



(August 2022)



The countryside charity
London

Working for a greener city

PROTECTING THE NIGHT: Dark Skies and Artificial Light in the City

City dwellers the world over are used to living in an environment where light from streetlamps, neon signs, transport hubs, shop windows, and so on all combine to create a brightly-lit urban environment where the 'sun never sets' and life can continue, unimpeded by darkness, 24/7. But what if that were not good for us?

There is increasing evidence that artificial light at night is harmful to both the environment and human health. Blue-rich light, such as that emitted by many modern LEDs, including the new 4000K street lights being rolled out across the capital, is particularly disruptive.

What can be done? Clearly, problems like unnecessarily bright streetlights require legislation. However, there is much we can already do as individuals, in our own homes and neighbourhoods, to make a difference. It is less about switching off lights and more about using light wisely.

Buying exterior lighting can be difficult, particularly as we tend to do it in daylight so cannot see the impact it would have in the dark. This lighting guide has been put together, with the aim of helping residents make informed, environmentally-sensitive choices that will contribute to protecting the environment and our health. It has been developed with the help of the Commission for Dark Skies (CfDS). We hope that you will find it useful.

To summarise, there are 5 essential principles to good external lighting:

Principles of good external lighting

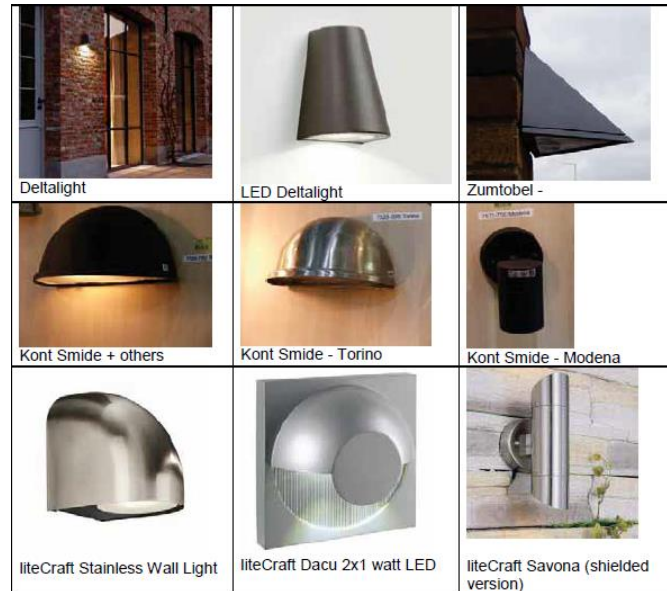
The 5-Star principles of good external lighting are :

1. DESIGN EXCELLENCE : seek innovative lighting design solutions to light responsibly★
2. DOWNWARD AND SHIELDED : light only when and where it is needed. ★★
3. LIMIT BRIGHTNESS: dazzle is detrimental to safety, health, and our environment. ★★ ★
4. USE WARM LIGHTING HUES: be good to ourselves and the rich biodiversity around us. ★★ ★★
5. ACTIVELY MANAGE: sign up to a culture of continuous improvement in environmental management. ★★ ★★ ★

Bath Starlit Skies Alliance

1. DESIGN EXCELLENCE : innovative designs to light responsibly

Well-designed, innovative light fittings prevent light from spilling outside where it is needed. Good lighting practice guidelines recommend that light fittings be downward facing and fully shielded. Some examples are given below. *N.B.* the key is that the light bulb cannot be seen.



Northumberland Dark Sky Park Exterior Lighting Master Plan

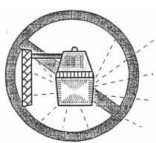
2. DOWNWARD AND SHIELDED : Light when and where it is needed

2.a Lanterns

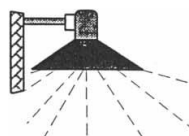
Many of us will have inherited traditional porch lights. These are often lanterns. Whilst they may give a suburb a period look, they allow light to escape upwards into the night sky and outwards into the wider environment rather than concentrating it downwards where it is needed.

Lanterns can be easily modified by :

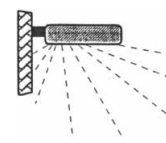
- * painting the sides black;
- * using an E27 to GU10 adaptor and a GU10 bulb on top/down fittings (*see Appendix*);
- * using a low Kelvin, low Lumen light bulb (such as Philips Classic 2.3W, 2000K, 125 Lumen or Philips Lustre 2200K, 325 Lumen) and only using the lights when needed or on a PIR sensor;
- * using a simple rotary dimmer where the switch is; or
- * changing the light fitting to one that directs light downwards and is fully shielded, for example :



Change this ...



