Cost-effective lighting for sports facilities:
a guide for centre managers and operators

A well-designed and energy-efficient lighting scheme cuts costs and improves lighting performance.
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Good lighting in sports centres not only makes playing a sport easier and more enjoyable, it can also attract more paying customers.

The long opening hours of most sports centres mean that they are heavy users of lighting. This can result in high energy bills and a significant maintenance commitment. However, by selecting energy-efficient lighting schemes, and making staff aware of good housekeeping practices, energy costs can be reduced substantially. This Guide provides advice at two levels:
- technical information for those responsible for maintaining and designing sports lighting
- good housekeeping advice for sports centre staff – in the pink boxes throughout the Guide.

**Advances in lighting technology**
Many sports centres were built in the 1970s. Since then there have been a number of advances in lighting technology that have made dramatic improvements in the energy efficiency of lighting. These include:
- greater light output for the same or lower electricity consumption
- improved colour rendering quality for a wide range of lamps
- high-frequency ballasts for fluorescent lamps
- the development of compact fluorescent lamps
- improvements in the design of luminaires (light fittings)
- effective and efficient lighting controls.

All these developments, as well as the more competitive market in sports facilities and the need to attract customers, have resulted in a reappraisal of lighting design.

The main ways of achieving a well-designed and energy-efficient lighting scheme are included in this Guide. It concentrates on lighting in multi-purpose sports halls and outdoor lighting, but also gives recommendations on other areas within sports centres.

**Daylight**
Windows not only provide a view to the outside world but, together with rooflights, can provide sufficient daylight for some lights to be switched off during the day. This cuts energy costs. In summer, relying on daylight rather than artificial light can reduce the build-up of heat from the lights, although the problem of solar gain may need to be addressed.

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**THE BUILDING REGULATIONS**
All new lighting installations, and existing ones that are ‘substantially replaced’, must comply with the lighting requirements of the 1995 Building Regulations, Approved Document L[1]. There are two aspects of the Regulations that affect lighting for sport:
- minimum efficacy of lamps*
- lighting controls.

All the lamp types recommended in this Guide are listed as high-efficiency lamps in Table 9 of Approved Document L. A lighting scheme will meet the first of the Building Regulations’ criteria if 95% of the installed lighting capacity uses lamps of the types listed below:
- high-pressure sodium (SON)
- metal halide
- induction lighting
- fluorescent – 26 mm (T8) tubes with low-loss or high-frequency ballast
- compact fluorescent – all ratings over 11 W.

The second requirement is to provide controls locally to ‘encourage the maximum use of daylight and to avoid unnecessary lighting during times when spaces are unoccupied’. All the lighting controls described on page 14 could be used to meet this requirement, although care is needed to comply with the requirement for switching to be provided ‘locally’.

* Efficacy is the ratio of luminous flux emitted by a lamp to the power consumed by the lamp.
Good housekeeping can typically make a saving of 10% of the energy bill. Make someone responsible for going around at set times during the day to check that specific lights are off. For example:
- in the morning, check that external lights are off
- during the day, check that lights are not left on in unused rooms, and where daylight is adequate
- when the centre closes, check that all lights are switched off, except those needed for security.

Posters on good housekeeping are available free from the Department of the Environment, Transport and the Regions (DETR). See back page for details.

Discuss with staff which lights in your centre could be switched off during the day and, if necessary, change the switching arrangements to allow them to be turned off separately. Using automatic lighting controls to switch off lights when no longer needed, e.g., when daylight is sufficient, saves electricity and extends the length of time before lamps need replacing (see page 14 for more details).
MULTI-PURPOSE SPORTS HALLS

There are four important components of a successful and energy-efficient lighting scheme:
- energy-efficient light sources
- appropriate choice of luminaires
- effective positioning of the luminaires
- effective and efficient lighting controls.

Choice of light source

To provide the lighting levels in sports halls which have high ceilings it has been common practice to use powerful 250 W and 400 W high-pressure mercury, sodium (SON) or metal halide lamps. These three lamp types are described below, together with advice on the minor changes that can be made to improve energy efficiency. Figure 1 illustrates the characteristics of these lamp types.

