Fördergemeinschaft Gutes Licht

Good lighting for Hotels and Restaurants 11

The travel experience

For work or recreation, business or pleasure – whatever the reason, all sorts of people spend a great deal of time in hotels and guest houses, restaurants and bars.

Whether the experience is a positive one depends on a lot of factors. But visual impact is high on the list.
Outside our normal environment our senses are particularly alert, ready to register and store unfamiliar and positive new impressions.

This is an automatic human response – one that paves the way for an appreciation of surroundings crafted for aesthetic appeal.

- Visual information accounts for 80 percent of all the information a human being receives.
- Light makes the quality of our environment visible and impacts on our emotional and subconscious response.
- The rules of sensitive, practical lighting design are complex.
  Lighting designers offer special expertise and solutions.

For details of illustrations, see acknowledgements for photographs on pages 44ff.

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We respond emotionally to the presence of light and enjoy intuitively the different kinds of atmosphere that daylight or artificial lighting creates.

So, in hotels and restaurants, lighting atmosphere should never be left to chance. Like a stage production, visual ambience and impact of light can be planned down to the very last detail.

A good lighting constellation – whether it is designed to aid orientation, facilitate communication or promote a sense of well-being – plays a key role in shaping the way we assess any experience, even if that assessment is on a subliminal level.

Welcoming and catering for guests day and night

The quality of daylight has had a crucial influence on the development and capacity of the human eye. The environmental requirements of our complex visual organ are high – and so, therefore, are the quality standards that need to be met by artificial lighting.
It would be wrong, however, for the lighting designer to seek to copy the characteristics of daylight.

Modern lighting technology offers a wide range of lighting tools specifically designed to solve different problems. They should be used discriminatingly.

In modern society – with its strong emphasis on information, communication and leisure pursuits – we increasingly spend evenings and hours after dark engaged in a wide range of activities that enrich our lives.
Without artificial lighting and the high technical and visual standards it achieves, this would not be possible.

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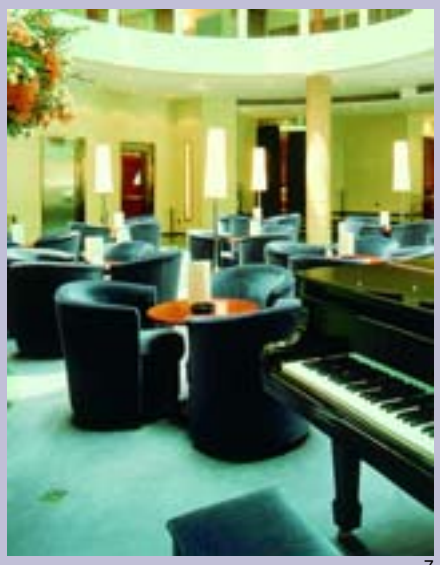
Human perception works on many levels – a fact that particularly needs to be borne in mind when implementing plans for artificial lighting.

Just as a good architect harnesses daylight by incorporating different shapes of window and openings for light into the design of a building, so too should artificial lighting be planned in detail.
While the architect's plans are based on the sun, a punctual light source shining on the outside of the building, the artificial lighting designer needs to take account of a variety of different light sources inside the building.

Daylight planning is complex – due to the constantly changing position of the sun and the quality/quantity of light – but planning artificial lighting involves addressing many factors.
The different physical properties of the light sources, their specific beam characteristics and light colours, even their impact on the interiors and objects illuminated need to be assessed and considered in the lighting design.



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- Artificial lighting plans need to take account of the constant changes in daylight.
- Lighting creates an atmosphere only in interaction with illuminated room surfaces, objects and shapes, structures, textures and colours.
- Under artificial lighting, the appearance of an interior and the objects in it is different from in daylight.

People in hotels and restaurants

Hotels and restaurants are classic service enterprises. As such, they require a lighting atmosphere designed specifically to meet guests' or diners' needs.

The quality of lighting this necessitates does more than just enhance the visual impact of the hotel or restaurant architecture; first and foremost, it sets the stage for the guests themselves.

To attain that goal, close attention needs to be paid to contemporary lighting design criteria and, in particular, to "lighting quality". This is a factor shaped by a whole range of quality features – from illuminance, glare limitation and luminance distribution to light colour, colour rendering, direction of light and modelling.
The basic ingredients of lighting quality are set out in technical standards. But lighting quality also needs to strike the right emotional note for the people, interiors or objects illuminated. This calls for creative use of basic lighting quantities: luminous flux, luminous intensity, luminance and illuminance.
And that needs to be based on analysis of the various zones of the establishment.

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Staff at a reception desk, in a restaurant or bar, or anywhere else where guests seek personal contact need to be clearly visible and easy to identify. Disturbing shadows should be avoided.
Where too much bright lighting is direct and directional, deep shadows are cast on faces.
For face-to-face communication, lighting needs to be planned and crafted so that facial features are bathed in soft, harmonious light.

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- The perfect lighting design accurately reflects the findings of a detailed analysis of the different areas of the establishment.
- The criteria that define the quality of modern lighting planning are:
  lighting quality
  economy
  reliability
  design
- The quality of artificial lighting plays a key role in shaping the image of a hotel or restaurant.
- Briefly, the basic lighting quantities are:
  luminous flux (lumens) – the rate at which light is emitted by a light source;
  luminous intensity (candelas) – the amount of luminous flux radiating in a particular direction;
  luminance (candelas/m^2) – the perceived brightness of a surface;
  illuminance (lux) – the amount of luminous flux falling on a given surface.

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Identifying design trends for hotels and restaurants calls for a capacity for keen and sensitive observation and a great deal of creative imagination.
Jan Wichers, who runs a design studio in Hamburg, possesses both of these qualities.
A host of international contracts and accolades testify to his sense of style and the quality of his work. Here, he muses on the subject of lighting.