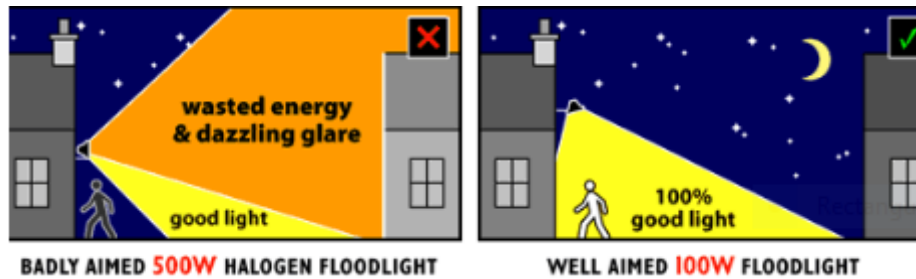
... to this...



...or this

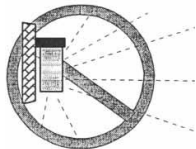
2.b Bulkheads (wall-mounted lights) and Spotlights

Bulkheads and spotlights are often much brighter than needed and are also incorrectly installed by electricians (they should be fitted with light going only downwards). By fitting visors or angling spotlights downwards, light can be spread more effectively with less bright bulbs.

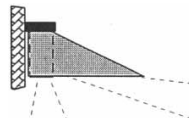
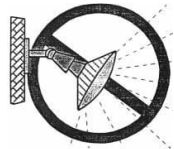


CfDS

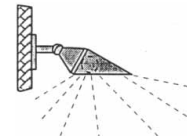
Bulkheads and Spotlights can be modified by...



directing the light downwards and



... installing visors
IDA



(1) Beware when buying spotlights – some on the market cannot be angled and almost all are brighter than necessary (see **'Security'** below). They should be less than 3000K. The CCT of LED spotlights can be modified using LEE filters (see Appendix)

(2) Spotlights with integral sensors usually only work if the light is angled outwards: it is therefore better to buy a separate light fitting and sensor. If you happen to have a spotlight that cannot be angled, it can be made to point downwards by adding a wedge.

2.c Uplighters and Downlighters



Uplighters send light up into the eyes of passers-by, the night sky and potentially into neighbouring homes. They are best avoided.



Downlighters in eaves create unnecessary, additional illumination and are best avoided.

2.d LIGHT WHEN IT IS NEEDED

Using timers can help to contain the amount of light used. Some people like sensors; however, they can be triggered by passing animals and the wind.

2.e 'SECURITY' LIGHTING : Less is more!

There is a popular misconception (promoted by manufacturers and electricians) that brighter light is better for security. In fact the opposite is true. At night we are dark-adapted and therefore need very little light to see. Bright light can literally 'blind' us by bleaching our vision (think car headlights). It

also creates areas of deep shadow where miscreants can hide. The following video and photos illustrate this :

www.darksky.org/light-pollution/lighting-crime-and-safety/

<http://www.nachhaltig-beleuchten.de/blog/en/how-to-lit-a-street-safely-and-how-to-effectively-blind-the-people/>

https://britastro.org/dark-skies/cfds_advice.php?topic=security

illinoislighting.org/crime.html (listed under the internet heading Outdoor Lighting and Crime Prevention)

2.f SKYLIGHTS

Installing (and using!) blinds on upward-facing windows also helps reduce light pollution.



Left to right : (1) no blind; (2) internal venetian blind; (3) internal and external blind

3. LIMIT BRIGHTNESS : Dazzle is detrimental to safety, health and the environment

The brightness of a bulb is determined by its Lumen output (formerly Wattage). Light bulbs are often sold as being 'watt equivalent'. This is somewhat misleading: one '60W equivalent' can in fact be much brighter than another as old Watts correspond to a range of Lumens and can therefore be more or less bright.