High-pressure mercury lamps have moderate energy efficiency and provide a cool white light but with only fair colour rendering. Colour rendering and energy efficiency can be improved slightly by changing to the ‘de luxe’ mercury lamps.

High-pressure sodium (SON) lamps combine high levels of efficiency with long lamp life.

Switching to ‘plug-in’ SON lamps (see below), which can be used as direct replacements for mercury lamps, will produce about 50% more light with 15% less energy consumption, but at the cost of a yellowish light with poor colour rendering.

Metal halide lamps give excellent crisp white light and good levels of energy efficiency. However, some lamp types have relatively short lives, making relamping costs higher than SON or mercury lamps.

While lighting schemes using these three types of lamp are generally energy efficient, they often have a number of drawbacks, including:
- high-intensity glare from the light fittings
- ‘dark holes’ when a single lamp fails
- relatively poor colour rendering, especially when standard lamps are used instead of the de luxe versions
- uneven light distribution and dark ceilings with some types of ‘high bay’ luminaires
- long restrike times, making the lamps unsuitable for most types of lighting controls.

Careful layout, use of appropriate lamp types and fitting choices (figure 2) will minimise these drawbacks.

### Table: Lamp Characteristics

<table>
<thead>
<tr>
<th>Lamp type</th>
<th>Efficacy (lumens per circuit watt)</th>
<th>Average life (thousands of hours)</th>
<th>Colour rendering index (Ra)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mercury</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>standard</td>
<td>20 40 60 80 100</td>
<td>6 12 18 24</td>
<td></td>
</tr>
<tr>
<td>de luxe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SON</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>standard</td>
<td>20 40 60 80 100</td>
<td>6 12 18 24</td>
<td></td>
</tr>
<tr>
<td>de luxe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>white</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SON plug-in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal halide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1 Lamp characteristics

Lamps with good colour rendering make recognition of coloured court markings easier.
## For high ceilings (over about 7.5 m)

- ‘High bay’ with prismatic reflector and 250 W SON or metal halide lamp
- Use prismatic reflector for light-coloured walls and ceilings
- Prism reflector reduces glare from lamp
- 250 W maximum lamp wattage to minimise glare

## For mounting between 6 m and 7.5 m high

- ‘Low bay’ with prismatic diffuser and 150 W or 250 W SON or metal halide lamp
- Spillage on to ceiling to reduce contrast with bright fitting
- Large surface area of diffuser to reduce glare
- Enclosed angle of light distribution
- Enclosed fitting keeps reflector free from dust
- 55 W compact fluorescent lamp
- Highly polished reflectors to direct light efficiently
- Deep louvres to minimise glare
- Wide distribution of light
- No upward light

## For mounting up to about 6 m

- Tubular fluorescent lamp (T8)
- Highly polished reflectors to direct light efficiently
- Deep louvres to minimise glare
- Wide distribution of light
- No upward light

The luminaire/lamp combinations above are up to 20% more energy efficient than the commonly used aluminium ‘high bay’ fitting with a 400 W mercury lamp.

### Figure 2 Selecting a suitable light fitting – the features to look for

**Choice of light fitting**

Where a new or replacement lighting scheme is being installed, the choice of light fitting has almost as much influence on energy efficiency as the lamp type. The design of the fitting also has a major influence on the quality of the lighting scheme. Figure 2 shows the features to look for when selecting a new fitting.

All fittings should also be robust enough to withstand knocks. Many manufacturers produce light fittings specifically for sports halls.

Lamps with good colour rendering make recognition of coloured court markings easier.
MULTI-PURPOSE SPORTS HALLS

High-frequency ballasts
When fluorescent light fittings are being modified or replaced, it is worth considering specifying high-frequency (HF) ballasts, especially when one ballast serves two lamps. HF ballasts have several advantages over conventional ballasts:

- lower running costs – about 20 to 25% less
- quick, reliable, flicker-free start
- increased lamp life by about 25% means longer relamping cycles and reduced maintenance costs
- no stroboscopic effects
- dimming facilities can regulate light output and so take advantage of daylight.

