Guide to the lighting of licensed premises

The Society of
Light and Lighting

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Foreword

For many years the CIBSE and its predecessor the Illuminating Engineering Society have offered advice and guidance on lighting. Most of that has been directed towards lighting in the workplace, but in an era where responsibility for safety and control of energy use are becoming increasingly important many other types of premises need consideration.

This guide offers advice on lighting in all types of premises where alcoholic beverages are sold for consumption on the premises, which may range from a busy city centre pub to the bar in a working men's club. It also covers the question of energy use — current regulations can nowadays put severe constraints on lighting. It is written in terms that require no specialist knowledge of lighting.

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Contents

1 Introduction

1.1 Scope of the guide

The function of this guide is to provide advice and assistance to all those who are concerned with the design, equipping, management and operation of 'licensed premises', i.e. premises in which alcoholic beverages are sold for consumption on the premises. They include the following:

- public houses
- bars/restaurants
- 'gastropubs'
- sports and social clubs
- health clubs and sports halls
- theatres and cinemas
- airports and railway stations
- universities and colleges
- hotels and guest houses
- licensed tea rooms
- conference halls and assembly rooms.

This guide is intended to cover existing buildings, new buildings, and those cases where existing buildings originally built for different purposes are converted to licensed premises. Experience indicates that the average life of a lighting installation is about twenty years, though minor alterations may be carried out at any time. Redecoration usually takes place more frequently, and when this is done the design and limitations of the existing lighting installation must be borne in mind. Lighting and decoration relate to one another to a large extent and should be considered together.

Licensed premises have to meet various requirements of law: they are a place of work and must comply with the Building Regulations and they usually require emergency lighting. This guide offers advice and guidance in respect of lighting on all of these points.

1.2 Arrangement of the guide

Many points have to be taken into account when designing lighting installations for both new build and refurbishment projects. The first design considerations are outlined in chapter 2 while more detailed design considerations for the lighting designer are given in chapters 3 and 4 (interior and exterior lighting, respectively). Chapter 5 is devoted to the question of energy use and the requirements of the current building regulations within the UK, which in most licensed premises can provide severe constraints on lighting design. Emergency lighting is covered in chapter 6, and chapter 7 deals with the maintenance of lighting. Explanations of some lighting terms are given in chapter 8.

1.3 The functions of lighting

In any interior space the lighting, be it natural or artificial, has to serve three main purposes. First, it has to enable the occupants to see what they are doing, i.e. to carry out the intended function of the space. This is known as 'lighting the visual task'. Second, it has to make the space appear as a reasonable place to be in; this is referred to as 'lighting for amenity'. The amenity factor is important in licensed premises. Third, it has to provide lighting for the occupants to move about safely. Light fittings are referred to as 'luminaires', and that term is used throughout this guide.

1.4 Terms used in this guide

It is necessary to define some of the terms used in this guide. For example the word 'bar' can mean the actual bar counter, or the room in which it is, or the whole establishment. The meanings of some terms used in this guide are set out below:

- *Pub*: a traditional public house
- *Bar*: the room or space which includes the actual bar counter
- *Bar walk*: the area adjacent to the bar counter where patrons stand to be served
- *Bar back*: the fittings, shelving, mirrors etc. behind the bar counter
- *Drinking area*: an area where patrons actually consume their drinks
- *Eating area*: an area where patrons consume meals
- *Luminaire*: any type of light fitting
- *Lamp*: the light source within the luminaire
- *Emergency lighting*: lighting provided to enable people to leave the building safely in the event of failure of mains power; it does not mean lighting to enable business to continue.

Note: drinking areas and eating areas may or may not be part of the bar space.

The terms 'illuminance', 'luminous flux', 'luminance' and 'light output ratio' are explained in chapter 8.

Abbreviations used in the text are as follows:

- CCTV: closed circuit television
- CDM: ceramic discharge metal halide lamp (section 3.3.6)
- CFL: compact fluorescent lamp (section 3.3.4)
- CMH: ceramic metal halide lamp (section 3.3.6)
- CRI: colour rendering index (section 2.4.1)
- ECG: electronic control gear (section 3.3.3)
- GLS: general lighting service lamp (the traditional incandescent lamp)
- kW·h: kilowatt-hour (basic unit of electrical energy)
- LCD: liquid crystal display
- T5, T8, T12: diameter of fluorescent tubes (16 mm, 26 mm, 38 mm respectively).

2 Why lighting is important

2.1 Character and atmosphere

The primary consideration should be the character and atmosphere of the building. Many factors contribute to the atmosphere in licensed premises, but decoration and lighting are often the most important. Different kinds of premises will call for different atmospheres. A small pub in the country may call for a very relaxed and welcoming atmosphere, whilst a town centre bar aimed at a younger clientele may call for a more stimulating, vibrant one, potentially with a theme of some kind. In some cases the atmosphere will need to alter at different times of the day. For example, a theatre bar may need a brisk and bright atmosphere when drinks have to be served rapidly during the interval of a play, but a more relaxed one if it is open for after-show drinks.

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Plate 1 The luminaires make a large contribution to the character and atmosphere of a room

2.2 Lighting and decoration

The style of the luminaires also contributes to the atmosphere. Even when they are switched off, they can indicate what kind of a room it is. For that reason they should be chosen carefully. Domestic style luminaires may be suited to a small village pub, but they may look out of a place in a busy city centre bar. The use of 'period' fittings is to be approached with caution. Equally, luminaires that look as though they were intended for industrial use are to be avoided. Whatever choice of luminaires is made, it is advisable that all in any one space should complement one another as shown in Plate 2.

Lighting and decoration complement one another to a marked degree. At any point in a room, much of the light comes not directly from the luminaires, but will have been reflected off the floor, ceiling or walls. If these surfaces are dark, the result may be a dark and gloomy room. If they are lighter, the result is likely to be a much brighter room. A warm atmosphere is generally expected, and it is

Plate 2 If luminaires of different styles are used together, they should be chosen so as to complement each other

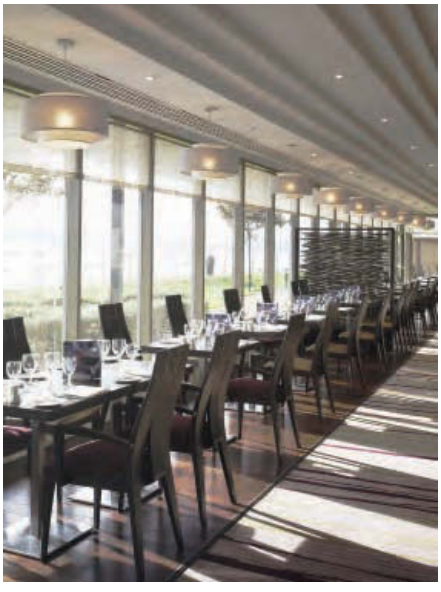
advisable to use the traditionally 'warm' colours, and to avoid large areas of green and blue colours. Some recommendations follow:

— Floors should be as light as possible consistent with the use that they get. Light carpets are usually not suitable. Equally, very dark wood and dark lacquered stonework are to be avoided.

— Ceilings should preferably be white or an off-white colour. If ceilings are very high, special treatment may be called for; in some cases they can be richly decorated, but in many cases it will be advisable to install a false ceiling such as a Barrisol® ceiling (Plate 5).

— Walls ideally should be light in colour; if there is much dark woodwork, lighter colours should be used on the upper parts.

As a result of the smoking ban in the UK, it may now be possible to use lighter colours for paint finishes and soft furnishings which would previously have been unsuitable.



Plates 3/4 The colour of the walls can have a profound effect on the atmosphere within a room

Plate 5 Luminaires mounted in a false ceiling

2.3 Daylight

Many licensed premises such as sports clubs operate mainly within daylight hours. As a light source, natural daylight is excellent and has perfect colour rendering. However, daylight should not be considered as 'free'. Large windows have implications on the heating and ventilation of the building as they often result in large heat losses in cold weather and considerable heat gains and solar glare in the summer.

Curtains can greatly reduce the night-time heat loss but they should be drawn back completely clear of the windows and window reveals during daylight hours, otherwise they can severely reduce the ingress of daylight.

Plate 6 A good example of the use of daylight in a bar. This is an 18th century building now used as a sailing club

Solar glare and solar heat gain can cause serious problems, especially in conservatories. One way of dealing with solar glare is to use venetian blinds. If used properly, they can eliminate solar glare whilst still giving the occupants a clear view of the outside world. Solar heat gain may be reduced by the use of movable external shades or awnings, but these are expensive to install and must be properly maintained. Further guidance may be found in the BRE publication, *Solar shading of buildings*[1].

Problems can also arise in the transition between areas lit by daylight to areas that are much darker. Examples include (*a*) entrances where patrons walk from a bright street into a dark bar, (*b*) where a conservatory has been added to an old building with few windows, (*c*) where the staff serving meals to patrons outdoors pass frequently between sunlight and darker kitchens. These problems are more acute for older people, whose vision adapts quite slowly to very large changes of light level.

Artificial lighting should be designed to complement daylight in all premises, particularly those with large window areas. In large spaces, the switching should be arranged in rows parallel to the windows so that lights may be brought on in groups as daylight fades (Figure 2.1).

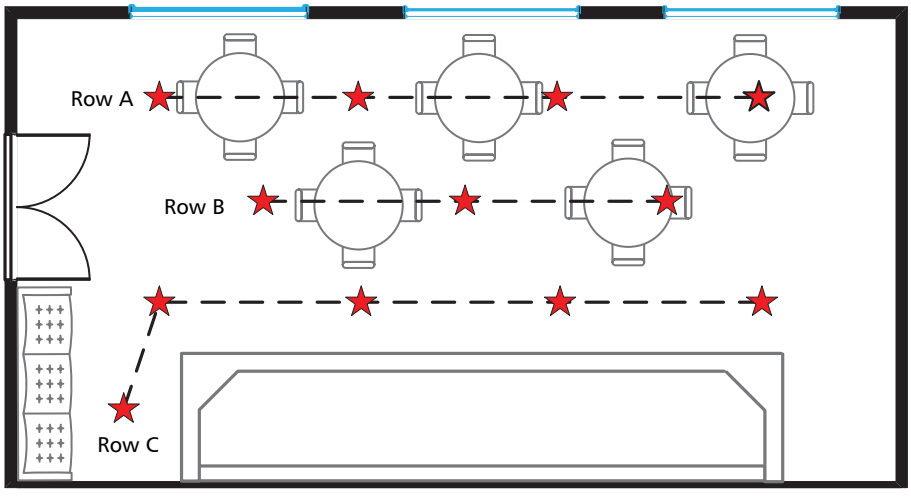


Figure 2.1 In large rooms it is advisable for the luminaires to be switched in rows parallel to the windows

2.4 Colour rendering and colour temperature

2.4.1 Colour rendering

There are many different types of lamp available. They all differ in their colour appearance and their ability to show colours of materials.

