration devices that upgrade low temperature heat to a useable temperature. For swimming pools, the heat source is usually the ambient air. The smaller the uplift in temperature required, the better the efficiency of the heat pump. Running costs vary according to the pool insulation and weather conditions but heat pumps typically deliver 2–3 kW of heat output for each kW of electricity input. Environmental impacts can be minimised by purchasing **green electricity** generated from renewable sources such as wind power. When purchasing the pump it is important to check that it uses the latest refrigerants, which are less harmful to the ozone layer.



e Recover heat wherever possible. An indoor pool's air-conditioning system should recover latent energy from evaporation for reheating. Careful siting of the plant room will minimise routing and ducting of services and increase heat recovery potential.

f A computer-controlled boiler management system will ensure optimum performance of the boiler, reducing operating costs and CO_2 emissions. This system should be linked to the ventilation system so that it operates automatically and only when required.

g Ensure that indoor pool halls are properly ventilated and that heat is recovered. Generally the space temperature should be between 24–30°C and relative humidity kept to 60% although this will depend on the level of insulation. Ventilation should be variable according to occupancy with a potential for 100% outside fresh air. This can be controlled by a carbon monoxide (CO) detector.

h Equate the running hours of the circulation pump with the use of the pool. This can be done automatically with the use of variable speed pumps in conjunction with automatic water quality testing equipment.

i Use energy-efficient lighting with timer and motion detector devices and label light switches so that only the lights that are required are switched on.

j Most of the heat loss from a pool is from the water's surface through direct conduction and convection to the air and through evaporation. The use of a pool cover when the pool is not in use will help to retain heat and save energy. Even indoors, a cover will help to reduce both the ventilation requirement and condensation damage.

k Automatic door closers and draught excluders will cut heat loss and improve user comfort. They may also help to reduce temperature settings.

l Regular inspection and preventative maintenance will help to keep equipment running efficiently and identify areas where perfomance can be improved.

4.7.4 Health and safety

a The future operational management of the pool with regard to health and safety will be made easier if these issues have been addressed at the design stage. Slippery pool surrounds and sharp tiles and edges can present serious hazards, so care should be taken in the choice of materials.

b An effective ventilation sytem is important to provide good indoor air quality so that bathers do not become drowsy or succumb to asthma attacks where they are susceptible.

More information

Indoor and Outdoor Swimming Pools
Know how number five, greenhotelier issue 31, April 2004
www.greenhotelier.org

Guidelines for Safe Recreational Waters: Volume 2: Swimming pools, spas and similar recreational-water environments
World Health Organisation, 2000
www.who.int/water_sanitation_health/bathing

PAS 39:2003 Management of public swimming pools. Water treatment systems, water treatment plant and heating and ventilation systems.
www.bsigroup.com/en-GB/about-bsi/media-centre/press-releases/2004/1/BSI-makes-a-splash-with-new-code-of-practice/

Pool Water Treatment Advisory Group (PWTAG)
www.pwtag.org

Swimming Pool Water Treatment and Quality Standards: Second Edition
PWTAG, 2004
www.pwtag.org

The Swimming Pool and Spa Association of New South Wales
www.spasa.com.au

The Swimming Pool and Allied Trades Association (SPATA)
www.spata.co.uk

US Environmental Protection Agency
www.epa.gov

World Health Organisation (WHO)
www.who.int