Unlike discharge lamps, HF fluorescent lighting can be used with a wide range of lighting controls. Grants may also be available for new fittings with HF ballasts; contact the Energy Saving Trust for details (see page 16).

Positioning of luminaires
Most sports need a glare-free, uniform distribution of light over the playing area. Lighting systems that provide a range of illumination levels produce substantial energy savings.

Reflective surface finishes can reduce lighting costs as well as enhance lighting levels; but surfaces which are too light can cause problems for some sports, for example, badminton. It may be possible to zone the lighting so that only those areas requiring illumination at any given time are lit.

Figure 3 illustrates the elements of a good lighting scheme for a multi-purpose sports hall.

Case study
TADCASTER SPORTS CENTRE
The refurbishment of the main hall at Tadcaster Sports Centre included a new lighting system. The new light fittings each have six PL-L 55 W compact fluorescent lamps. They are wired so that two, four or all six lamps can be switched on independently, giving three lighting levels.

The light fittings were developed for use in sports halls where badminton is played. The features of the scheme include:

- fluorescent light source for good colour rendering and quick start-up
- high-frequency ballast for flicker-free light, high energy efficiency, and 12 000 hour lamp life
- multiple lamps in each fitting so that a single lamp failure will not create a ‘dark hole’.

Does the switching allow lights to different sections of the hall to be switched off when not in use?
Where a hall is designed to provide a high level of lighting for championship matches, lighting levels should be switched back to a lower lighting level for general recreational use.
All the lights do not need to be on when the hall is being cleaned. Instruct the cleaners to switch on only a half or a third of the lights for cleaning. If necessary, mark the appropriate switches with a ‘C’.

Figure 3 Features of a good lighting scheme
**SWIMMING POOLS**

As well as choosing energy-efficient light sources, there are a number of important design issues to consider when lighting a swimming pool. These include:

- minimising reflected glare from the light fittings off the pool surface
- selecting a light fitting that resists corrosion
- the colour performance of the lamp.

**Minimising reflected glare**

Glare from light reflected off the pool surface can seriously inhibit pool surveillance and should be minimised wherever possible.

The ideal place to locate the lighting is directly over the pool. This minimises reflected glare and also ensures that the light penetrates to the full depth of the water. Lighting in this position is a suitable option only if it is easily accessible, such as from gantries or a suspended ceiling with ready access from above. Where access from above is not feasible, it may be possible to position lighting so that lamps and luminaires are accessible from the pool side. Figure 4 shows two schemes which achieve this without compromising lighting levels, or causing excessive glare.

**Corrosion**

The humid and corrosive atmosphere in many pool halls means that the correct choice of light fitting is important. Every luminaire is given an ingress protection (IP) rating. This indicates the level of protection it provides against the ingress of water and solid objects.

To avoid the risk of corrosion, light fittings should have:

- a body made of non-ferrous material, such as cast aluminium or polycarbonate
- a rating of IP55 or better (where IP00 means no protection).

**Colour temperature of lamps**

The ‘colour temperature’ of a lamp can affect the colour of the water and how warm people feel. Selecting a lamp with a colour temperature of 3500 K or less (see page 15) will help people to ‘feel’ warm, but may give a greenish appearance to the water. A lamp with a colour temperature of 4000 K or above is more like daylight and gives the water a good blue colour.

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**Good Housekeeping**

Most swimming pools have good daylighting from windows or rooflights. In many cases there will be sufficient daylight to allow some of the lights to be switched off during the day. Make someone responsible for this and, if necessary, change the switching arrangement so that selected lights can be switched off separately. As an example of the savings, if ten 400 W SON lamps are switched off for an average of only 6 hours a day for 360 days a year, there is an energy saving of £604 a year (assuming electricity costs of 7p/kWh).
COST-EFFECTIVE LIGHTING FOR SPORTS FACILITIES

LIGHTING IN OTHER AREAS

Fluorescent lighting is widely used in other areas of sports centres, such as ancillary halls, fitness suites, changing rooms and circulation areas.