It is well known that surface colours may appear differently under different light sources. For example, a red carpet will look a rich red under domestic incandescent lighting, but a duller, flat red-brown under cooler fluorescent lighting. That is because incandescent lamps emit more light at the red end of the spectrum whereas many fluorescent lamps emit mostly at the blue/green end.

Some types of lamp will render colours well while some may appear to distort colours. To indicate the ability of a light source to render colours properly, a colour rendering index (CRI) has been developed. The scale runs from 0 to 100, with 100 representing ideal colour rendering, such as that produced by halogen lamps. Note that two lamps with the same CRI may not necessarily display colours in the same way.

Good colour rendering is important in all areas of licensed premises used by patrons; the faces of both staff and patrons should be well lit, food and drink should look appetising and coins and banknotes need to be easily distinguishable. Ideally, lighting in patron areas should have a CRI of 90 or above, but considerations

Plate 7 Coins on a bar counter; if yellow tinged lighting is used it is easy to confuse a 10 p coin with a £1 coin

of energy use may preclude this in some areas. The minimum CRI should be 80. In areas used only by staff, a CRI of 80+ is acceptable. At cash points, the use of yellow-tinted lighting is to be avoided as it can make a 10 p coin look very like a £1 coin (Plate 7).

2.4.2 Colour temperature

'White' light, as we know it, is a mixture of light of many wavelengths. The wavelengths of visible light and the colours that we usually associate with them are shown in Figure 2.2.

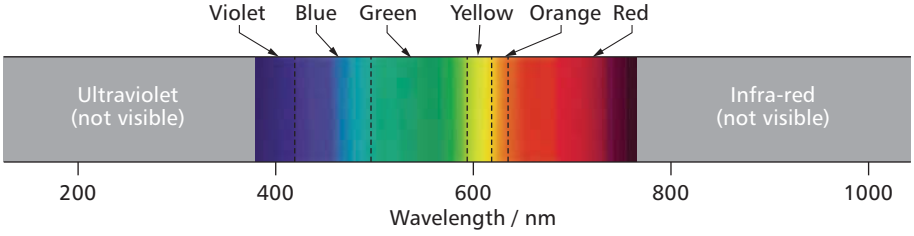


Figure 2.2 The wavelengths of visible light and the colours that are usually associated with them

It is also sometimes necessary to specify the actual colour of the light emitted by the lamps, which is known as the 'colour appearance' of a lamp. There is no simple connection between colour appearance and colour rendering index.

'Colour temperature' is a simple way of describing the colour appearance of light sources. When a body such as a bar of iron is heated it glows at first red and then, as the temperature rises, white. The colour of the light emitted from it is determined by its temperature. The colours of most light sources resemble those of incandescent bodies and so the colour can be indicated by the temperature of a body that would emit light of the same colour. This is referred to as the colour temperature.

Traditionally red and orange colours are spoken of as 'warm' whilst blue and green are called 'cool'. These terms are often used by lamp manufacturers to describe lamps, e.g. 'cool white' or 'warm white'. The colour temperatures of some light sources are given in Table 2.1. Colour temperatures are expressed in terms of absolute temperatures on the kelvin (K) scale.

Table 2.1 Colour temperatures for various light sources

Source	Colour temperature (K)
Candle flame	1900
Traditional bulb / warm fluorescent lamp	2700
Tungsten halogen lamp	3000
Cool fluorescent / metal halide lamps	4000–4500
Direct sunlight	4800
Overcast sky	6500
Light from clear blue sky	10 000 upwards

2.5 Modelling, glare and sparkle

For licensed premises where a warm and welcoming atmosphere is called for, lamps whose colour appearance lies in the range 2700–4000 K should be used.

In many parts of licensed premises, the appearance of people is critical. If light is provided by a few small bright light sources, strong shadows will be produced, which lead to an unflattering appearance (Plate 8). Equally, if the light is made very diffuse in character, it may make things look flat and uninteresting. One solution to this problem is to provide one style of lighting to provide general lighting with supplementary spotlights to provide highlights (Plate 9).

The positioning of luminaires is critical; luminaires that are close to our usual sight lines, such as those mounted on a low ceiling, may produce objectionable glare (Plate 10). Wall mounted luminaires may do likewise. In the latter case, luminaires with a relatively low luminance may be used. Glare is often a problem in the lighting of exterior areas and careful consideration must be given to the safe movement of people and vehicles in these areas.

Whilst glare is to be avoided, spotlights can be used to emphasise key areas or displays and to add visual interest to the bar area. Lighting to produce highlights, referred to as 'sparkle', can be achieved with carefully positioned spotlights, but care has to be taken to see that such spotlights do not produce glare.

Plate 8 Strong directional lighting, e.g. from downlighters, can produce unflattering modelling

Plate 9 The lighting of faces is critical; staff and customers have to be able to see each other clearly

Plate 10 Glare produced by wall mounted luminaires

2.6 Choice of lamps

There is a wide variety of lamps available, all with different characteristics in terms of their energy use, efficiency, colour appearance and colour rendering. A brief summary is given below but more detailed information on all lamp types available can be found in section 3.3.

Traditional incandescent lamps are referred to as GLS (general lighting service) lamps. Compact fluorescent lamps are referred to as CFLs. Light emitting diodes are called LEDs.

GLS lamps are best used over areas with yellow and red furnishings and fabrics as they bring out the depth of colour and emphasize a feeling of warmth. For blues and greens, low voltage halogen light sources may be used which provide a crisp and accurate reflection of the décor. Fluorescent lamps that have a good colour rendering index (both linear and CFLs) will be sympathetic to most colours of the spectrum. Where possible CFLs should be used in table lamps, floor lamps and pendants.

2.6.1 Light source performance

Table 2.2 shows some main characteristics of light sources.

Table 2.2 Light sources and their characteristics

Source	Efficiency (lumens per watt)	Typical life (hours)	Colour rendering	Dimmer compatible?
GLS	12–14	1000	Excellent	Yes
Tungsten halogen	13–15 / 25*	2000–3000	Excellent	Yes
Compact fluorescent	50–70	8000–15 000	Average to good	Only types so marked
Tubular fluorescent	50–100+	8000–20 000	Good in multi-phosphor versions	Only with appropriate wiring and control gear
Ceramic metal halide	80–100	10 000–15 000	Excellent	Yes
LED	30–80+	20 000–50 000	Poor†	Yes

* Low voltage versions offer an efficiency of up to 25 lumens per watt
† Improvement may be expected in the next few years

2.6.2 Energy efficient lamps

The use of energy efficient lamps can result in a considerable reduction in the running costs of licensed premises. An example is outlined in Table 2.3 below; that of a small village pub with a bar and two rooms. It is assumed that the lights will be on for 12 hours a day, 365 days a year, a total of 4380 hours per year.

Table 2.3 Energy efficiency example: village pub with bar and 2 rooms

Room/space	Lamp type	Quantity	Total wattage (W)	Energy consumption (kW·h)
(*a*) Using GLS lamps				
Drinking areas	Twin wall brackets (40 W)	20	1600	7008
Bar	Halogen spotlights (50 W)	6	300	1314
Passages, WCs	Flush ceiling fittings (60 W)	10	600	2628
				Total: 10 950
			Total cost (at 9 p/unit) = £985 per annum	
(*b*) Using energy saving lamps				
Drinking areas	9 W spiral	20	360	1577
Bar	15 W reflectors	6	90	394
Passages/WCs	11 W twin-tube	10	110	482
				Total: 2453
			Total cost (at 9 p/unit) = £221 per annum	

The costs of the lamps in the two cases are roughly similar as CFLs have a much longer life than GLS lamps. Therefore the total annual savings by using energy saving lamps is £764 per annum.

2.6.3 Lighting controls

It is worth investing in suitable controls for any lighting installation. This makes the lighting scheme more flexible, and enables it to be used more economically in terms of energy use.

2.6.3.1 Switches

Plain switches are the most important element of lighting control. To save wiring costs, it is sensible to group lights of one function together, e.g. all the lights for the bar walk may be controlled from one switch, but it has to be remembered that the maximum load that can be connected to a tumbler switch is about 1.2 kW. In large areas it pays to divide lighting into sections or zones, each independently switched. Where part of an area may be lit by daylight and part not, the lights in the daylit area should have a separate switch so that they can be turned off when not required. In large rooms which may be partly lit by daylight, it is advisable to arrange the separate switching of lamps adjacent to the windows, as in Figure 2.1 above.

It is advisable for all of the light switches to be on a single panel at a central point not accessible to the public. Staff turnover in licensed premises is notoriously rapid, and for that reason the function of each switch should be clearly marked.

Additional light switches should be provided at each entrance door for basic access lights. In some staff areas, such as cellars, it is advisable to use lighting controls operated by presence detectors to ensure that the lights are off when rooms are unoccupied.

2.6.3.2 Dimming controls

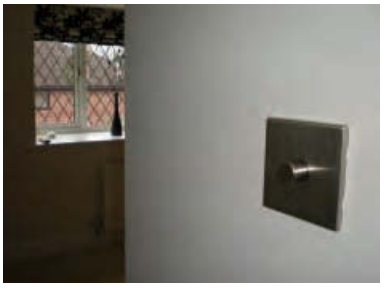


Plate 11 Rotary dimmer switches of this type can be used with GLS lamps but are not suitable for most types of compact fluorescent lamps

Dimming controls offer a valuable option for 'scene setting', and can also considerably reduce energy consumption. It is, for example, possible to vary the intensity of light within a given area to suit the time of day. However, irrespective of the type of dimming system used, it must be capable of being switched to full output instantly (see section 2.6.3.4).

Dimming controls include:

— *Rotary dimmer switches* (Plate 11): suitable for use with GLS lamps, mains voltage halogen lamps and many low voltage lamps when used in conjunction with suitable transformers, but cannot be used with most varieties of compact fluorescent lamps. It is important that GLS lamps are not inadvertently replaced with compact fluorescent lamps (see section 3.3) in dimming circuits. It should be noted that new types of compact fluorescent lamps, which are compatible with conventional rotary dimmer switches, are becoming available.