Old Watts	Approx. Lumens
25 W	230 – 270 spotlight
35 W	250 – 280 spotlight 200 – 300 Useful Lumens (spotlight) 390 – 410 lamp
40 W	440 – 460 lamp
50 W	330 – 400 spotlight 350 – 450 Useful Lumens (spotlight)
60 W	800 – 850 lamp
75 W	1000 – 1100 lamp
100 W	1500 – 1600 lamp

HOW MANY LUMENS ARE NEEDED?


The IDA (International Dark-Sky Association) and CfDS recommend that outdoor lighting should not exceed 35 lumens/m² of illuminated target surface and ideally be as low as 10. By way of comparison, the full moon is about ¼ of a lumen per square metre!

Please avoid 'dusk to dawn' light bulbs: in bad weather they can stay on all day!

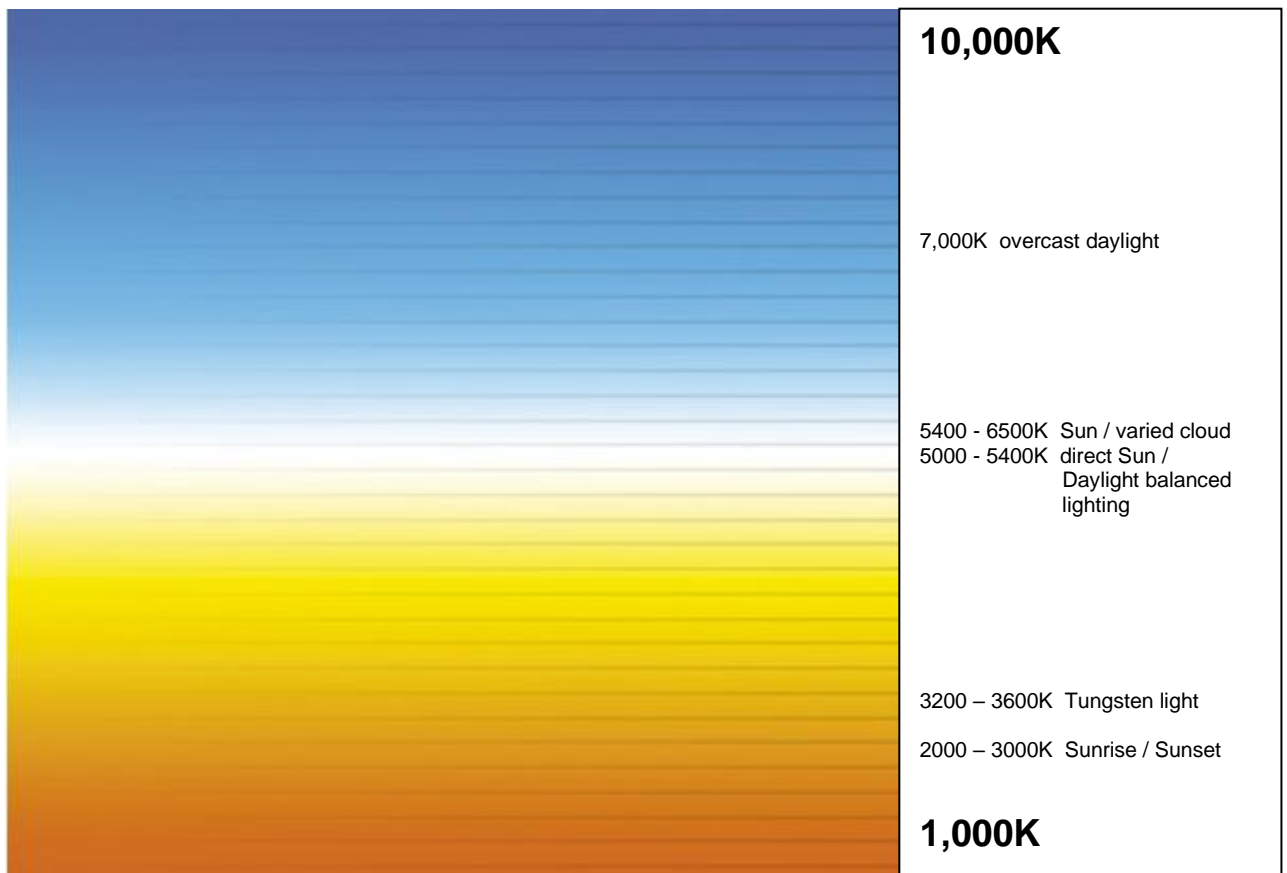
GLOW STONES

An intriguing lighting option are Glow Stones. These are solar-powered stones that can be used to delineate a garden path and steps. Someone at CfDS even uses two green ones as starry 'eyes' to keep deer out of his garden! For further information go to : <https://www.glowstones.com/>