Fluorescent lamps combine high energy efficiency with good colour rendering and are ideal for lighting these areas. However, as figure 5 shows, there are wide differences in energy efficiency between different fluorescent lamps. Figure 5 illustrates the following points.

- Within each range of lamps, the larger wattage lamps are generally more energy efficient.
- The slimmer 26 mm (T8) fluorescent tubes use about 10% less electricity than the older 38 mm (T12) tubes for the same light output. New 16 mm fluorescent tubes (TLS) are now available which can give energy savings of 30%.
- The newer triphosphor lamps produce more light than the older halophosphate lamps for the same energy consumption.
- HF ballasts are more energy efficient than conventional wire wound ballasts (see page 8).

Figure 5 Comparison of running costs and light output for different fluorescent lamps

<table>
<thead>
<tr>
<th>Lamp replacement costs (excluding labour costs)</th>
<th>Electricity costs</th>
<th>Annual running costs (£ per year assuming 5800 hours at 7p/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light output</td>
<td>0</td>
<td>£10</td>
</tr>
<tr>
<td>4 x 600 mm long tubes (standard ballast)</td>
<td>old 'white' colour tubes (9000 hours life)</td>
<td></td>
</tr>
<tr>
<td>2 x 1200 mm long tubes (standard ballast)</td>
<td>old 'white' colour tubes (9000 hours life)</td>
<td></td>
</tr>
<tr>
<td>with 2 x slimmer 26 mm tubes</td>
<td>old 'white' colour tubes (9000 hours life)</td>
<td></td>
</tr>
<tr>
<td>with 2 x triphosphor lamps</td>
<td>new triphosphor colour tubes (12-15,000 hours life)</td>
<td></td>
</tr>
<tr>
<td>with 2 x high-frequency ballast</td>
<td>new triphosphor colour tubes with HF ballast (15-18,000 hours life)</td>
<td></td>
</tr>
</tbody>
</table>
Alternatives to tungsten lighting

As well as general fluorescent lighting, most sports centres also have some feature lighting. Tungsten spotlights are frequently used for this. However, more efficient lamp types are available, as shown in figure 6.

Low-voltage dichroic halogen lamps are widely available. They produce a well-defined beam of crisp, white light and are ideal for adding sparkle and creating pools of light. They have two or three times the life of conventional tungsten lamps and consume only half the electricity to produce the same amount of light. They can also be dimmed.

Compact fluorescent lamps (CFLs) are the most energy-efficient alternative to the conventional tungsten lamp, but they provide a less concentrated beam of light. However, with their low electrical consumption, long life and good colour rendering properties, CFLs are a good choice where a compact light source is needed. CFLs can be dimmed only by using an electronic dimming ballast.

<table>
<thead>
<tr>
<th>Lamp replacement costs (excluding labour costs)</th>
<th>£10</th>
<th>£20</th>
<th>£30</th>
<th>£40</th>
<th>£50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of lamp replacement</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>100 W tungsten reflector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1000 hours life)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 W low voltage tungsten halogen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5000 hours life)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 W compact fluorescent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8000 hours life)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 6 Alternatives to tungsten ‘spot’ lamps – comparison of running costs
EXTERNAL LIGHTING

External lighting at sports centres includes:
- amenity lighting of entrance approaches
- security lighting of car parks and open areas around the building(s)
- lighting of outdoor sports facilities.

Amenity and security lighting

Energy-efficient lighting is largely a combination of selecting energy-efficient light sources and choosing fittings that direct the light to where it is needed.

For localised lighting, such as entrance canopies, the CFL is a good choice that is widely used. CFLs are about four or five times more energy-efficient than tungsten lamps and have lamp lives of 8000-10 000 hours compared with 1000 hours for tungsten. Wall-mounted bulkhead fittings or downlighters in canopies are effective for providing local lighting. For lighting pathways, column lighting is much more energy-efficient than bollard lighting.

Where more powerful outdoor lighting is needed, 70 W and 150 W SON lamps are the main choice.