— *Low voltage halogen dimmers*: require matching transformers which are specifically designed for lamps of this type.

— *Fluorescent lamp dimmers*: linear fluorescent lamps require specialised dimming equipment, which in some cases may require additional wiring. Some forms of electronic control gear can offer simple dimming at little extra cost.

2.6.3.3 Control systems

There is a wide variety of control systems available with various degrees of complexity, and corresponding cost. These include:

— *Manual systems*: a combination of simple switches and dimmers. This is the simplest and cheapest option.

— *Electronic single room systems*: these typically can control up to five circuits and provide four different scene settings. They can be operated from a switch panel, or a hand-held remote control.

— *Electronic multi-room systems*: these are lighting management systems for large numbers of lighting circuits throughout a building. They have to be professionally programmed when they are set up. They offer infinitely variable settings with pre-set values that can be selected from a control panel. It can thus be changed from a bright lunchtime setting to a more subdued early evening one at a touch of a button. Systems can also be programmed to fade slowly from one setting to another. These systems are highly sophisticated but are expensive.

— *Daylight control*: a light sensor monitors the level of natural light, switching 'on' when it fades below a trigger point. Such controls are good for dusk-to-dawn security lighting. This type of control can also be used to maintain a specified level of light in a room; this can ensure that lights are switched off in a room when there is plenty of daylight available.

— *Presence detection*: a passive infrared (PIR) detector can tell whether there is anyone in a room or not. This can be used to switch off lights when rooms are left empty, e.g. meeting rooms, store rooms and toilets. In large rooms an additional relay may be needed.

Where lighting is to be provided for dance or performing areas, it is advisable to use a simplified form of stage lighting installation in addition to the basic amenity lighting.

2.6.3.4 Manual override controls

Irrespective of the control or dimming system employed, it must be provided with manual override switches, placed within easy reach of staff so that if an incident occurs, full level lighting can be switched on instantaneously. This is a legal requirement. Such a feature may also be utilised to indicate to patrons that the premises is closing.

3 Lighting design: interior

3.1 General design considerations

Patrons enjoy a relaxed atmosphere, and to create this, the lighting should be designed accordingly. The best results will be achieved by using a variety of light sources to achieve good vertical and horizontal illuminance, and contrasting some areas against others. Having arrived at a target level of overall ambient illumination, smaller and more directional light sources may be added to highlight specific areas. Spotlights should be sited with care and used advisedly, and once aimed, should be firmly locked in position. They are not a suitable means to provide general illumination of an area.

Luminaires need to be robust, and readily replaceable. Luminaires within reach of patrons must be cool to the touch, and should be secured to walls, tables or floors to comply with health and safety requirements and to prevent theft. Luminaires should be carefully positioned so as to avoid glare, which is often a problem in premises with low ceilings; it must be remembered that all luminaires will be viewed from both sitting and standing positions. It is advisable to use only those luminaires where the actual light source is not directly visible by normal viewing.

Each area within the building has a different function and the visual tasks involved for each of these will vary. The tasks will also vary for the staff and the patrons. It is important to consider all tasks that may need to be carried out at different times of the day and by different people.

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Plate 12 Patrons expect a relaxed atmosphere in drinking areas; the lighting should be free from glare

The fundamental considerations in planning the lighting layout must be:

— Who is going to use the space?

— What will they be doing?

— How long will they be doing it for?

It is also important to assess the degree of difficulty for the task; reading a menu may be a simple task for most people but small or intricate print is difficult for people with lower visual acuity. Descending steps to a cellar may be simple enough until the person is carrying something which may impair their vision.

The principal visual tasks met with are summarised below.

Patrons need:

— to be able to see each other clearly, and to enjoy a cheerful, relaxed atmosphere

— when at the bar, to see the bar staff clearly

— to identify entrances and exits

— to see the drinks on sale clearly

— to see to move about easily, especially if carrying drinks when the bar is crowded

— to be able to see TV screens

— to read newspapers and menus

— if meals are served, they need to see what they are eating

— to find the way to the toilets without asking

— to see to play games, e.g. pool, darts etc.

Staff need:

- to see patrons' faces clearly
- to pour drinks accurately
- to see if glasses are clean
- to see cash and tills clearly
- to see what patrons are up to
- to keep the place clean
- occasionally, to identify broken glass after breakages
- to move barrels, kegs and other goods safely
- to make beer line or gas connections safely
- to read sell-by dates, delivery lists etc.

3.2 Detailed requirements

3.2.1 Entrances and exits

The lighting should ensure that the door and approach to the door(s) stand out from the surrounding area. This applies both to people leaving and to those arriving from outside, particularly in strong sunlight. Additional illumination will be needed at such points. Suggestions include:

- extra ambient light, i.e. additional luminaires
- skirting level lighting in passageways
- extra luminaires for use during daylight hours to help people adjust when entering from sunlight outside, but which are not used in the evenings
- spotlights are not suitable.

People tend to move naturally towards more brightly lit areas, and the lighting should be arranged to attract people away from doorways in order to avoid blockages.

3.2.2 The bar walk

Here the aim is to achieve contrast with the surrounding area, so that the eye of a new patron is drawn to the bar. Suggested approaches are:

- use downlights to mark out the floor passage
- adjacent lighting should be less bright to enhance the effect of the pathway to the bar
- use a lighter coloured (i.e. more reflecting) floor covering than the surrounding drinking areas.

Floor level lighting may be considered; patrons often drop money when at the bar. Recessed LEDs can be used as a decorative detail.

3.2.3 Bar counters

So that the bar staff and CCTV security cameras can discern the features of patrons, a vertical illuminance of 100 lux should be achieved. Good vertical illuminance is important, without glare and with good colour rendering, as patrons and staff need to see the colour of drinks and money. The lamps chosen should have a colour rendering index greater than 80. Suggestions include:

- a high level of ambient lighting in the whole bar area.
- linear lighting directly above the bar, but shielded from the view of patrons; tubular fluorescent lamps may be used either with diffusers

or built into the superstructure of the bar. There should be no glare to either patrons or staff

— in long bars cold cathode or LED lighting can be used in suitable coving (see section 3.3.8)

— internally illuminated tap points (e.g. lager or mixers) should not be too bright or they will form unwanted focal points.

— downlights alone are not suitable; halogen spots are possible provided that only low wattage (20 W flood) are used and the counter top is made of a non-reflective material such as wood or Corian®.

3.2.4 Bar backs

The choice of lighting will depend on the type of display (bottles, optics, etc.) envisaged. Possible approaches are:

— wall wash with luminaires positioned above the bar back

— entire panels of the bar back illuminated from the front, or rear-illuminated panels

— if there is a superstructure to the bar, luminaires fitted to light the bar back

— glass fronted cooling cabinets may or may not be lit from within and they should not be allowed to become focal points

— spotlights above the bar area, carefully directed at the bar back; these should be above head level

— decorative features may be added, e.g. rope lights along the front edges of shelves, or strips of LEDs above, underneath, or at rear of shelves.

3.2.5 Display areas and tills

It is vital that there should be adequate light so that staff can see money clearly, so a minimum of 200 lux is suggested. In dim areas such as night clubs it may be possible to use lighting only slightly brighter than that of the surroundings. However, excessively bright tills may impede the ability of the staff to see what

Plate 13 Bare CFLs protruding from luminaires produce unwelcome glare

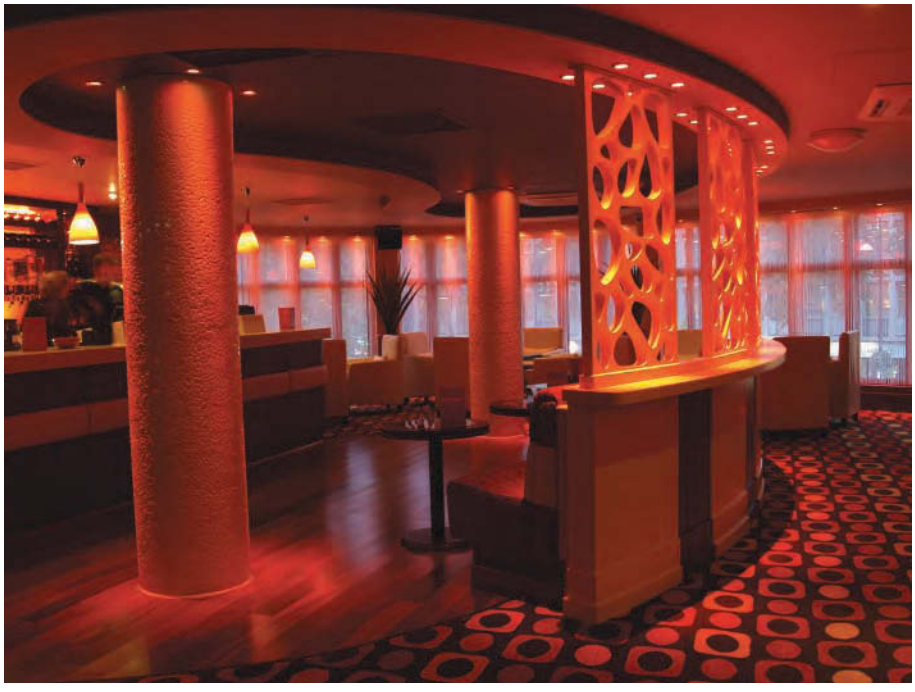

Plate 14 A typical nightclub; a higher level of lighting is needed at the tills than in the drinking areas, but they should not be too bright

is going on in drinking areas. For a CCTV system to be effective there must be adequate vertical illuminance and good colour rendering. One approach is to use downlights or spotlights over displays and tills. Many modern tills use LCD touchscreens, so care with the positioning of any such luminaires must be taken to prevent disability glare or unwanted reflections.

3.2.6 Staff areas: cellars, changing rooms, kitchens, stores

The important point is to ensure that there is sufficient light to enable the various tasks to be carried out safely. The lighting needs to be as energy efficient as possible, in order to meet the requirements of the building regulations for the building considered as a whole. Suggested luminaires with high energy efficiency are:

— those using T5 fluorescent tubes with electronic control gear (see section 3.3.3), possibly with prismatic diffusers

— flush ceiling luminaires with fluorescent lamps with electronic control gear, with opal or prismatic diffusers.

In kitchens, good colour rendering is called for (CRI > 80), fully enclosed and moisture proof luminaires should be utilised with easily cleaned surfaces. A maintained illuminance of 500 lux should be provided. Cellars, passages and store rooms should be provided with an illuminance of not less than 100 lux. Staff changing and rest rooms should be lit to 200 lux. Rooms used as offices require an illuminance of 300–500 lux.