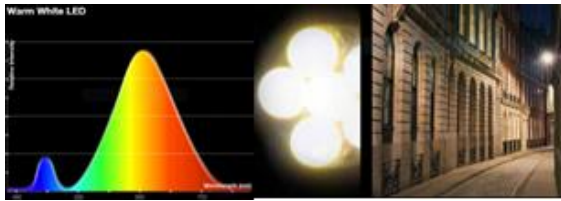
4. USE WARM LIGHTING HUES : LEDs and Colour Temperature (aka Kelvins)

 Beware! - nowadays, many light fittings come with integral LEDs that are startlingly white (in excess of 3000K). These LEDs contain a significant amount of blue that is detrimental to the environment (fauna and flora) as well as human health.

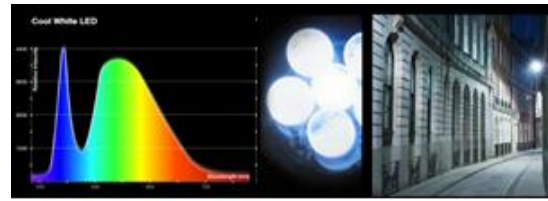
If you are unable to find an LED light fitting with less than 3000K then either choose a fitting with amber LEDs (bearing in mind the number of Lumens - see 3 above) or, better still, one where you can change the bulb. Choosing lighting with a colour temperature of less than 3000K (and preferably as low as 2000K) is being good to the environment and good to ourselves. It still provides adequate lighting. (see D. 'SECURITY' LIGHTING above):



Kelvins : the theory



Kelvins : "Warm White" less than 3000K



Kelvins "Cool White" more than 3000K

Speirs and Major

5. ACTIVELY MANAGE

LED lighting is changing rapidly and new technology is coming on the market all the time. We all need to keep abreast of developments and be willing to re-assess our exterior lighting from time to time.

6. ENVIRONMENTALLY FRIENDLY LIGHT FITTINGS

Environmentally friendly domestic, commercial and public light fittings can be obtained from Dark Sky Lighting Ltd (DSL*) <https://www.darkskylighting.co.uk/> DSL is the UK brand partner of the International Dark Sky Association (IDA) and all light fittings have IDA Fixture Seal of Approval (IDA FSA).

**DSL was set up in response to feedback from end users who were finding it difficult to navigate some lighting manufacturers' websites to find compliant and friendly lighting as it is often buried within other ranges with product identification or specification codes that are confusing, particularly where other colour temperatures or mounting options are available.*

7. FILTERS: ALTERING CCTs WITHOUT CHANGING LIGHT FITTINGS (RETROFITTING)

It will be apparent from Section 1 of this guide, that the correlated colour temperature (CCT) of a light is critical. The CCT of existing LED lights can be tuned downwards by using filters. LEE Filters are amongst the best in the industry and can be obtained either directly from LEE Filters [Zircon for LED - LEE Direct \(leefiltersdirect.com\)](http://www.leefiltersdirect.com) or through DSL (see 6 above) <https://www.darkskylighting.co.uk/> . They are a quick, cheap and effective way of reducing the CCT of a light without the need for changing it before its time. They are available in 24in x 24in (61cm x 61cm) sheets and 10ft x 4ft (3.05m x 1.2m) rolls which currently retail at £6.24 and £62.40 respectively.

8. LIGHT BULBS AND ADAPTORS

Subject to modification

When buying light bulbs, it pays to go to a big brand name such as Philips, Osram, Sylvania, Bell or General Electric as the quality of light (strength and colour) is more consistent from light bulb to light bulb. Look for the CRI number, it should be no less than 80.