SON lamps are very energy efficient and have long lives – typically 14 000-24 000 hours. The familiar tungsten halogen floodlight, in contrast, has very high running costs and is not recommended for continuous use.

Figure 7 (below) compares running costs for a range of lamps which are used for external lighting, illustrating that changing to more energy-efficient lamps can produce substantial savings.

Floodlighting outdoor sports facilities

There are two choices of energy-efficient light sources for outdoor sports facilities – metal halide and SON. Metal halide is the primary choice because it produces an excellent crisp white light that has good colour rendering and is suitable for television coverage of games. The lamps are efficient, but have a shorter life of 6000 hours, so lamp replacement costs are generally higher than for SON lamps.

SON de luxe lamps, with their golden white light, are suitable where accurate colour rendering is less important. Their main benefit over metal halide lamps is their longer life.

<table>
<thead>
<tr>
<th>Lamp</th>
<th>Electricity costs</th>
<th>Annual running costs (£ per year assuming 2200 hours at 7p/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lamp replacement</td>
<td>0 £10 £20 £30 £40 £50 £60 £70 £80</td>
</tr>
<tr>
<td></td>
<td>costs (excluding</td>
<td>Frequency of lamp replacement</td>
</tr>
<tr>
<td></td>
<td>labour costs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0  1  2  3  4  5  6  7  8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of times lamps need replacing every 3 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(assuming 2200 hours a year)</td>
</tr>
<tr>
<td>500 W</td>
<td>Tungsten halogen</td>
<td>(2000 hours life)</td>
</tr>
<tr>
<td>100 W</td>
<td>SON</td>
<td>(33 000 hours life)</td>
</tr>
<tr>
<td>150 W</td>
<td>SON de luxe</td>
<td>(15 500 hours life)</td>
</tr>
<tr>
<td>250 W</td>
<td>Mercury</td>
<td>(2000 hours life)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(33 000 hours life)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(15 500 hours life)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2000 hours life)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(33 000 hours life)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(15 500 hours life)</td>
</tr>
<tr>
<td>100 W</td>
<td>Tungsten (1350 lumens)</td>
<td>(1000 hours life)</td>
</tr>
<tr>
<td>18 W</td>
<td>CFL (1200 lumens)</td>
<td>(10 000 hours life)</td>
</tr>
</tbody>
</table>

Figure 7 Comparison of running costs for external lighting
The energy costs for lighting a football pitch with 16 x 1 kW metal halide lamps, similar to the scheme illustrated in figure 9, would be about £1.12 an hour, assuming electricity costs of 7p/kWh.

**Avoiding light pollution**

Light travelling up into the night sky (sky glow) or spilling on to neighbouring properties is a form of pollution. The familiar ‘globe’ light is a well-known culprit, with half the light being wasted (see figure 8). Light pollution can be minimised and energy saved by selecting fittings that are specifically designed to minimise the spread of light above the horizontal and which direct light downwards using reflective optics (see figure 9).

All external light fittings should be enclosed to prevent moths flying into the bare lamps, causing cool spots and premature lamp failure. Enclosed fittings are also easier to clean.

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**Figure 8 Lantern lighting – features to look for**

- ‘post top’ clear globe
  - Poor light distribution
  - Heavy light pollution
  - Inefficient use of energy

- ‘post top’ globe with opaque canopy
  - Opaque top redirects some light downwards
  - Lens directs light downwards

- Bracket mounting lantern with reflective optics
  - Polished reflector gives more downward light
  - Asymmetrical reflectors available
  - Very energy efficient

- Minimum light pollution

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**Figure 9 Energy-efficient external lighting – avoiding light pollution**

- Lighting of building helps security
- All light directed downwards
- Light fitting with asymmetrical reflector optics at edge of site
LIGHTING CONTROLS

Make regular checks to see that lighting controls, particularly time switches, are set correctly and not overridden manually. The operation of lighting controls should be ‘fine tuned’ to obtain maximum energy savings but should not inconvenience the users of the building.