3.2.7 Drinking areas

The lighting system needs to be flexible to respond to differing needs at different times of day, i.e. brighter lighting at lunchtime, early evening and for morning cleaning, with softer lighting for the later evening.

The following points should be taken into consideration:

— At least some of the luminaires should be under dimmer control.

— Scene setting (see section 2.6.3): switches or dimmers must be in a place not accessible to the public and should be clearly labelled. Switching to be arranged in rows parallel to the windows so that full use can be made of daylight.

— Diffuse general lighting is preferable to pools of bright or harsh light.

— Economy: given the desirability of dimming, it is worth ensuring that power is saved when using the softer lighting scene. Two suggestions for this are:

(*a*) Arrange to have twin-lamp luminaires with each lamp on a separate circuit, so a 50% or 100% output can be chosen. This feature can also be incorporated within a large globe pendant or on a chandelier.

(*b*) Use fluorescent or metal halide lamps with electronic control gear (see section 3.3.3) and dimmers; when dimmed there is a significant reduction in power used.

When there is fixed seating in the form of banquettes or groups, the lighting can be designed accordingly, using wall lights, ceiling lights, recessed lighting or wall washers from above or below. More often there is an area with movable tables and chairs. Some options are:

— to provide lighting all round on the walls, e.g. wall lights, uplighters or both

— ceiling lights: if these are recessed it is important that good diffusers are used, e.g. satin glass covers, otherwise the ceiling may appear unpleasantly dark

— pendants or chandeliers may be used where there is a high ceiling.

The needs of television viewers should not be overlooked. Spotlights or other bright sources should not be used near screens, and direct light from light sources should not be allowed to fall on the screen as it greatly reduces the contrast of the picture. It is advisable to have two set lighting levels, one subdued for TV viewing and a brighter one when the TV is not in use. This can be achieved by switching extra luminaires on or off.

Routes to toilets need to be clearly identifiable, especially when the premises are crowded. Decorative luminaires above the doors can help.

The introduction of gaming machines, with their ever-changing brilliantly coloured displays, is a matter to which some thought must be given, as they may produce anything but a relaxed atmosphere. They can also upset patrons with epileptic tendencies. Whilst they may be in place in a vibrant city centre establishment aimed at a young clientele, they may be quite out of character in an ancient country pub. One solution is to place them in an alcove where they are visible to only part of the drinking area.

3.2.8 Restaurants and eating areas

Lighting needs to be flexible to respond to differing requirements, e.g. Sunday lunchtime or Friday evening. It needs to reach each table so that patrons can see to read the menu, but without making them feel exposed; the primary requirement is for the lamps to have a CRI of at least 80. Points to consider for specification:

— Dimmers: at least some of the luminaires should be dimmer controlled.

— Switching: arrange to switch the luminaires in groups that follow the room's layout and pattern of use. For example, where one end of a restaurant has natural light, the luminaires at that end should

Plate 15 A well lit menu board; the use of a matt surface on the board eliminates unwanted reflections from nearby lamps

be separately controlled to allow them to be switched off when not needed during daylight hours.

— Spotlights: should be avoided since they produce glare and dark shadows.

— It is better to illuminate the whole space than to provide individual table lighting; one can choose a direct or indirect lighting scheme, or a mixture of the two. The more diffuse the light, the softer the ambience.

— Direct lighting options: wall lights, pendants, chandeliers.

— Indirect lighting methods: wall uplighters, concealed lighting in coving along beams or in window embrasures; wall washers set behind fixed seating or recessed in ceiling.

— Economy: when lighting is dimmed, it is prudent to ensure that electricity savings are also being made. To do this, one should maximise the use of efficient light sources, e.g. fluorescent or metal halide. This reduces running costs both in terms of electricity consumption and in labour in replacing lamps.

3.2.9 Games areas

Games areas generally need higher overall illumination than drinking areas. Principles for consideration:

— Separate games rooms: high levels of ambient lighting without shadowing:

  (*a*) indirect: wall uplights or lighting in ceiling coving

  (*b*) direct: ceiling lights, wall lights, pendants.

— Games within the main bar area: highlight specific items such as a pool table or dartboard. This can be achieved by direct lighting angled into the games area, such as pendants or spotlights over tables, wall washers for dartboards, fluorescent strips with diffuser designed to cut-off to the rear.

3.2.10 Steps and stairways

In many older premises there are small changes in level between various parts of the same room. These represent a hazard to users, so good lighting and marking are highly advisable. Similar hazards exist on stairways. Various measures can be taken to reduce the risks, initially by providing an illuminance of 100–200 lux but additional measures can include one or all of the following:

— Edging of a contrasting colour to the floor surface should be put on stair treads, across their whole width.

Plate 16 A typical stair hazard; it is difficult to discern the edges of the treads

Plate 17 Some well lit stairs; low level lighting by LEDs is provided at the side of each stair tread

— Increased ambient lighting on steps and stairways; 'light the treads and not the risers' is good advice.

— Low level lighting at the side of stair treads to target the light where it is needed. Such luminaires are available with compact fluorescent or LED light sources. The latter has the advantage of colour options, but care should be taken to get adequate contrast between the LED colour and the carpet.

— Edge-strip lighting along stair treads; LED strips provide excellent highlighting of the edge of each step.

The advantage of the latter two methods is that they have little impact on the ambient lighting in the area.

3.2.11 Toilets

The style of luminaire chosen will depend on the establishment and its clientele — what is suitable for a cricket club or restaurant may be inappropriate to a town bar. Energy efficient light sources should be used as toilets are in use throughout opening hours. An illuminance level of 200 lux should be provided at washbasin height. Fully enclosed decorative or bulkhead luminaires should be selected that are easy to clean, vapour-resistant and appropriate to the interior design. They may be either ceiling or wall mounted. In some places it will be advisable to use vandal-proof luminaires.

Lighting for mirror and baby changing areas should have good colour rendering (CRI > 90): patrons do not like greenish fluorescent lighting when checking their make-up. Decorative tungsten halogen lamps can well be used here. Downlights immediately above mirrors cause harsh shadows and are to be avoided.

The entrances to toilets should be clearly visible, and so should the signs to them; appropriately directed spotlights may be used. Low level floor lighting can also be used to indicate entrances and exits.

3.2.12 Lighting for cleaning

In larger premises it may be worthwhile installing a secondary lighting system, to be used only to enable cleaning and restocking to be properly carried out, outside trading hours. The luminaires should be located so as to be as inconspicuous as possible when the normal lighting is in use. The lamps chosen for this must comply with the energy requirements of the Building Regulations[2–4] (see chapter 5).

3.3 Energy considerations and lamp selection

Constraints upon energy use today imply that we can no longer continue to use the classic incandescent lamp that has been widely used in the past. It is vital that lighting users and designers should be aware of the many types of lamp available today and their relative efficiencies (lumens per watt)*, see Figure 3.1.

By law, the European Union energy label (Figure 3.2) must be displayed on all new electrical products including lamps displayed for sale. This label should be used to assist in sourcing energy efficient lamps. In addition to the standard 'A to G' scale ('A' being excellent, 'G' poor) for energy efficiency, information on the packaging must include luminous flux (light output) in lumens, the input power of the lamp in watts and the average rated life in hours.

3.3.1 Incandescent lamps (energy rating E and F))

Also known as general lighting service (GLS) lamps, these are the traditional bulbs of the kind that has been in use for over 100 years. Light is generated by passing an electric current through a thin wire (filament) which glows white hot and emits light. They are cheap to make and have good colour rendering properties, but their disadvantages are that they are inefficient in terms of energy use and

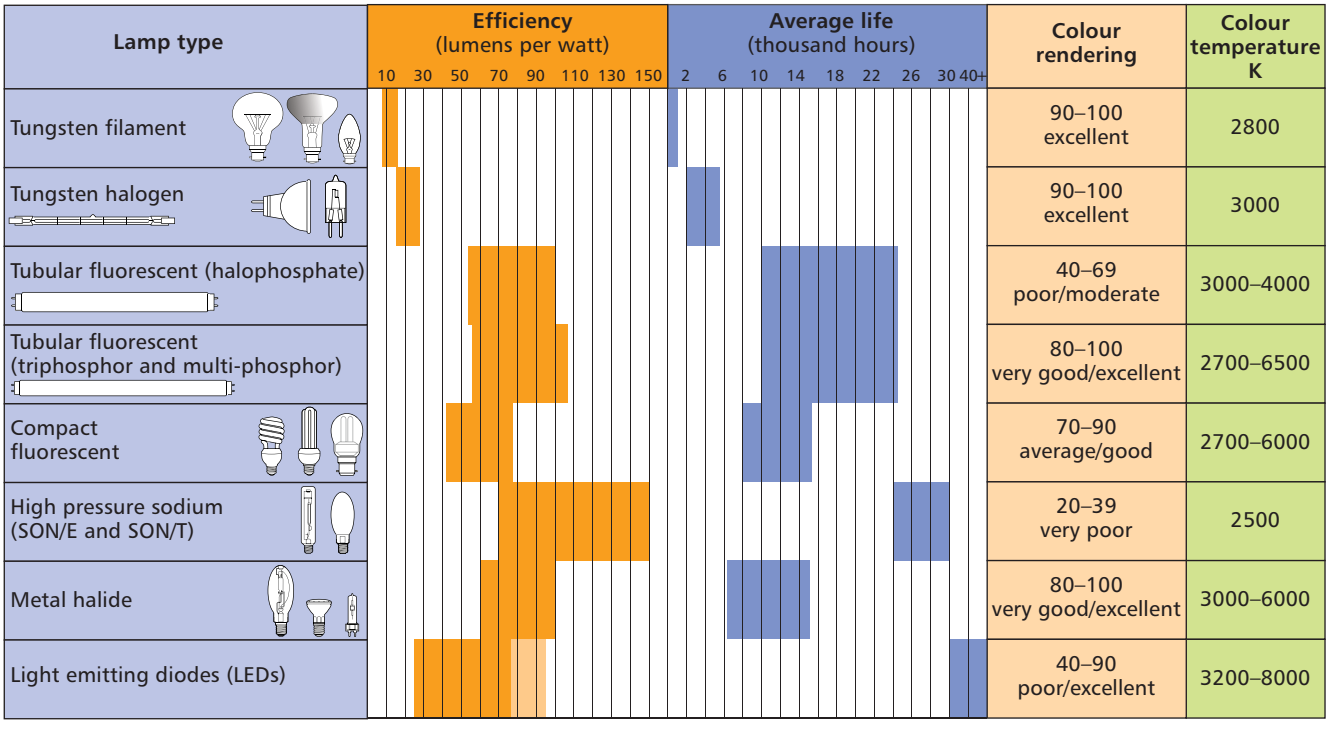

Figure 3.1 Typical performance characteristics for a range of lamp types

they have short lives. Their efficiency is no better than 12–14 lumens per watt, and their life is about 1000 hours in use. Because of their poor use of energy, they are being phased out in many countries, including the UK.