More work is needed by manufacturers for there to be an appropriate selection of low CCT bulbs. In the meantime, the following are various light bulbs and adaptors currently available: some would need dimming. With the exception of the E27 to GU10 adaptor, they are all made by Philips. Further information on available light bulbs can be found here: <https://www.lighting.philips.co.uk/prof/led-lamps-and-tubes/led-bulbs/classic-filament-ledbulbs>

The CCT of any outdoor light source should not exceed 2700K and dimmable bulbs should ideally be dimmed to the lowest CCT possible.

a) **BAYONET B22 FITTING**



1. **Extra Warm White : Philips Classic LED A60 Non-dimmable Light Bulb, B22, 2.29W, Gold 2000K, 125 lumens** <https://www.amazon.co.uk/Philips-LEDclassic-Lamp-Glass-Flame/dp/B073FNDD2C>



2. **Warm White : Philips CLA LEDBulb DT 5-40W B22 CR190 A60 CL Dimmable 2700 – 2200K 470 lumens** <https://www.amazon.co.uk/Philips-Classic-Clear-Bayonet-Dimmable/dp/B08K2Z2ZWJ>



3. **Warm White : Philips LEDBulbs DT5-40W B22 CR CR190 A60 FR Dimmable 2700-2200K / 470 lumens** https://www.lightbulbs-direct.com/philips-led-11w-gls-b22-corepro-2700k-warm-white-opal/?gclid=Cj0KCQjw0oyYBhDGARIsAMZEuMt945aZcJh1x1ZUwdAchYABDO2LkVR_OISECN LyxPh3NbtI44ONtPkaArR6EALw_wcB

b) **SCREW E27 FITTING**



1. **Warm White : Philips LED Lamp (Dimmable) 3.5W-15W E27 Flame Dimming 2000K / 136 lumens** <https://www.argos.co.uk/product/8905310>



2. **Warm White : Philips LED Lamp (Dimmable) 5.5W-25W, E27, Dimming**
2000K / 250 lumens <https://www.argos.co.uk/product/8539250>



3. **CLA LED Bulb DT 5.5-40W A60 E27 CL**
2700-2200K / 470lm <https://lightsave.co.uk/philips-cla-ledbulb-dt-5-5-40w-a60-e27-cl.html>



4. **CLA LED Bulb DT 5-40W E27 CR190 A60 FR**
2700K 470lm <https://www.amazon.co.uk/Philips-lamp-replaces-Watt-Kelvin/dp/B00L5FBYVI?th=1>

- c) **E27 to GU10 ADAPTOR** (available from : <https://www.ledkia.com/uk/>)

Downward-facing E27 screw fittings can be adapted for use with GU10 bulbs. This has much the same effect as having a downward-facing, fully-shielded light fitting.



- d) **GU10 BULBS**



Philips LED Spot 2.6W-35W GU10 Warm White, Dimmable
2200K to 2700K, 230 Lumens <https://www.lighting.philips.co.uk/consumer/p/led-spot--dimmable-/8718699774110/specifications>



Philips LED Spot (Dimmable) 3.8W-50W, GU10 from warm to extra warm white, Dimmable
2200K to 2700K, 345 lumens <https://www.lighting.philips.co.uk/consumer/p/led-spot--dimmable-/8718699776459/specifications>

FOR LIGHT FITTINGS, FILTERS AND BULBS :

IDA Approved domestic, commercial and public lighting solutions:

Dark Sky Lighting Ltd (IDA FSA) : <https://www.darkskylighting.co.uk> (IDA Fixture Seal of Approval)

IDA Approved filters:

Lee Filters : [Zircon for LED - LEE Direct \(leefiltersdirect.com\)](http://www.zirconforled.com)

Other:

Amazon : <https://www.amazon.co.uk/>

Any Lamp BV : <https://www.any-lamp.co.uk/>

CP Lighting & Interiors : <http://www.cp-lighting.co.uk/>

Ledkia : <https://www.ledkia.com/uk/>

Light Save : <https://lightsave.co.uk/>

Philips : <https://www.lighting.philips.co.uk/consumer/choose-a-bulb>

FOR FURTHER INFORMATION :

American Medical Association : <https://www.ama-assn.org/press-center/press-releases/ama-adopts-guidance-reduce-harm-high-intensity-street-lights>

Biological Conservation : <https://www.sciencedirect.com/science/article/pii/S0006320719307797?via%3Dihub>

Campaign to Protect Rural England (CPRE) : www.nightblight.cpre.org.uk/

Commission for Dark Skies (CfDS) : www.britastro.org/dark-skies/ and https://britastro.org/dark-skies/pdfs/CfDS_booklet_Rev07.pdf

International Dark-Sky Association (IDA) : www.darksky.org/

* Starlit Skies: starlitskies.org.uk/

Published: 28 August 2020

Updated : 22 August 2022

Author : ICFicker