At present lighting controls are rarely used in sports centres. This is one area where significant energy savings could be made. Using automatic lighting controls saves electricity and extends lamp life.

Automatic controls fall into three main categories.

- Time switches can switch lights on and off at preset times each day. Solar time switches are useful for controlling external lighting because they adjust the on/off times to coincide with dawn and dusk throughout the year. Prices range from about £25 up to £100.

- Photocell controls switch lights on or off, or dim lights, in response to the level of daylight. Simple external photocells cost as little as £10; more sophisticated ones for internal use are about £20 to £60 each.

Fluorescent lamps are suitable for most forms of lighting control, including dimming. SON, metal halide and mercury lamps have long run-up and restrike times after they have been switched off and are not dimmable. This should be borne in mind when selecting or commissioning suitable lighting controls.

Lighting controls can be used in many ways, often in combination. For example:

- External lights can be switched on by photocell control at dusk and switched off by time switches shortly after the centre closes.

- Movement detectors can switch lights on whenever movement is detected and switch them off after a set period of no movement. A unit to control the lighting in a squash court or changing room costs about £40.

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Lighting controls can be used in many ways, often in combination. For example:

- External lights can be switched on by photocell control at dusk and switched off by time switches shortly after the centre closes.

- Movement detectors can control fluorescent lighting to squash courts, fitness rooms etc.

- Photocells can switch lights off in areas that have good natural daylight.

Lighting levels can be controlled through a dedicated central control package or incorporated into an existing building energy management system (BEMS). The lighting power circuits in a building can be used to send control signals. With this mains-borne signalling method no additional wiring circuits are needed and additional controls can be added in stages. Other systems use dedicated control circuits. The most cost-effective solution will depend on the specific details of the existing installation and control options required.

THE WELSH INSTITUTE OF SPORT, CARDIFF

A sophisticated lighting control system was used in the refurbished hall at the Welsh Institute of Sport. The hall was designed for Olympic standard table tennis, but will also be used for conferences, dinners and presentations.

To cater for the very different lighting needs of these functions, a dedicated building management system was installed to control the lighting. This allows the lighting level to be set at \( \frac{1}{4}, \frac{1}{2}, \frac{3}{4} \) or the full 500 lux lighting level. The high-frequency fluorescent lighting can be dimmed from between 100% to 1% according to need. HF ballasts ensure a flicker-free light, and deep louvres minimise glare, both of which help players to concentrate on their game.

The lighting can be switched from the wall-mounted switches or from a hand-held controller. In emergencies, the lights can be switched up to 100% immediately.

Movement detectors can reduce lighting costs significantly in rooms that are used only intermittently.

Make regular checks to see that lighting controls, particularly time switches, are set correctly and not overridden manually. The operation of lighting controls should be ‘fine tuned’ to obtain maximum energy savings but should not inconvenience the users of the building.
Cleaning and replacing lamps in high positions can be a substantial ongoing maintenance burden, as well as presenting hazards to staff working at height. Access to light fittings should therefore be a high priority when designing new lighting schemes. Where access to lamps is difficult, select lamps with a very long service life.

To ensure that the correct energy-efficient lamps are used in the right light fittings, it is recommended that the maintenance staff prepare a lamp schedule or illustrated sheet identifying:

- which lamps go where
- how frequently lamps should be replaced
- where replacement lamps can be obtained.

Where lamps with different colour temperatures (figure 10) are used in different parts of the centre, this should be noted to avoid a combination of colours in the same room. A quick check of the lighting schedule will enable an energy manager to assess if more energy-efficient alternatives could be used.

The trade price of some powerful discharge lamps is £100 or more, so it is worth looking out for the electrical wholesalers who offer large discounts on lamps. Discounts of over 50% are available, so it is well worth comparing prices.

Keep light fittings clean to prevent the build-up of dust and grime. This is particularly important for external fittings in heavily polluted areas, and for uplighters and cove lighting internally.

Light-coloured surfaces help to reflect light and make a space appear brighter, reducing the need for artificial lighting.