3.3.2 Tungsten halogen lamps (energy rating D)

These are incandescent lamps in which the envelope contains a tiny amount of one of the 'halogen' elements, usually chlorine or bromine. This has the effect of prolonging the life of the filament, and enables it to be run at a higher temperature so that it is more efficient — around 15–20 lumens per watt. The life is usually at least twice that of a GLS lamp. They have good colour rendering qualities, and can be used in dimming circuits. Some versions are available which can be used as direct replacements for GLS lamps, using the same luminaires and this will effect some energy saving, with consequent reduction of running costs.

They can be made in small sizes with a reflector within the envelope, and these are useful in display and decorative lighting. Some reflector types are designed to reflect some of the heat from the filament back onto it, which results in a higher efficiency and, in some types, this can be as high as 28 lumens per watt.

3.3.3 Tubular fluorescent lamps (energy ratings A and B)

The familiar fluorescent tube lamp has been in use for over 60 years, and is widely used in commercial and industrial lighting. It is much more efficient than incandescent lamps and has a much longer life with 10 000 hours being quite usual. However it cannot be simply connected to the mains — equipment is needed to keep the current under control, which is known as the 'control gear'. Two styles of control gear are available. In the original 'switch start' type, simple electrical devices are included in the circuit and the lamp is run at the same frequency as the mains. In the other system, electronic devices are used and the lamp is powered at a much higher frequency. This system is more efficient, reliable and results in much longer lamp life, but is more expensive in terms of initial cost. The phrase 'electronic control gear' is usually abbreviated to ECG.

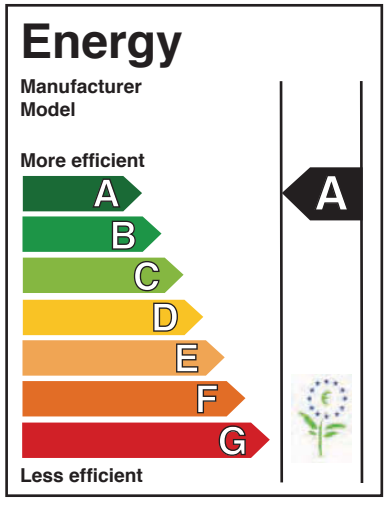

Figure 3.2 EU energy label

Whilst it is generally not suitable for the main lighting in the customer areas of licensed premises, fluorescent lighting can be used as concealed or decorative lighting. It can also be used in staff, office and storage areas.

Fluorescent lamps are available in a wide variety of colours. The original 'halophosphate' types, often called 'standard white' or 'warm white' have poor colour rendering with a colour rendering index (CRI) around 60. These should not be used as the more modern types are more energy efficient. Halophosphate lamps of the T8 and T12 sizes are now being phased out.

More modern types have good colour rendering (CRI 80–90), and are available in a variety of colour temperatures. When operated with electronic control gear efficiencies of 80–100 lumens per watt can be achieved with lamp lives of 24 000 hours. Although more expensive in initial cost, the reduction in energy usage and maintenance costs over the older halophosphate types can result in payback times of less than 12 months when lamps are in use for long hours.

Fluorescent lamps were originally made with a tube of 38 mm diameter. This tube size is referred to as 'T12'. Most lamps are nowadays of the T8 size (25 mm). T8 lamps are more efficient and their use offers a reduction in energy usage of about 10%. In existing luminaires with switch start control gear, T12 lamps can be replaced by T8 lamps to obtain this saving. Even more efficient lamps of T5 size (16 mm) are also available.

The colours of fluorescent lamps are sometimes described by three-figure numbers such as 'colour 835' or 'colour 940'. The first digit represents the first digit of the colour rendering index. The following two digits are the first two

figures of the colour temperature so that 'colour 835' implies a lamp whose colour rendering index is between 80 and 89, and whose colour temperature is 3500 K.

Failed fluorescent lamps must not be broken up or placed in domestic rubbish as they contain a small amount of mercury (less than 5 milligrams per lamp). The local authority should be consulted about their disposal, and recycling facilities should be available.

3.3.4 Compact fluorescent lamps (CFLs) (energy ratings A and B)

Also referred to as 'energy saving' lamps, compact fluorescent lamps are similar in principle to tubular fluorescent lamps, but the tube is smaller in diameter and is convoluted in some way to form a compact lamp. Their efficiency is high (50–70 lumens per watt) and they have long lives, typically 8000–12 000 hours. They use roughly one-quarter of the energy needed by equivalent incandescent lamps, and are much cooler in operation. Hence they can be used where excessive heat is to be avoided, such as fully recessed luminaires, or those mounted near ceilings.

They are very suitable for licensed premises where they are in use for long periods, and can be used in places where they may be within the reach of customers. However their colour rendering is not as good as that of GLS or tungsten halogen lamps; they usually have a colour rendering index below 90.

CFLS generally use electronic control gear. This may be located in the luminaire and, in this type, the lamp is provided with pin connections and must only be used in the type of luminaire for which it was designed. In the other type of CFL the control gear is embodied in the lamp cap, and these lamps are provided with the usual bayonet or screw caps. Lamps of this second type can be used as direct replacements for GLS lamps in circuits which are not controlled by dimmers.

In the case of circuits with dimmers, it is essential that any CFLS used are compatible with dimming circuits — some CFLS are, some are not. Use of the wrong type may result in failure of both lamp and dimmer.

The actual tube in a CFL is often too bright to look at. Varieties are available in which the tube is housed in an outer frosted envelope, so that the lamp resembles the traditional GLS lamp. These should be used in luminaires where any part of the lamp is viewable at normal viewing angles — if a 'bare' CFL protrudes from a luminaire it is likely to cause glare (Plate 13 above).

Failed CFLS must not be placed in domestic rubbish as they contain a small amount of mercury (less than 5 milligrams per lamp). The local authority should be consulted about their disposal, and recycling facilities should be available.

3.3.5 Metal halide lamps (energy rating A)

These are high intensity discharge light sources in which the light is produced by the visible radiation from an arc of mercury vapour containing selected metal halides. Versions are available with either clear or coated envelopes. Their high efficiencies of 60–100 lumens per watt, together with long lives of 5000–6000 hours coupled with good colour rendering (CRI 70–90) allow their use in a wide range of applications. They are available in a range of power outputs of 20–2000 watts and with colour temperatures of 3000–6000 K. They require several minutes to achieve full light output and when hot, several more minutes to re-start if switched off, which limits their application in most interiors unless secondary sources of light are available.

The higher wattages are especially suitable for exterior lighting applications such as building floodlighting, garden, exterior play areas and car park lighting. For purely decorative use coloured versions are available that can find effective use in decorative lighting of gardens and building exteriors.

3.3.6 Ceramic metal halide lamps (energy rating A)

These are a type of metal halide lamp that use a ceramic material for the arc tube instead of quartz, resulting in superior colour rendering (CRI 80+) and improved lumen maintenance through life. The new arc tube design delivers excellent colour consistency and lamp reliability together with a long service life of 6000–12 000 hours.

The availability of 20, 35 and 70 watt versions has enabled their wide application in spotlighting and feature lighting. Their high luminous efficacy of 80–90 lumens per watt and a colour temperature of 3000 or 4000 K make these lamps suitable for many interiors, provided they do not need to be switched on or off frequently.

3.3.7 Light emitting diodes (LEDs) (energy rating A to D)

Light emitting diodes (LEDS) are small semiconductor devices which emit either white or coloured light when energised by a low voltage direct current. LEDS are extremely small, and this means that to get enough light for general lighting purposes, large numbers of them have to be used together in clusters. However they are being developed very rapidly and more powerful ones are appearing. They have extremely long lives, usually up to 50 000 hours. White LEDS can have an efficiency of between 30 and 80 lumens per watt. The colour rendering of current white LEDS is good, but not perfect, but will soon be improved.

Because of their small size, LEDS offer great possibilities in decorative lighting, and are often used in 'ropes' or 'chains'. They can be incorporated in materials and fabrics, and can be used to highlight architectural features of buildings. They can be used to advantage to light refrigerated displays or wine coolers. They offer exciting opportunities to architects and lighting designers. By combining groups of different colours with appropriate switching, exciting colour changes become possible.

They can be used equally well for exterior lighting, especially in gardens, and to highlight exterior features. They are fully dimmable if appropriate dimmers and control gear are used, and colour changing can be achieved either automatically or by the use of simple hand control sets. With their long service lives they can also be used for display and emergency signage.

3.3.8 Cold cathode lamps (energy rating A and B)

Cold cathode lamps are similar in principle to fluorescent lamps, and they have very long lives, typically 45 000 hours. They are therefore suitable for use in places where access for replacement is difficult. They are of smaller diameter than traditional fluorescent lamps, but can be made in longer lengths and are available in over fifty colours. However they are fragile and require specialised control gear and so can only be used in places where there is no possibility of patrons touching them.

They are available in straight lengths which can be mounted end-to-end so as to produce a continuous line of light and may be used behind coving for ceiling lighting. They can also be made in custom-fitted shapes to emphasise architectural features, or as decorative lighting. Some types are dimmable if appropriate control gear is used.

The amount of light they produce can be as high as 3200 lumens per metre length, but in many varieties this figure will be much lower.

3.4 Check list

Before commencing the preparation of any lighting design detailed consideration of all the relevant items in the following check list should be carried out so that a clear specification of the proposed works may be prepared.

— Ensure that light levels are appropriate for the users, activities and tasks of an area. Higher lighting levels may be required for certain areas.

— Use lighting to create the right atmosphere. Strike a balance — lighting which is too dim prevents the staff from seeing all that is going on, allowing criminal behaviour to go unheeded, but bright glaring light is cold and unwelcoming.

— Lighting controls must not be accessible to the public.

— Lighting controls must be clearly labelled.

— The use of zone switching or dimming controls must be considered, both to increase flexibility and to reduce electricity consumption.