Candlelight dinner. The challenge of speaking to the soul.
Let's start with a quote from a lighting designer: "Because luminaire manufacturers increasingly encounter architects with a desire to make a strong design statement, manufacturers' architectural and custom lighting departments are getting better all the time. They also work increasingly with independent lighting designers.
The role that has been adopted by lighting designers is that of interpreter between interior designer and electrical engineer.
But they are also designers in their own right. They are specialists in lighting atmosphere and lighting aesthetics."
The quote says it all. No architect should hesitate to engage specialists to optimise the service he offers.
Lighting designers know about the impact of light. They offer the experience that enables a creative design, a vision to become a reality.
And they do it a great deal better than computers packed with technical data and high-resolution graphics.

Lighting today has become such a technologically complex subject that this kind of cooperation is imperative.

It is more than just a matter of lighting concepts delivering the right quantity and quality of light without undue energy costs. It is more than a matter of intensity distribution curves and illuminance diagrams. It is primarily about developing lighting atmospheres finely tuned to the diverse and changing needs of a particular interior design.
Good interior design speaks to the heart. And that calls for experience in this sensitive area – experience that makes it possible to realise a vision.
Creative, poetic design work is needed. Perception of light and a sense of well-being are key to a positive experience.

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Because wrong use of light can deal a deathblow to the heart and soul. That is what happens when the emotional dimension is ignored.

Making effective use of light means also working with shadow, with darkness.
Acceptance depends on the different levels being right.
What counts is the emotional quality of the lighting; light needs to work magic.
Think of the magic in the phrase "candlelight dinner".
A warm, romantic atmosphere full of promise – created entirely by the light of a single candle. The lighting required is minimal but it needs to be crafted with care and sensitivity. Through the retina to the soul – direct. That is good lighting.

Jan Wichers, Hamburg

- In lighting design, emotional quality comes first.
- Lighting designers are specialists in lighting atmospheres and lighting aesthetics and offer experience which make creative joint design work possible.
- Harnessing light also means working with shadow.

Foyers, halls and lobbies

First impressions are crucial – and artificial lighting plays a key role in determining what those impressions are and where they are made.

If the first positive impression is not made by a helping hand or a successful search for a parking space, it is the foyer, hall or lobby that shapes a guest's first opinion of the hotel.

At dusk, and especially at night, a lighting ambience that emphasizes the lines and contours of the architecture and interior design can be particularly advantageous.

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Foyers and halls are parts of the building where people converge. They form a link between outdoor areas and the inside of the building.

Their main purpose is to act as centres for information and communication.
At the same time, however, lighting support is needed for other, subsidiary functions, e.g. staging presentations and possibly sales operations, helping visitors get their bearings, directing guests to other parts of the building and providing waiting facilities. Functions with a very clear emotional character.

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- Artificial lighting provides guidance for guests and helps them get their bearings.
- The first visual impression a guest gets is shaped crucially by the nature of the artificial lighting and can be very difficult to correct. Good conditions for visual perception help give the guest a greater sense of confidence and wellbeing.
- Artificial lighting should help structure a foyer or entrance hall and distinguish active zones from rest areas.

Receptions

As far as the guest is concerned, the reception is the organisational hub of the hotel and it needs to be perceived as such.

It thus needs architectural emphasis – something achieved by harnessing accentuating light to grab the attention of the guest.

So luminance at the reception – i.e. the perceived brightness of surfaces – should be higher than in the surrounding area.

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But the external design of the reception should direct only the attention of guests. For efficient communication at a reception – which can at times be a very complex task – the quality of the light illuminating those engaged in conversation is a crucially important factor.
The directional downlighting normally installed here needs to be supplemented by horizontal lighting to provide the vertical illuminance needed to lighten the otherwise harsh shadows. This makes for balanced lighting on faces and the reception counter.

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- The reception is the first place a hotel guest makes for, so the lighting should underline its status as the hub of the hall.
- Guests and staff need to be able to see one another clearly. That creates confidence.
- Dazzling reflections on the counter can be prevented by ensuring that lighting is predominantly indirect or that critical angles of light incidence are avoided.

Restaurants

Lighting for areas where people eat is primarily mood lighting. But it also needs to ensure that guests can find their way around and conduct conversations at the table while facing in any direction.

The kind of artificial lighting required for a restaurant depends primarily on the style of the establishment.
The range of conceivable lighting moods is endless – from glaring brightness to intimate candlelight. The important thing is that the atmosphere should suit the architectural surroundings, ensure that food is clearly presented and looks attractive, and that visual conditions at the table are right for conversation.
The level of brightness selected then determines the degree of intimacy for diners. And all these priorities need to be addressed by lighting compatible with the catering concept of the house.

This is a good point to look at light colour. The light colour of a lamp is the colour appearance of its light, expressed as a colour temperature in degrees Kelvin (K). It is one of the crucial factors defining the visual ambience of a room. Light colours are divided into three groups: warm white (below 3300 K), neutral white (3300 K – 5300 K) and daylight white (over 5300 K).
To ensure that the impression a room makes is not impaired, care must be taken – not only on initial installation but also when lamps are replaced – to use the light colour stipulated in the lighting design.

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- Artificial lighting underlines the restaurant concept.
- During the day, brightness and transparency make for a stimulating atmosphere.
- In the evening, gentle lighting and warm light colours provide the calm and relaxing ambience a guest wants.

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Restaurants

Restaurant lighting should be low-key for all service areas except buffets; the emphasis should be on the arrangement of tables.

At the same time, it should be assumed that the "observer principle" applies, i.e. that people prefer all active areas to be cast in a brighter light than themselves.

In a restaurant context, this means the surface of the table should be more brightly lit than the surroundings, though guests should still be able to make one another out clearly.

The lighting designer also needs to pay attention to the colour rendering properties of the lamps used in the luminaires.
This is because good colour rendering is essential for ensuring that the freshness and delicacy of food is immediately apparent.