**Lamp replacement**

When replacing a fluorescent tube that has failed, it is also worth replacing its glow starter canister with a new electronic starter. These start the tube without flickering, extend the life of the lamp and so reduce maintenance. They also prevent the lamp from coming on when it has reached the end of its life, avoiding the unsightly flashing on and off, which can be very distracting.

Aim to replace SON and metal halide lamps as soon as they fail. The lamp igniter will continue to try to restart the failed lamp. This can use more electricity than if the lamp was working normally and, in addition, puts enormous strain on the ballast, causing it to fail in extreme cases.

![Colour Temperature of Lamps](image-url)

**Good Housekeeping**

Keep light fittings clean to prevent the build-up of dust and grime. This is particularly important for external fittings in heavily polluted areas, and for uplighters and cove lighting internally.

Light-coloured surfaces help to reflect light and make a space appear brighter, reducing the need for artificial lighting.
REFERENCES AND FURTHER READING

REFERENCES


FURTHER READING

English Sports Council
16 Upper Woburn Place, London WC1H 0QP.
Tel 0171 388 1277. Fax 0171 383 5740
- Guidance Note 370: Floodlighting
- Guidance Note 383: Sports halls – lighting

Chartered Institution of Building Services Engineers (CIBSE)
Delta House, 222 Balham High Road, London SW12 9BS.
Tel 0181 675 5211. Fax 0181 675 5449
- The Code for interior lighting (1994)
- Sports lighting guide (LG4: 1990)
- Lighting requirements of Building Regulations Part L (GN4:1996)

The Institution of Lighting Engineers
Lennox House, 9 Lawford Road, Rugby CV21 2DZ.
Tel 01788 576492. Fax 01788 540145
- Guidance Notes on avoiding light pollution

BRE
CRC Communications Ltd
151 Rosebery Avenue, London EC1R 4QX
Tel 0171 505 6622. Fax 0171 505 6606
- IP6/96 People and lighting controls
- Digest 272 Lighting controls and daylight

ENERGY HELPLINE

Energy Saving Trust (EST)
11-12 Buckingham Gate,
London SW1E 6LB.
For Helpline telephone 0990 133538

DETR ENERGY EFFICIENCY BEST PRACTICE PROGRAMME DOCUMENTS

Good housekeeping posters
Posters and stickers about saving energy are available free from the Department of the Environment, Transport and the Regions, Blackhorse Road, London SE99 6TT.
Tel 0181 691 9191

The following publications from the Department of the Environment, Transport and the Regions’ Energy Efficiency Best Practice programme are available from BRECSU Enquiries Bureau (see below for details).

Good Practice Guides
160 Electric lighting controls – a guide for designers, installers and users
211 Drawing a winner. Energy efficient design of sports centres

General Information Report
35 Daylighting for sports halls. Two case studies

The Government’s Energy Efficiency Best Practice programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice programme are shown opposite.

Visit the website at www.energy-efficiency.gov.uk
Call the Environment and Energy Helpline on 0800 585794

For further specific information on:
Buildings-related projects contact: Enquiries Bureau BRECSU Garston, Watford WD25 9OX
Tel 01923 664258 Fax 01923 664787 E-mail brecsuenq@bre.co.uk

Industrial projects contact: Energy Efficiency Enquiries Bureau ETSU Harwell, Oxfordshire OX11 0RA
Tel 01235 436747 Fax 01235 433066 E-mail estuenq@abt.co.uk

ENERGY CONSUMPTION GUIDES: compare energy use in specific processes, operations, plant and building types.

GOOD PRACTICE: promotes proven energy-efficient techniques through Guides and Case Studies.

NEW PRACTICE: monitors first commercial applications of new energy efficiency measures.

FUTURE PRACTICE: reports on joint R&D ventures into new energy efficiency measures.

GENERAL INFORMATION: describes concepts and approaches yet to be fully established as good practice.

FUEL EFFICIENCY BOOKLETS: give detailed information on specific technologies and techniques.

INTRODUCTION TO ENERGY EFFICIENCY: helps new energy managers understand the use and costs of heating, lighting, etc.

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