— An override is required, within easy reach of the bar staff, so that if an incident occurs the lighting level can be raised. High-level lighting is an important element of control. This helps at the end of trading so that staff can see to clear up and clean and is a specific requirement of the Building Regulations.

Finally carry out a detailed examination to investigate the overall energy efficiency of the proposed solution so as to comply with the requirements of Part L of the current Building Regulations[2–4].

4 Lighting design: exterior

4.1 General design considerations

The principal functions of exterior lighting are:

— to attract patrons to the premises

— to make gardens and external smoking areas pleasant places to occupy

— to allow patrons and staff to move about safely, and to identify hazards such as steps

— to enable patrons to move and park cars safely

— to provide overall security of the premises.

Plate 18 A well-lit pub sign; the light sources have been carefully shielded to avoid unwanted glare or light spill

Of all these, safety and security are paramount considerations.

The first consideration is whether external lighting is necessary at all. Premises in a brightly lit city centre may not need any if well designed signage is used. If external lighting is needed the next action is to determine how much of the building requires lighting. A good starting principle is to light those parts of immediate interest to patrons, such as the façade, entrances, access ways, car parks and gardens, and to leave the rest. There is no point in lighting dustbin areas or the back of a building sporting a fine display of pipes and guttering.

Whatever lighting scheme is adopted, it must fit in with its surroundings. The amount of light used needs careful consideration; a pub in a dark country village will need far less than, say, a suburban roadhouse. The scheme must also be acceptable in daylight when it is switched off — the lighting equipment must not be obtrusive, especially in conservation areas.

Another important consideration is spill light and glare. Light should not trespass into adjacent properties where it is not wanted, nor should it be allowed to spill into the night sky. Apart from its effects on birds and other wildlife, sky glow may prove very unpopular with the surrounding community, particularly in the countryside. Patrons should not have to suffer glare in gardens or smoking areas and particular care must be taken to see that external lighting does not cause glare to nearby road users.

4.2 Locating the luminaires

Luminaires should be located where they produce little or no glare to residents of the premises, to neighbours or to passers-by. They must not be visually intrusive and must be accessible for maintenance.

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Luminaires placed high up can be seen from a great distance, especially in rural areas. Equally, luminaires placed on external walls at or near eye level can produce very severe glare (Plate 19) and are to be avoided. There may be restrictions on mounting locations on listed buildings or in conservation areas, and this should be checked with the local authority planning department and English Heritage where appropriate.

In garden areas, luminaires can sometimes be mounted in trees to advantage, although they may be obtrusive during the day. Lighting equipment can sometimes be screened by careful planting. Floodlights used for façade lighting can also be placed in sunken pits to make them less obtrusive, but care must be taken to avoid light spillage into the night sky. Wherever baffles or shades are used to control light spillage, they must be securely locked in position to prevent misuse, both by staff and patrons.

Plate 19 Glare from a badly placed exterior light

4.3 Lamp selection

Bearing in mind that external lighting can be in use over long periods and that large areas have to be lit, the energy costs are important. In general this means that tungsten halogen is not advisable, except to pick out a few distinctive features, such as the traditional pub sign. In gardens and external smoking areas it is recommended that lamps with a colour rendering index (CRI) of at least 80 be used; these include fluorescent, and CFLs. In places used only for movement (e.g. access ways, footpaths and car parks) lamps with a CRI greater than 60 can be used, which means that metal halide or high pressure sodium can be used. Low pressure sodium lamps are not recommended because their colour rendering is poor, they are incompatible with CCTV security systems, and are unpopular with the public.

Neon tubes and festoons of LEDs can be used to pick out architectural features of a building, but this is only acceptable in locations where a vibrant atmosphere is the norm, such as town centres.

4.4 Control

In general, the external lighting, including advertising signage, should only be on during those trading hours which are in darkness. Time controls to switch lights off when they are not needed should always be included as it is very easy for staff to forget to switch external lights off. This can be achieved by a solar-dial time clock (so called because it turns the lighting on at dusk as it varies through the year), and off at a set time (closing time or shortly after). Security lighting can be controlled by passive infrared (PIR) detectors. These will switch it on when they detect any movement and switch it off if there is no further movement within a pre-set period, e.g. five minutes. Some security lighting may need to be on all night and energy-efficient lamps should be used in such cases.

4.5 Gardens/external smoking areas

These are areas where people expect to relax, and to see each other properly. It is important to use lamps of good colour rendering (CRI > 80), and to avoid glare. Good colour rendering is important so that flowers and gardens can be enjoyed.

Steps in paths and other access ways must be lit clearly. Waterproof low level luminaires (just above ground level) immediately adjacent to the step(s) are a good way of doing this. If there is a flight of more than four steps, then luminaires mounted above head level may be called for, and the principle of 'light the treads and not the risers' should be used.

4.6 Car parks

Car parks used during the hours of darkness must always be lit, both for security of patrons and for safe movement of cars and people. It is particularly important to avoid glare to drivers; attempts to floodlight across large areas from pole or wall mounted luminaires at or not far above eye level can be a lethal hazard. Unless it is a very small car park — perhaps 6 spaces — luminaires mounted on poles away from the main building will be required.

Whatever lighting is used, it must be compatible with CCTV if this is in use. Care must be taken to avoid spill light, and to minimise the visual impact of the scene — car parks are often visible from great distances.

The choice of illuminance level for any particular external feature depends greatly on its surroundings. A rural pub, for example, needs far less light to stand out in its surroundings than a night club in a bustling city centre. To avoid over-lighting and to reduce energy waste, the Institute of Lighting Engineers produced a set of standard lighting limits for varying environmental zones. These zones are defined as:

- E1: national parks, areas of outstanding natural beauty or other dark landscapes
- E2: areas of 'low district brightness', rural areas but not those included in E1
- E3: areas of medium district brightness, e.g. in urban locations
- E4: areas of 'high district brightness', e.g. town centres.

Note that the criteria given under E1 do not preclude the installation of necessary task lighting or to meet health and safety requirements.

Recommended levels of lighting for outdoor car parks are given in Table 4.1.

In zones E1 and E2, there should be no sky glare and elsewhere it must be kept to the absolute minimum. Care should be taken to see that light does not shine directly into windows of neighbouring properties and that any high-mounted luminaires are not viewable from a great distance.

Table 4.1 Lighting levels for car parks

Area	Zone	Illuminance, *E* (lux)	
		E (average)	E (minimum)
Rural	Zones E1 and E2	15	5
Urban	Zones E3 and E4	30	10

5 Energy use and Building Regulations

In England and Wales, Part L of the Building Regulations 2010[2] sets a target for the total amount of energy that can be used within a new or extended building. Similar regulations apply in Scotland[3] and Northern Ireland[4]. The energy used in lighting is part of that total, and additional stipulations apply to lighting.

5.1 Requirements

Lighting systems are required to have energy efficiency values, as defined below, that are better than a stated minimum value.

Steps in paths and other access ways must be lit clearly. Waterproof low level luminaires (just above ground level) immediately adjacent to the step(s) are a good way of doing this. If there is a flight of more than four steps, then luminaires mounted above head level may be called for, and the principle of 'light the treads and not the risers' should be used.

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5.1 Requirements

Lighting systems are required to have energy efficiency values, as defined below, that are better than a stated minimum value.

5.1.1 Energy use requirements in bars, drinking and eating areas

For most areas in licensed premises the energy efficiency is defined in terms of 'lamp lumens per circuit watt' averaged over the whole area of the particular type of space within the building. In any one luminaire the 'lamp lumens' is the total amount of light produced by the lamps within it. 'Circuit watts' means the actual power consumed in the lamp, plus any that may be used in its control gear. With GLS lamps, halogen lamps, and those compact fluorescent lamps that do not have external control gear, this figure is simply the wattage of the lamp.

With tubular fluorescent lamps and many types of discharge lamp the wattage quoted is that of the power used in the lamp only. Some additional energy is always used in the control gear. In the case of fluorescent lamps with switch start control gear, it is safe to assume that this amounts to about 15% of the lamp wattage. Thus a luminaire with 2 × 58 watt fluorescent lamps might have circuit-wattage of about 142 watts. If electronic control gear is used this loss is greatly reduced.

The figure set for the spaces with which we are concerned is a minimum of 55 lumens per circuit watt. That precludes the use of GLS lamps and halogen lamps over large areas, such as a whole restaurant or drinking area. However, they may be used in small numbers provided that the average figure is met for the whole space.

There is an exception to this rule for display lighting, for which the limit is 22 lumens per circuit watt. This means that some tungsten halogen lamps can be used for display lighting, such as that used on a bar back. The regulations also stipulate that 'lighting controls should be provided so as to avoid unnecessary lighting during the times when daylight levels are adequate or when spaces are unoccupied'

5.1.2 Energy use in office, storage and other back of house areas

For these areas energy efficiency is defined in terms of 'luminaire-lumens per circuit watt' averaged over the whole area of the particular type of space within the building.

In any one luminaire the 'luminaire-lumens' is the amount of light that is actually emitted, i.e. the lamp output in lumens multiplied by the light output ratio (see chapter 8 for definitions of terms). The 'circuit watts' means the actual power consumed by the lamps and any control gear (see 5.1.1 above). The minimum set in this case is 55 luminaire-lumens per circuit watt.

This implies that all back of house areas such as staff corridors, offices and changing rooms must use energy efficient lamps such as fluorescent or compact fluorescent. After the public has left, the control system should ensure that display lighting can be switched off and that low-energy lighting is switched on in the public areas for clearing, cleaning and re-stocking.

5.1.3 Further advice

A full explanation of these regulations is given in SLL Factfile No 9[5], which may be downloaded free-of-charge from the Society of Light and Lighting website (www.sll.org.uk). It should be noted that the requirements of these building regulations do not apply in other countries. However with increasing concern over energy usage world-wide, it is likely that other countries will adopt similar measures. Any such measures are likely to closely resemble those of the UK, so it is prudent for those concerned with 'licensed premises' in other countries to follow the advice given in this guide.

More detailed advice on the requirements of the building regulations and many other points is given in *The SLL Lighting Handbook*[6] obtainable from the CIBSE Bookshop, 222 Balham High Road, London SW12 9BS (http://www.cibse.org/bookshop).

5.2 Meeting the requirements of the Building Regulations

The Building Regulations[2–4] only apply where building work is being carried out, for example in new premises or if the lighting system is being replaced. Under the 2010 Regulations exemption is given if the area covered by the lighting is less than 100 square metres. The following points should be noted:

— The regulations apply to the energy used averaged over the whole area of the building. This means that if high efficiency lighting in used in the staff areas of a building, some lower efficiency equipment can be used in patron areas.