Like light colour, colour rendering is standardised. It is expressed as a colour rendering index R_a, based on the rendering of test colours commonly found in the environment. $R_a = 100$ is the best possible value; the lower the index, the poorer the colour rendering properties.
In restaurants and kitchens, a minimum of $R_a \geq 80$ is required; $R_a \geq 90$ is better.

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- The level of brightness on the table needs to permit visual appraisal of the quality of the food.
- Guests need to be able to make out physical gestures and facial expressions with ease.
- The colour rendering properties of the artificial lighting (Index $R_a \geq 80$ or $R_a \geq 90$) has to meet the high standards needed for realistic rendering of food colours.

Bistros and bars

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The design of bistro and bar lighting should be based on precise analysis of the groups the establishment wishes to attract. Depending on the intended design statement, any of the whole range of lamps and luminaire types available could be an option.
Where the intention is to appeal mainly to a younger market, a wide variety of visual effects will be needed to attract large numbers of customers.

For the more conservative guest, the traditional hotel bar dispenses with special effects and offers a relaxing atmosphere. The guests themselves, whether seated or standing, are bathed in only minimal light and great care is taken to avoid glare. Behind the bar, lighting needs to permit visual appraisal of drinks and food by staff.
Punctual light sources lend a dramatic sparkle to gleaming objects.

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- While guests enjoy the emotional elements of the lighting concept, staff need to be able to perform specific visual tasks. Illuminance level, glare limitation and colour rendering are important factors here.
- Light shining through matt glass surfaces behind shelves and display cabinets shows cleanliness.
- Punctual light sources reinforce the impression of gleaming surfaces.
- Coloured light and programmed colour changes create atmosphere. The lamps used are coloured fluorescent lamps and LEDs.
- Escape route signs and escape route lighting need to be installed and maintained as stipulated in standards (see also FGL booklet 10).

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Conferences and seminars

As the need for information grows and mobility increases in modern society, hotels face a rising tide of demand for rooms specifically designed for effective, professional communication.

The lighting required for a meeting, lecture or seminar room designed solely for the purpose of communication needs to be specially planned.

The first requirement is to meet the human need for visual contact with the outside world – a need we feel even when we are performing concentrated work.
Interior room zones with no windows or other links with outdoors are not very suitable for this purpose.
At the same time, it needs to be ensured that systems are in place to exclude all daylight and provide the darkened conditions needed for projector-based presentations.
Even in seminar and conference rooms which are used normally, however, the extremely high luminance produced near windows by direct incident sunlight can result in a level of glare with the potential to seriously disrupt communication.

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Communication is a process that involves all our senses and can be effective only where visual interference is ruled out.
So artificial lighting needs to be variable, catering to needs ranging from group work at desks to note-taking during slide presentations.
At the same time, to avoid too much light falling in one plane – which can happen where narrow-angle ceiling luminaires provide an excessive lighting component – care needs to be taken to ensure that the entire room is illuminated, including the walls and the ceiling.
Electronic lighting management systems are recommended here.

- Room-darkening facilities need to be designed to permit total exclusion of daylight.
- A combination of different lighting systems and light colours enables lighting to be tailored for various forms of room use.
- Air-handling luminaires offer a perfect solution for combining artificial lighting with ventilation or air-conditioning.
- Groups using the room need to be able to regulate lighting and air-conditioning themselves, so lighting management systems should be local and preferably designed for manual operation.

Corridors

Corridors need to be regarded primarily as circulating areas, where the need for guidance and security comes first. From a psychological viewpoint, the impression of depth due to the shape of the interior is not highly conducive to a sense of wellbeing.

However, with artificial lighting, corridors can be transformed into communication-friendly, spacious areas with a distinct ambience.

Crucially important is the need to avoid uniform, homogeneous lighting systems; instead, the human eye should be offered variety with an interesting landscape of differing luminance levels.
Walls – and especially ceilings – should be bright and cheerful to avoid the depressing "cave effect" that can readily occur where ceilings are too dark.

Illuminated room numbers also help guests get their bearings. Luminaire manufacturers offer two different solutions here: backlit numbers and special ceiling spots which make room numbers on walls or doors stand out clearly against the surroundings.
Installing such systems requires appropriate wiring, which needs to planned at an early stage of any construction or refurbishment project.

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- Corridors are also escape routes. Escape route signs and escape route lighting need to be installed and maintained in accordance with standards (see also FGL booklet 10).
- Room numbers should be backlit or illuminated.
- Long corridors can be structured and optically shortened by pools of intense light.
- Bright ceilings make a corridor look higher, bigger and more agreeable.
- Illuminated, light-coloured walls reflect light and raise the level of vertical illuminance.

Staircases and elevators

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Staircases are often designed for prestige but their basic function still needs to be a primary consideration: first and foremost, stairs have to be safe for those who use them.
To make for safe visual conditions on a staircase, artificial lighting needs to be designed so that no treads are obscured by shadows.
For a user looking down or up the stairs, there must be no risk of luminaires causing glare or distracting attention.
One principle that applies to all lighting designs is particularly important for staircases. Low-reflectance surfaces, such as dark carpets or stone steps, call for higher design illuminances to be clearly made out.

The important thing is to ensure that the illuminance provided is right for the reflectance of the materials used. While highly reflective surfaces require only a low level of illuminance to make them appear bright, low-reflectance materials need a much greater intensity of light to achieve a similar impression of brightness. Highly reflective surfaces thus have a significant bearing on the economics of lighting design.

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Travelling in an elevator is often an uncomfortable experience because if it is enclosed, it can be claustrophobic and if its walls are transparent, like the glass elevators integrated into halls, it can easily trigger fear of heights.
Such phenomena occur partly as a result of visual confusion – confusion which can be reduced by the colour scheme and brightness of the elevator entrance and interior.
Even outside the elevator doors, a greater sense of security can be promoted by a significantly higher level of brightness.
Inside the elevator, the colour scheme should be bright and walls and ceiling should be lined with mirrors or shiny panels to suggest more space.
The lighting should be largely diffuse to avoid hard-edged distorting shadows on the faces of elevator users.

- Staircases are also escape routes. Escape route signs and escape route lighting need to be installed and maintained in line with standards (see also FGL booklet 10).
- Staircase treads should not cast shadows over the next tread down. Before a lighting design is prepared, the brightness and colour of the floor covering needs to be defined.
- LED luminaires are an option for illuminating staircase treads and are especially suitable for escalators. High maintenance costs here are substantially reduced as a result of the shock resistance and long service life (approx. 50,000 hrs) of LEDs.
- Elevator entrances should be designed to be inviting by raising the level of brightness above that of the surroundings. Inside elevators, lighting should be largely diffuse to avoid harsh, distorting shadows.

Rooms and suites

The majority of hotel guests use their rooms mainly in the evening and at night, so lighting plays a particularly important role here.
Lighting design for hotel rooms and suites should be geared primarily to the need for ambience and comfort, which in lighting terms means luminaires which are individually switched and regulated to cater for different room uses.
The various zones of the room are defined and signalled to the guest primarily by the room furnishings. That structuring can be further emphasized by lighting scenes programmed to produce various arrangements of accentuating light.
To enhance the overall impression made by the room, quality of design should be a priority when selecting luminaires.

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Guests should be able to select and regulate the level and distribution of brightness in the room to suit their mood.
Convenience is significantly heightened by central light switches at the entrance to the room and also at the bed.
It must also be remembered that older people need considerably more light than young ones, so the psychological impression of brightness a hotel room makes differs significantly according to the guest's age.
For this reason alone, individual dimmer control is recommended for regulating lighting levels.

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- Hotel rooms and suites have a wide variety of function zones (for working, reading, watching TV, resting, sleeping, etc.). The lighting thus also needs to be multifunctional.

- Guests need to be able to identify swiftly the various ways in which they can switch and regulate the lighting in the room. Guests have different perceptions of brightness, so luminaires should be dimmer-controlled.

- Warm light colours make for a homely atmosphere.

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Rooms and suites

It is particularly important in a hotel room or suite to ensure that the lighting is planned with the interior design and the furnishings of the room in mind.
This is because the illuminance required depends on the reflectance of the surfaces of walls, ceiling, floor and furniture.

One factor defining the impression a room makes is the distribution of luminance, i.e. the perceived brightness of surfaces in the room.
Dark woods, carpets and fabrics require a higher level of illuminance for good visual conditions.
The human eye adjusts automatically to different luminance levels (adaptation). Where levels differ too much, however, the constant need to adapt and re-adapt gives rise to visual fatigue.

Direction of light and modelling impact on the visual information we receive about the details of furnishings in a room. The design target here is balanced modelling with soft brightness contrasts.
Harsh deep shadows create an impression of dynamism, which should be avoided in a hotel room or suite.
Too little modelling, however, impairs 3D vision and makes for visual monotony.
Light directed onto walls and ceilings makes rooms seem larger.

Any form of glare interferes with our sense of wellbeing. So, direct glare due to excessively bright lamps or luminaires and indirect glare caused by reflections should at least be avoided along principal lines of vision.

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- The illuminance required in a room depends on the reflectance of the materials and finishes present.
- The way luminaires are arranged and distribute their light determines the direction of light and modelling in the room.
- The design target is balanced modelling with soft-edged shadows.
- Direct and reflected glare should be avoided.

Bathrooms

Bathrooms are required to serve different purposes at different times of the day. In the morning, guests want a bright, invigorating atmosphere to start the day; in the evening, they prefer a warmer ambience.
With different luminaire systems of different light colours, bathroom lighting can easily be adapted to meet these requirements. Lighting control, however, should go beyond mere on/off switching; it should offer the possibility of activating and individually dimming programmed lighting scenes.

In bathrooms, as in any other part of the building, installation regulations and standards must always be observed. But the need to meet standards is particularly acute here because of the presence of wet zones. The rules governing bathrooms are set out in DIN VDE 0100 Part 701, which defines four room zones with different safety requirements. Electrical appliances, including luminaires, need to be adequately protected (IP rating).

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Mirror lighting should be provided by glare-free luminaires for both vertical and horizontal lighting in a mix designed to prevent harsh shadowing on the face and body of the guest.
The use of just two narrow-beam downlights set in the ceiling over the guest's head produces precisely the lighting situation which should be avoided. If that base lighting is supplemented by diffuse luminaires (e.g. with white opal enclosures) mounted on the wall, however, a harmonious distribution of light is achieved.
Beauty care at a mirror calls for lamps with good colour rendering properties (Index $R_a \geq 80$ or $R_a \geq 90$).

- Mirror lighting should be realised with diffuse light and a direct lighting component of max. 20% (Index $R_a \geq 80$ or $R_a \geq 90$).
- Bathroom lighting can be bright and fresh in the morning (light colour > 3300 K), and warmer in the evening (light colour < 3300 K).
- Different function zones, such as mirror, shower, WC, etc., should be served by tailored lighting systems. For damp and wet zones, higher degrees of protection are required (DIN VDE 0100 Part 701).

Fitness and wellness

In today's health- and leisure-oriented society, pools and saunas, activity zones and rest areas are considered an intrinsic part of the modern hotel service package.
Here, the special challenge for the lighting designer lies in enhancing the experience provided by these facilities.
Punctual light sources lend brilliance to gleaming, tiled surfaces.
The visual impact of cleanliness and hygiene is heightened by raising the brightness level and using lamps of cooler light colour (> 4000 K).
Harnessing the capacity of water to produce interesting lighting effects calls for the services of a specialised lighting consultant.