— The use of tungsten-halogen is now effectively restricted to display lighting of bar backs and display signs. Although less stringent regulations apply to display lighting, it is not possible to claim that lighting used over a large area constitutes 'display lighting'.

— Emergency lighting does not come under these restrictions

Operators of licensed premises who have to re-equip their premises should give particular attention to section 3.1, and chapters 4, 5, 6, and 7 of this guide. This includes all services and not just the lighting.

5.3 Overall energy use within a building

When new buildings are planned — or existing ones extensively altered — the local authority may require the building owner to demonstrate compliance with the requirements of Part L of the Building Regulations[2]. The calculations to achieve this are beyond the scope of this guide. If a certificate is required, then assistance from an appropriately qualified consultant should be sought. The Society of Light and Lighting provides a Directory of Lighting Consultants on its website (http://www.sll.org.uk/resources/directory).

6 Emergency lighting

Emergency lighting is a vital part of any lighting system. It is required to enable people to leave a building safely in the event of mains power failure. It helps to avoid panic and to restore confidence; it enables people to leave a building and for specific tasks, such as cooking, to be stopped safely. Emergency lighting is closely involved with fire safety, and safety signs and escape routes have to be considered together. There are two categories of emergency lighting, known as 'escape' and 'standby' lighting.

6.1 Escape and standby lighting

'Escape lighting' means lighting provided to enable the occupants of any premises to evacuate the building safely if the normal lighting fails. This also enables specific tasks to be stopped safely.

'Standby lighting' means lighting provided to enable normal activities to continue within the building during a mains failure. Standby lighting can be used as escape lighting, but if that is done, it must meet all the specific requirements for escape lighting which are described below. This is most common in larger buildings such as hotels, airports etc.

In smaller premises, it is usual only to provide escape lighting. For the purposes of this guide the phrase 'emergency lighting' refers to escape lighting, except where standby lighting is specifically mentioned.

6.2 Requirements of the law

By law, almost all licensed premises have to provide emergency lighting and exit signs. If there is any doubt as to whether emergency lighting and signs are required, the Local Authority or Fire Officer should be consulted. The requirements for emergency lighting are detailed in BS 5266[7,8]. SLL Lighting Guide LG12: *Emergency lighting*[9] also offers detailed guidance on the design and installation of emergency lighting. The sections below set out the basic requirements.

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6.3 Illuminance values on escape routes

All escape routes and areas must be kept clear at all times when the premises are in use. The illuminance should be adequate for people to see their way out. It must come into operation within 5 seconds of the mains failing and must remain operative for a minimum of one hour. The illuminance on the centre line of any escape route should be not less than 1.0 lux, with a minimum of 0.5 lux across the central 50% of the width of the escape route (Figure 6.1).

Emergency luminaires should be located to illuminate hazards such as steps and changes of direction of the escape route.

6.4 Illuminance values in open areas

For larger open areas where a defined exit route is not easily identified, additional emergency lighting is required (Figure 6.2). The illuminance on the floor of the open area, up to 0.5 m of a wall, should be a minimum of 0.5 lux. Emergency lighting must also be provided in lifts, toilets and closets. The emergency lighting must be at full power within 60 seconds of mains failure.

6.5 High risk task areas

There are places where the task activity cannot be halted immediately, such as cooking, which need emergency light. These high risk task areas should ideally be illuminated to the level required by the task and in any event the maintained illuminance should be not less than 10% of the required maintained illuminance for that task and be not less than 15 lux. This emergency lighting must be fully operational within 0.5 seconds. The uniformity should not be less than 0.1. For this a maintained system should be considered.

6.6 Luminaires

Emergency lighting luminaires should be of a style that will blend in with the normal lighting scheme and with the architectural style of the premises. They must be suitable for the environmental conditions of their location; for example luminaires outside the final exit should be weatherproof to ingress protection specification IP65[10].

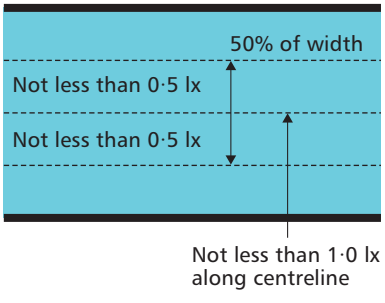

Figure 6.1 Illuminance on escape route (up to 2 m wide)

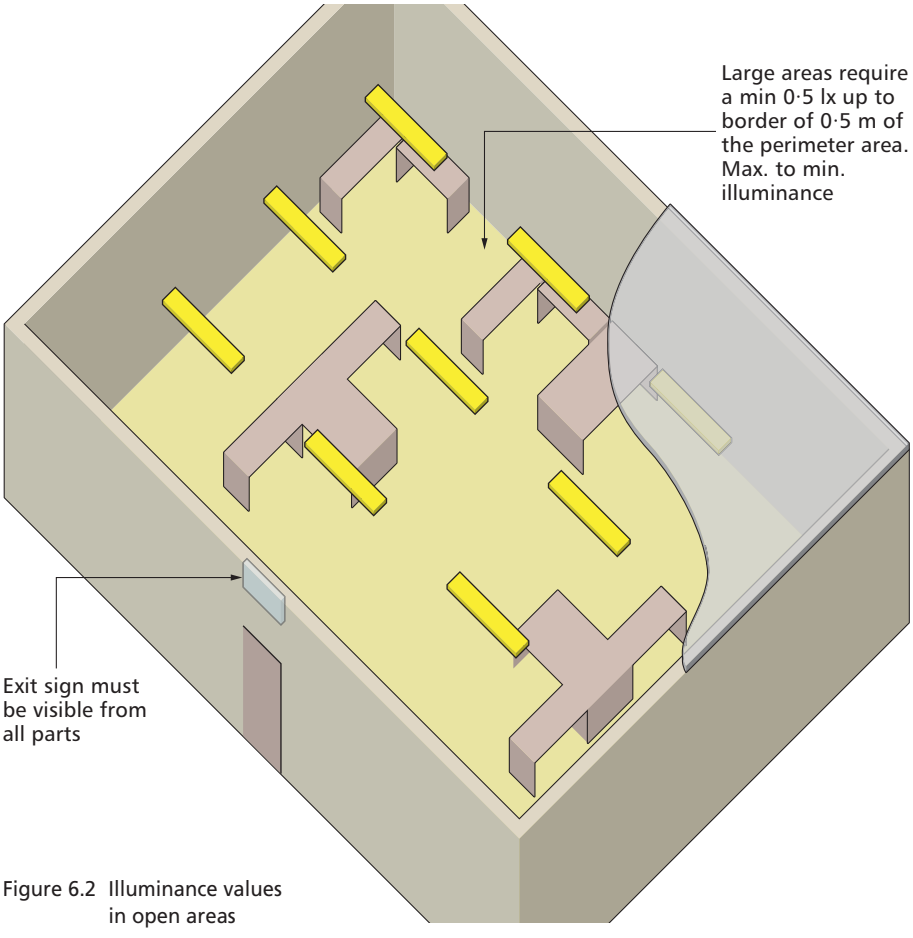

Figure 6.2 Illuminance values in open areas

The luminaires can either be standalone or integrated with the normal luminaires. They can either be self-contained or fed from a central power system. The choice is decided mainly by the size and complexity of the premises, though testing and maintenance needs should also be considered. In most licensed premises self-contained luminaires provide the most practical solution. These can be connected to the local lighting circuits to detect any mains failure and require little maintenance.

Emergency luminaires should be positioned above head height (i.e. at least 2.0 m above the floor). The lamps should have a colour rendering index above 40, so that the colours of safety signs can be recognised. They must also be chosen to avoid dazzle to anyone in the premises. Spotlight-style emergency lights should not be positioned near escape doors as they may dazzle occupants endeavouring to escape.

6.7 Safety signs

Safety signs including directional signage must be provided to indicate the escape route and final exit points from any part of the premises. The luminance (see section 8.2) of the safety colours on the signs must be at least 2 candela/m^2. The signs should be pictograms as defined in BS 5499[11]. The signs should be visible at all times when the premises are in use, and they must be illuminated within 5 seconds of the mains failing. The escape route signs must be placed so that the occupants can clearly see them and identify the escape route from any part of the premises.

Examples of approved emergency exit signs are shown in Figure 6.3.

Figure 6.3 Emergency exit signs

6.8 Planning emergency lighting

There is no precise planning sequence to be followed but the points below should be considered. Before starting the plans it is most important that consultation is carried out with relevant regulatory bodies to verify the escape route, exit doors, etc.

(1) Establish licensing requirements.

(2) Examine building plans.

(3) Mark exits and final exits.

(4) Mark escape routes.

(5) Identify open areas and special locations.

(6) Mark location of hazards, fire-fighting appliances, and alarm call points.

(7) Identify small toilets with no windows and toilets over 8 m^2.

(8) Identify closets, control rooms, special plant rooms and lifts.

(9) Note illuminance and other specification requirements.

(10) Select signs and escape luminaires fit for the purpose.

(11) Position luminaires at essential locations.

(12) Add extra luminaires to complete scheme.

(13) Check uniformity and glare.

(14) Prepare installation instructions.

(15) Prepare commissioning procedure, including illuminance checks.

(16) Prepare operation testing service instructions.

(17) Prepare log book.

6.9 Inspection

Regular inspection of emergency lighting schemes is essential and as such, must be considered and adequately documented. Regular testing at monthly intervals of both short duration and annual full duration are required. The onus for these activities falls on the competent person of the owner/user of premises. The testing may be manual by local switch or by automatic self-testing or remote central controlled testing system. The inspection needs to confirm that the luminaires are in place as designed, the lamp in maintained luminaires is functioning and the signs are visible. During inspection if any faults are noticed these should be recorded in the logbook and corrective actions taken at the earliest opportunity.

7 Maintenance

7.1 General

In most areas of licensed premises, defects in the lighting system are immediately visible to patrons. It is therefore important that any defects be rectified at the earliest opportunity — failed lamps or dead flies left in luminaires for days on end convey the impression that nobody cares. It is a good plan to make one individual responsible for lighting maintenance. This does not mean that he or she should have to do it all, but they would be responsible for seeing that it gets done.

Adequate stocks of all the types of lamp used in an establishment should be held and, in view of the variety of lamps now in use, clear instructions should be given about their use (see section 7.2 below). In some cases it is advisable to keep a small number of replacement luminaires. If a stepladder or other equipment has to be used to carry out maintenance, it is the responsibility of the management to ensure that the staff are properly trained to use it. The Work at Height Regulations[12–15] should be observed at all times.