Planning underwater lighting to enhance the visual impact of a pool, intensifying the effect by lowering the brightness of the surroundings and using the surface of the water to produce decorative reflections calls for a great deal of experience with light and a detailed knowledge of the specific room situation.

Pillar lighting is used to grab attention.
The aim here is to emphasize the weight of the pillars by modelling – not to create a two-dimensional scene with diffuse light.
Pool facilities with glass walls appear more spacious at night if the garden areas outdoors are illuminated.

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- Depending on the lighting, water can have a dramatic impact or look like a gently flowing stream.
- Brighter lighting and neutral light colours reinforce the impression of a high standard of hygiene and cleanliness.
- Special regulations need to be observed for the installation and operation of electrical systems in pool and sauna facilities (DIN VDE 0100 Part 702 for swimming pools, DIN VDE 0100 Part 703 for saunas).
- Coloured light and programmed colour changes create atmosphere. The lamps used are coloured fluorescent lamps or LEDs.

There are basically three forms of lighting for offices in administrative areas.
Room-related lighting: ceiling luminaires make for uniform brightness throughout the room.
Task area lighting: where different visual tasks are performed in different parts of a room, their different lighting requirements can be met.
Task zone lighting: supplementary lighting is used to raise the level of lighting to meet the requirements of a specific visual task performed in a particular part of the task area.

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For office work, a minimum of 500 lx illuminance is required. This level of brightness can be achieved using a combination of direct and indirect lighting or with direct lighting alone.
Most people find the light of pendant luminaires or standard luminaires for direct/indirect lighting particularly agreeable. Good uniformity is more easily achieved with a direct general lighting system comprised of recessed ceiling, surface-mounted ceiling or pendant luminaires. The highly directional light emitted by these luminaires is distributed by specular louvers, thus ensuring the necessary glare limitation.

Good glare limitation is a must in any room where work is performed – but especially at VDU workplaces. Direct glare, e.g. from an unshielded ceiling luminaire or other highly luminant surfaces such as windows, is avoided by using suitably designed luminaires and positioning luminaires and workplaces correctly.
Reflected glare occurs where light is reflected into the eye by shiny surfaces, e.g. screen reflections. To avoid reflected glare, monitors should be set at an angle to luminant surfaces such as windows, luminaires or bright walls – where they exceed a luminance of 1000 candelas/m^2 – so that disturbing reflections cannot appear on the screen.

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- The lighting design requirements for offices are set out in DIN EN 12464-1, DIN 5035 Parts 7 and 8 as well as the national ordinance protecting employees working at VDUs (Bildschirmarbeitsverordnung). Mean illuminance needs to be at least 500 lx. Detailed information can be found in FGL booklet 4 “Good Lighting for Offices and Office Buildings”.

- Lighting management makes for enhanced lighting comfort and facilitates task area and task zone lighting. It also enables daylight to be included in the lighting calculation; energy can thus be saved by constant light regulation. More information can be found in FGL booklet 12 “Lighting Quality with Electronics”.

Kitchens and utility rooms

Kitchens and utility rooms are used for preparing and cooking, cleaning and restoring what will later be presented to guests for appraisal.
Whether this is a culinary delicacy or an item of clothing, kitchen and utility room lighting needs to ensure the visual conditions required for safe and reliable handling by staff.

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As well as having to conform to the relevant standards (e.g. DIN EN 12464-1), lighting here needs to comply with the stipulations of ASR workplace regulations.
To do so, these rooms require a glare-free lighting system delivering 500 lx mean illuminance.

Because of the steamy atmospheres found in kitchens and laundries, luminaires here should be designed for use in damp interiors (degree of protection IP 54). Near cooking ranges, luminaires also need to be resistant to chemical attack.

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Where the act of cooking is a signal event, the lighting design parameters are different. In this situation, the guest is again the prime consideration. A culinary performance is like a stage production: it needs to be enjoyed without distraction or glare.
For participants too, the level of brightness needs to be high enough to ensure that the task can be performed safely and surely.

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- Kitchens and utility rooms are governed by ASR workplace regulations and DIN EN 12464-1. They require bright, uniform lighting (mean illuminance 500 lx).
- At serving counters, a light colour similar to the one at guests' tables is recommended for the inspection of food.
- Kitchens require luminaires specifically designed for use in damp interiors (degree of protection IP 54 recommended). Near cooking ranges, resistance to chemical attack is also required.

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The illuminated exterior of a building at night does more than boost prestige; it also helps guests get their bearings. A building identified from afar as a place for hospitality guides guests swiftly and easily to the door, makes an agreeable impression and leaves behind a pleasant memory.

However, night lighting finely tuned to the architecture also has an enduring positive impact on the image of the establishment.

Floodlighting a building from outside and below can make it look very solid; illumination from inside can lend it an open, filigree appearance.
Façade illumination does not necessarily have to follow the lines and contours of the architecture.
Artistic night lighting can ignore architectural and constructive details and craft a totally new image for the observer.
A particularly interesting effect here is achieved where lighting is activated before daylight fades. The observer thus witnesses an architectural transformation as darkness descends.

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During the warmer months of the year especially, the outdoor areas of hotels and restaurants possess considerable allure.
In the dark, the human eye is particularly susceptible to glare; subliminal discomfort results.
So lighting for outdoor facilities needs to be planned with particular care.
Even very low illuminances are found bright enough when our eyes have adapted to the dark.
Direct eye contact with lamps needs to be avoided at all times in the main viewing directions. In restaurants with seating outdoors, glare is a particularly important aspect.

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- Punctual light sources in a linear arrangement guide guests through the prevailing darkness. Path lighting in parks and gardens where steps or other potential hazards are present needs to provide a minimum of 5 lx illuminance.
- Glare caused by luminaires makes it hard for us to get our bearings. Orientation is facilitated by illuminated or luminescent signs.
- With a service life of around 50,000 hours, LED (Light Emitting Diode) technology is particularly suitable for accentuating night lighting outdoors.
- LEDs are also used for dynamic coloured lighting. Colour changes can be programmed in any sequence and at any speed. Where RGB colours (red, green, blue) are used, they can be combined to produce any colour at all (including white). RGB fluorescent lamps are an alternative light source.

Lamps

These two pages show a selection of the most important types of lamps for hotels and restaurants.

1, 2 Incandescent lamps
The traditional incandescent lamp is still the most widely used light source of all. This is due in part to the wide range of different units available. Reflector and bowl reflector lamps provide decorative directional lighting. Incandescent lamps emit an agreeable warm-white light with good colour rendering properties and can be dimmer-controlled. Their luminous efficacy, however, is relatively low and their service life short.

3, 4, 5, 6 Tungsten halogen lamps (230 Volt)
Tungsten halogen lamps for 230 V line voltage produce an agreeable white light with very good colour rendering properties. Their service life is longer than that of incandescent lamps and their luminous efficacy higher. Dimming control presents no problems. They are also available as reflector lamps.

7, 8 Low-voltage tungsten halogen lamps (12 Volt)
Low-voltage tungsten halogen lamps have the same characteristics as lamps for line voltage. To operate them, however, a transformer is needed to reduce the line voltage to 12 Volts. IRC (Infra Red Coating) lamps consume 30 percent less power for the same luminous flux. With appropriate transformers and dimmers, they can be dimmer-controlled.

9, 10 Energy-saving lamps
Energy-saving lamps are compact fluorescent lamps. They are nearly the same size as incandescent lamps and have the same screw base (E14/E27). The electronic ballast (EB) required is integrated in the lamps. Energy-saving lamps consume 80% less power and have a considerably longer life than incandescent lamps.

11, 12, 13, 14 Compact fluorescent lamps
Unlike energy-saving lamps, compact fluorescent lamps have a plug-in base; the ballast needs to be integrated in the lamp. Compact fluorescent lamps have the same characteristics as three-band fluorescent lamps. Here, too, luminous efficacy is improved, service life lengthened and visual comfort heightened by EB operation. Lamps can be dimmed by dimmable EBs.

15, 16 Metal halide lamps
These high-pressure discharge lamps are noted for their high luminous efficacy and excellent colour rendering properties. With modern metal halide lamps with a ceramic burner, light colour remains constant throughout the life of the lamp. Inductive ballasts and starters or EBs are needed to operate metal halide lamps.

17, 18, 19 Linear three-band fluorescent lamps
Three-band fluorescent lamps are noted for their high luminous efficacy, good colour rendering properties and long service life. Operated by electronic ballasts (EBs), they achieve even higher luminous efficacy, a longer service life and greater visual comfort. 16 mm diameter lamps are designed for EB operation only. Dimming control of three-band fluorescent luminaires is possible with appropriate EBs.

20 Light-emitting diodes (LEDs)
LEDs are available in numerous shapes and colours. They are extremely small, have a high resistance to impact and emit neither IR nor UV radiation. They have a very long service life. LEDs with a special fluorescent coating produce white light. The most important lighting applications at present are in orientation and decorative lighting. LEDs are designed for d.c. operation.

Illustration No.	Lamp type	Power rating (Watts)
	Incandescent lamps	
1	Reflector lamps	30 – 100
2	Bowl reflector lamps	40 – 100
	Tungsten halogen lamps (230 V)	
3	With jacket	25 – 250
4	Mini-format	25 – 75
5	With base at both ends	60 – 2.000
6	With reflector	40 – 100
	Low-voltage tungsten halogen lamps (12 V)	
7	With reflector	20 – 100
8	Pin-based	5 – 100
	Energy-saving lamps	
9	Candle-shape	5 – 12
10	Incandescent-shape	5 – 23
	Compact fluorescent lamps	
11	2-, 4- and 6-tube lamp	5 – 120
12	2-tube lamp	18 – 80
13	4-tube lamp	18 – 36
14	2D-lamp	10 – 55
	Metal halide lamps	
15	With base at one end	35 – 150
16	With base at both ends	70 – 400
	Linear three-band fluorescent lamps	
17	16 mm diameter with high luminous efficacy[1)]	14 – 35
18	16 mm diameter with high luminous flux[1)]	24 – 80
19	26 mm diameter	18 – 58
	Light-emitting diodes (LEDs)	
20	Individual LEDs[4)]	0,7 – 5

Light colour:
ww = warm white, nw = neutral white, dw = daylight white

Luminous flux (Lumens)	Luminous efficacy (Lumens/Watts)	Light colour	Colour rendering index R_a	Base
–	–	ww	≥ 90	E14; E27
–	–	ww	≥ 90	E14; E27
260 – 4,350	10 – 17	ww	≥ 90	E14; E27
260 – 1,100	10 – 15	ww	≥ 90	G9
840 – 44,400	14 – 22	ww	≥ 90	R7s
–	–	ww	≥ 90	E14; E27; GZ10; GU10
–	–	ww	≥ 90	GU5,3
60 – 2,200	12 – 22	ww	≥ 90	G4; GY6,35
150 – 600	30 – 50	ww	80 < 90	E14
150 – 1,350	30 – 59	ww	80 < 90	E27
250 – 9,000	50 – 75	ww, nw	80 < 90	G23; G24; GX24; 2G7/8
1.200 – 6,000	67 – 75	ww, nw, dw	80 < 90	2G11
1.100 – 2,800	61 – 78	ww, nw	80 < 90	2G10
650 – 3,900	65 – 71	ww, nw, dw	80 < 90	GR8; GR10; GRY10
3.300 – 14,000	85 – 95	ww, nw	≥ 90; 80 < 90,	G8,5; G12;
6.500 – 36,000	90	ww, nw	≥ 90; 80 < 90,	RX7s; Fc2
1.250 – 3,650[2)]	89 – 104	ww, nw, dw	80 < 90	G5
1.850 – 7,000[2)]	77 – 88	ww, nw, dw	80 < 90	G5
1.350 – 5,200	75 – 90[3)]	ww, nw, dw	80 < 90	G13
18 – 120	13 – 24	–	–	–

1) For EB operation only
2) Luminous flux at 35°C
3) Luminous efficacy increases to 81 – 100 lm/W with EB operation.
4) The illustration shows individual LEDs on a flexible printed-circuit board.