Lighting maintenance includes mainly the replacement of lamps and the cleaning of luminaires. Occasionally the replacement of damaged luminaires may be called for, but this may be beyond the remit of the normal bar staff. For the purposes of maintenance, lighting equipment can be put in two categories: (*i*) that which is accessible from or near floor level, and (*ii*) other interior equipment, and exterior lighting equipment, which is nearly always inaccessible from ground level. 'Accessible from or near floor level' means equipment less than 2.4 metres (8 feet) above the floor.

7.2 Equipment accessible from or near floor level

Failed lamps should be replaced promptly. To do this, clear instructions must be given to the staff involved and these should be prominently displayed in an area used by staff, but not by patrons. Bar staff are often peripatetic, and in many cases English is not their first language. These instructions must make clear: (*i*) that the relevant circuit must be switched off before any attempt at replacement is made, and (*ii*) exactly which type of lamp is to be used in each luminaire — putting a non-dimmable lamp in a dimmer controlled circuit can have expensive consequences. These instructions should include a chart or plan showing the positions of luminaires and the lamps to be used in each. Any stock of replacement lamps should be marked to conform with this chart.

7.2.1 Lamp replacement

Modern types of lamp such as CFLs have much longer lives than the familiar GLS lamp, and may start flickering or flashing whilst still working. Any such lamps should be replaced promptly; flickering can cause epileptic seizures in some people and is disturbing to everybody. The light output of all fluorescent lamps, both CFLs and tubular lamps, decrease slowly throughout their life and it may be worthwhile to replace old lamps which still appear to be working properly.

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7.2.2 Disposal of used lamps

Many types of lamp such as CFLs and tubular fluorescent lamps contain small amounts of mercury vapour, and some may contain other toxic materials. Consequently old lamps must not be put in general rubbish, but must be disposed of safely. The local authority should have facilities to do that and they should be consulted; most civic amenity sites will accept them.

7.2.3 Cleaning of luminaires

The currents of air rising in luminaires cause dust and dirt to accumulate in them. Although this may not greatly affect the light output, it is readily visible to patrons. A regular programme for cleaning should be laid down; luminaire cleaning involves washing some parts and therefore should only be done out of normal trading hours.

The staff who do this work must be fully trained. They must ensure that all the circuits concerned are dead before they start, and remain dead whilst they are working. Some luminaires require special tools or techniques to get to their inner surfaces, and staff should be shown how to do this. Any special tools or keys required should be kept carefully in a specified place so that they do not get lost.

Many types of lamp in use today have much longer lives than the familiar GLS lamp. Consequently it is necessary to clean luminaires several times during the life of the lamps if light output from them, and a good appearance, is to be maintained. As a rough working rule, it is advisable to clean all interior luminaires once each quarter.

7.2.4 Replacement of luminaires

Luminaires occasionally get damaged or broken. Many decorative types of luminaire are only made in short production runs, and replacements or replacement parts may not be readily available. To meet this contingency, it is advisable to keep a small number of spare luminaires in stock. If an entire luminaire has to be replaced, that work must be entrusted to a qualified electrician.

7.3 Equipment not readily accessible from ground level

All of the points made in sections 7.2.1, 7.2.2 and 7.2.3 apply equally, but it may not be practicable to replace failed lamps immediately. It may be necessary to call in specialist contractors to carry out this work. If that is done or if special equipment (e.g. tower ladders) has to be used, the labour costs may far exceed the costs of replacement lamps. In that case it makes sense to replace all the lamps in a group at one time, whether they have failed or not. If such a system of group replacement is used, it should be done at regular intervals, and proper records should be kept.

7.3.1 Interior equipment not readily accessible from ground level

Large chandeliers using dozens of lamps present a particular problem. Failed lamps are readily identifiable while the chandelier is switched on, but they cease to be so when it is switched off and lowered to floor level. It is a simple matter to photograph the chandelier using a mobile camera phone while it is working to enable the failed lamps to be identified.

7.3.2 Exterior equipment

All the foregoing remarks about maintenance apply equally to exterior lighting, but most of it is not accessible from ground level. Thus ladders or jacking platforms have to be used. Normal bar staff should not be expected to carry out this work. Anyone who does engage in this work should be properly trained and be provided with adequate safety equipment; in many cases it is best handed over to specialist contractors. If it is necessary for ladders or jacking platforms to be used on or near public roads or paths, precautions should be taken to ensure public safety.

Exterior luminaires may need attention more often than those indoors. They may become dirty through weather, accumulations of dead leaves, and bird droppings. If a luminaire controlled by a daylight sensor remains alight during daylight, it is usually because of bird droppings on the sensor. These should be removed at the first opportunity.

Note that if professional window cleaners are used, it may be possible for them to carry out the cleaning and maintenance of exterior luminaires, provided that they are suitably trained.

8 Measures of light

8.1 Luminous flux and illuminance

The basic unit of visible light is the lumen. An incandescent 100 watt bulb has a light output of about 1300 lumens; a five foot fluorescent lamp may have an output of about 6000 lumens. The total amount of light emitted by a lamp is referred to strictly as its luminous flux output. However, we are more usually concerned with the intensity of light falling on a given surface, such as a bar top. That quantity is referred to as the illuminance. It is defined in terms of the amount of light falling on a unit of area. The unit is the lux, which is the illuminance occurring when 1 lumen falls on an area of 1 square metre. The illuminance values found on the desk tops in offices are usually in the order of 300 lux, but in our homes we usually use lower values around 100 lux or so. A surface lit to 1000 lux will appear very bright. Outdoor values are much higher. On an overcast day the illuminance on the ground may be about 5000 lux, whilst in direct sunlight in the latitude of the UK the illuminance will be perhaps 50 000 lux. Moonlight produces an illuminance of about 0.1 lux.

Note that the value of illuminance on a surface usually varies widely from point to point. In the case of a table under a ceiling light, the ratio of that of the brightest point to that of the darkest may be as much as 3:1. When a single value of illuminance is given, it refers to the average value over the whole surface area.

When we speak of the illuminance on a given surface we usually mean a horizontal surface, but there are cases where we have to speak of the illuminance on a vertical surface, e.g. on a board displaying a menu.

8.2 Luminance

We are often concerned with the brightness of a surface as we see it. This can be measured, and it is referred to as the 'luminance' of the surface. The unit of luminance is given in 'candela per square metre' which is abbreviated to cd/m^2. The full definition of luminance is beyond the scope of this guide.

8.3 Light output ratio

Not all of the light emitted by the lamp or lamps within a luminaire emerges from it as useful light. Some is inevitably obstructed by the lampholder and other parts of the luminaire, and some of its surfaces will absorb some light. The ratio of the usable light which emerges from a luminaire to the total amount of light produced by the lamp(s) within it is referred to as the light output ratio of the luminaire. It is always expressed as a percentage, and is abbreviated as LOR. At best the light output ratio can be as high as 85%, but many domestic luminaires have much lower LORs, often as low as 50%.

9 Further reading

Advice on lighting of all kinds is given in *The SLL Lighting Handbook*[6], published by the Society of Light and Lighting, 222 Balham High Road, London SW12 9BS (http://www.sll.org.uk).

The requirements of Part L of the Building Regulations which affect lighting are given in Factfile No. 9[5], which may be downloaded free from the Society's website, see above.

Guidance on emergency lighting is given in the SLL Lighting Guide LG12: *Emergency lighting*[9], obtainable from the Society. Detailed requirements for emergency lighting are set out in BS 5266[7,8].

New Bars & Restaurants 2[16] by Daniela Santos Quartino considers issues of design, including lighting, and may also be of interest.

Note that if professional window cleaners are used, it may be possible for them to carry out the cleaning and maintenance of exterior luminaires, provided that they are suitably trained.

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References

1 Littlefair P J *Solar shading of buildings* BRE Report BR 364 (Garston: BRE Press) (1999)

2 The Building Regulations 2010 Statutory Instruments 2010 No. 2214 (London: The Stationery Office) (2010)

3 The Building (Scotland) Amendment Regulations 2010 Scottish Statutory Instruments No. 32 2010 (London: The Stationery Office) (2010)

4 The Building (Amendment No. 2) Regulations (Northern Ireland) 2010 Statutory Rules of Northern Ireland No. 382 2010 (London: The Stationery Office) (2010)

5 *Lighting and the 2006 Building Regulations* SLL Factfile No. 9 (London: Society of Light and Lighting) (2006)

6 *SLL Lighting Handbook* (London: Society of Light and Lighting) (2009)

7 BS 5266-1: 2005: *Emergency lighting. Code of practice for the emergency lighting of premises* (London: British Standards Institution) (2005)

8 BS 5266-10: 2008: *Guide to the design and provision of emergency lighting to reduce the risks from hazards in the event of failure of the normal lighting supply* (London: British Standards Institution) (2008)

9 *Emergency lighting design guide* SLL Lighting Guide LG12 (London: Society of Light and Lighting) (2004)

10 IEC 60529: *Degrees of protection provided by enclosures (IP Code)* (Geneva, Switzerland: International Electrotechnical Commission) (2001)

11 BS 5499-4: 2000: *Safety signs, including fire safety signs. Code of practice for escape route signing* (London: British Standards Institution) (2000)

12 The Work at Height Regulations 2005 Statutory Instruments No. 735 2005 (London: The Stationery Office) (2005)

13 The Work at Height Regulations (Northern Ireland) 2005 Statutory Rules of Northern Ireland No. 279 2005 (London: The Stationery Office) (2005)

14 The Work at Height (Amendment) Regulations 2007 Statutory instruments No. 114 2007 (London: The Stationery Office) (2007)

15 The Work at Height (Amendment) Regulations (Northern Ireland) 2007 Statutory Rules of Northern Ireland No. 135 2007 (London: The Stationery Office) (2007)

16 Quartino D S *New Bars & Restaurants 2* (London: Harper Collins) (2010)

Foreword

For many years the CIBSE and its predecessor the Illuminating Engineering Society have offered advice and guidance on lighting. Most of that has been directed towards lighting in the workplace, but in an era where responsibility for safety and control of energy use are becoming increasingly important many other types of premises need consideration.

This guide offers advice on lighting in all types of premises where alcoholic beverages are sold for consumption on the premises, which may range from a busy city centre pub to the bar in a working men's club. It also covers the question of energy use — current regulations can nowadays put severe constraints on lighting. It is written in terms that require no specialist knowledge of lighting.

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