Lighting management

Lighting management offers huge scope for creating optimal lighting constellations for different times of the day and year – especially in hotels and restaurants.
The planning for any lighting management system should focus on human needs and expectations.
Lighting management systems enable us to tailor the lighting climate in a room to our current requirements – much in the same way as we mix hot and cold tap water to get the cold, lukewarm or hot water we want.

- Catering to personal preferences – because all guests have their own idea of what makes an agreeable ambience.
- Boosting motivation and dynamism – because customised lighting makes for an enhanced sense of wellbeing.
- Providing the extra light needed in the winter months.
- A free choice of functions instead of a one-size-fits-all lighting solution.

In addition to these aspects, attention should also be paid to the economic advantages of a lighting management system.
Considerable energy savings can be made, for example, by the integration of presence or light sensors.
In hotels, in particular, communication routes to rooms are rarely used during the day. With presence sensors, lighting can be switched on when it is required; there is no need for maintained lighting. For initial orientation, however, a basic level of illuminance is required, which can be provided by residual brightness from main corridor lighting or the emergency lighting in the corridor itself.

Light sensors measure the illuminance of daylight or artificial lighting. When pre-defined threshold values are reached, a light sensor signals the need for luminaires to be switched on or off or for dimming levels to be raised or lowered. Known as constant light regulation, this offers high energy-saving potential for foyers, receptions, conference and seminar rooms, daylit communication routes and all administrative and utility areas.

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Lighting management permits fast, variable and dependable lighting scene adjustment to suit different forms of room use – something which is particularly useful in the seminar and conference rooms and multi-purpose rooms found in hotels and catering establishments.
From family parties to receptions and assemblies, from seminars and meetings to lectures and slide, video or beamer presentations – different events and activities call for different visual conditions. Depending on the multifunctional lighting components installed, lighting management offers the possibility of switch or handset control to vary illuminance, luminance distribution, direction of light, modelling and light colour. Every anticipated lighting situation can be planned, tested and stored in advance and then activated at any time.
In addition, all the lighting scenes defined in this way can be manually modified and adjusted to meet the specific lighting requirements of guests.

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The internationally standardized digital interface DALI (Digital Addressable Lighting Interface) is designed to facilitate flexible lighting management in individual rooms or small building units. As an independent system or integrated into a building management system, DALI controls switching and dimming functions and verifies the availability of connected components.

The working group AG DALI (www.dali-ag.org), which operates under the wing of the German electrical and electronics association Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (ZVEI), Frankfurt/Main, numbers among its members leading European and US manufacturers of electronic lighting components.

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- Presence and light sensors switch and regulate lighting systems automatically, making for greater lighting comfort and economy.

- Because of the lower energy costs, higher luminous efficacy (electronic operating gear) and longer service intervals compared to old or standard lighting systems, the time taken to recoup the initial outlay on new lighting and a lighting management system is generally no longer than five years.

Emergency lighting and regulations

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Lighting is governed by a host of regulations and standards which can seem like an impenetrable jungle to the layman. So owners, planners, installers and operators of lighting systems in hotels and restaurants should always seek expert advice and demand appropriate guarantees from the specialists they engage.
The safety of guests and prevention of industrial accidents need to be assigned top priority. This obligation can be seen from the examples on the right showing the regulations that apply to certain lighting applications.

Emergency lighting is essential for bridging power cuts that affect the general lighting. Emergency lighting is a standardised term covering both standby lighting and safety lighting.
Standby lighting ensures that important operations are maintained and provides the minimum general lighting required until the fault is cleared.

Safety lighting is a blanket term covering safety lighting for escape routes and particularly hazardous workplaces as well as anti-panic lighting. At particularly hazardous workplaces, for example, detail identification (safe termination of operations, recognition of safety colours) still needs to be assured even after normal power supply fails.

General interior lighting
Luminaires generate heat.
Luminaires mounted e.g. in furniture need to bear either the M or the MM symbol, depending on the material on which they are mounted.
In the case of spots, a minimum distance needs to be observed from the surface they illuminate.
Recessed luminaires bearing the F-fire safety symbol need to be mounted directly on normally flammable or flame retardant materials.
In corridors or along escape routes with F30/F90 fire ceilings, luminaires are required to be encased in a material certified by the Materials Testing Agency.

Exterior lighting
Outdoor lighting systems need to be protected from water, summer temperatures and winter frosts. Where humidity is high, adequate corrosion resistance is also required.
The relevant degree of protection against the ingress of water needs to be observed (DIN VDE 0100-737, DIN VDE 0100-559).

Kitchens and utility rooms
Lighting systems for kitchens and utility rooms primarily need to be protected against the ingress of water. Where a steamy atmosphere may be present, the 2nd numeral of the degree of protection should be at least 1. Where hosepipes or high-pressure equipment are used for cleaning, the 2nd numeral of the degree of protection should be at least 4. (DIN VDE 0100-559).

Bathrooms
In bathrooms, as in facilities such as swimming pools or saunas, the operation of electrical appliances is governed by special regulations. These are set out for bathrooms in DIN VDE 0100-701, for pools in DIN VDE 0100-702 and for saunas in DIN VDE 0100-703.
DIN VDE 0100-559 must also be observed.

Decorative lighting
Recessed ground or floor luminaires need to withstand the weight of pedestrians and require a non-slip surface; where wheeled vehicles are present, they need to be appropriately reinforced.
The degree of protection needs to suit the room situation and permit problem-free cleaning. In most cases, the degree of protection required is IP 65.

Safety lighting
In establishments seating more than 400 guests or with over 60 beds, safety lighting is required by law. This means that guests and staff need to be able to find their way along escape routes as well as in corridors, stairwells and exits even if the general lighting should fail completely.
The same requirement can also apply to smaller establishments where orientation is difficult or where there is no natural lighting.

Temperature symbols

Symbol	Meaning
	Luminaires for mounting on building parts non-flammable up to 180°C.
	As F symbol, but suitable for use with thermal insulation backing.
	Luminaires for mounting in/on furniture where the mounting surface is non-flammable up to 180°C. Important note: mounting instructions must be observed
	Luminaires for mounting in/on furniture where the mounting surface is non-flammable up to 95°C in normal operation. Important note: mounting instructions must be observed
	Luminaires for locations exposed to fire hazards. Temperature of horizontal luminaire surfaces max. 90°C in normal operation. Glass surfaces of fluorescent lamps max. 150°C.

Classes of protection
Luminaires need to offer protection against electric shock. There are three admissible classes of protection for this: Class I , Class II and Class III. Luminaires can be assigned to only one class.

Symbol	Meaning
	Class I unit with protective conductor terminal
	Class II unit with protective insulation
	Class III unit for operation on protective extra-low voltage

Degrees of protection
Degrees of protection indicate the extent to which a product is protected against the ingress of foreign bodies and moisture. They consist of the code letters IP (Ingress Protection) and two numerals. The first numeral indicates the degree of protection against foreign bodies and contact, the second numeral defines protection against water.

Laws and ordinances
- Workplace Ordinance (Arbeitsstättenverordnung)
  The law concerning the design of work premises is based on the Workplace Ordinance (Arbeitsstättenverordnung) of 12 August 2004, issued pursuant to Article 18 of the Occupational Health and Safety Act (Arbeitsschutzgesetz). Among other things, the Workplace Ordinance transposes the European Directive 89/654/EEC on "minimum safety and health requirements for the workplace" into national law. Its purpose is to ensure that work premises are equipped and maintained to avoid exposing employees to health and safety hazards.
  Technical rules set out in Workplace Regulations (Arbeitsstättenrichtlinien) help define in more concrete terms how the requirements of the Workplace Ordinance can be fulfilled.
  The Workplace Regulations developed for the present Workplace Ordinance, which include
  – ASR 7/3 "Artificial lighting"
  – ASR 7/4 "Safety lighting"
  will remain valid until revised and until new technical rules are published, but only for a maximum of six years after the Workplace Ordinance came into force.

For the trade and industrial sector, trade employers' liability insurance associations have issued the following regulations to define the requirements of the Workplace Ordinance in more concrete terms (in line with Article 15 of the Social Security Code, Book VII):
– BGV A1 "Principles of prevention" for the prevention of accidents in the industrial sector
– BGV A8 "Health and safety markings at workplaces" in trade and industry
– BGR 216 "Optical emergency guidance systems", which includes safety lighting, for trade and industry

- Industrial Health and Safety Ordinance (Betriebssicherheitsverordnung)
  "Ordinance governing the health and safety aspects of the provision and use of materials at work, the operation of equipment requiring supervision and the organisation of occupational health and safety precautions" of 27 September 2002 (effective as of 3 October 2002). The ordinance was issued on the basis of Art. 18 of the Occupational Health and Safety Act (Arbeitsschutzgesetz). Among other things, it transposes the European Directive 89/655/EEC on "minimum safety and health requirements for the use of work equipment by workers at work" into national law.
- Electromagnetic Compatibility Act (EMV)
  This act applies to appliances which can cause electromagnetic interference or whose operation can be impaired by such interference. It transposes the European Directive 89/336/EEC on the "approximation of the laws of the EU Member States relating to electromagnetic compatibility" into national law.

Standards and other technical regulations
- DIN EN 12464-1 "Light and lighting – Lighting of work places, Part 1: Indoor work places"
- DIN EN 60598 series "Luminaires"
- DIN VDE 0100 "Regulations governing electrical installations with a rated voltage up to 1000V"
- DIN VDE 0108 "Power installations and safety power supply in communal facilities"
- DIN 4844 series "Safety marking"
- DIN 67528 "Lighting of parking areas and indoor car-parks"
- Technical requirements for low-voltage mains connection (TAB)
  TAB regulations govern all systems connected to and operating on power utility low-voltage mains. Among other things, they contain stipulations for the electrical connection of luminaires, e.g. requirements to prevent interference with AF remote control systems.
- Technical regulations for elevators (TRA)
  TRA 200 "Passenger elevators – freight elevators"

ENEC test symbol
ENEC (European Norms Electrical Certification) is a European test and certification symbol for luminaires and electrical components in luminaires. It is displayed along with the logo and identifying numeral of the relevant national testing agency. The test institute in Germany is the VDE, which is identified by the numeral "10".

Degree of protection

1st numeral protection against foreign bodies		2nd numeral water protection	
0	unprotected	0	unprotected
1	protected against foreign bodies > 50 mm	1	protected against drops of water
2	protected against foreign bodies > 12mm	2	protected against drops of water below 15°
3	protected against foreign bodies > 2.5mm	3	protected against spraywater
4	protected against foreign bodies >1.0 mm	4	protected against splashwater
5	protected against dust	5	protected against jets of water
6	dustproof	6	protected against floodwater
7	–	7	protected against the effects of immersion
8	–	8	protected against the effects of submersion

Example: IP 23 = protected against foreign bodies >12 mm and spraywater

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Information
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