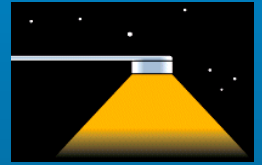




The British Astronomical Association's
Campaign for Dark Skies



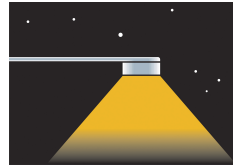
Lighting guidelines

The following lighting guidance and advice has been put together by the lighting experts of the Campaign for Dark Skies.

Following this advice will save money, increase health and safety, and minimise the amount of light wasted into the night sky, allowing every to see the inspiring view of a night sky full of stars.



The British Astronomical Association's Campaign for Dark Skies



Lighting guidelines

Summary of advice for efficient lighting

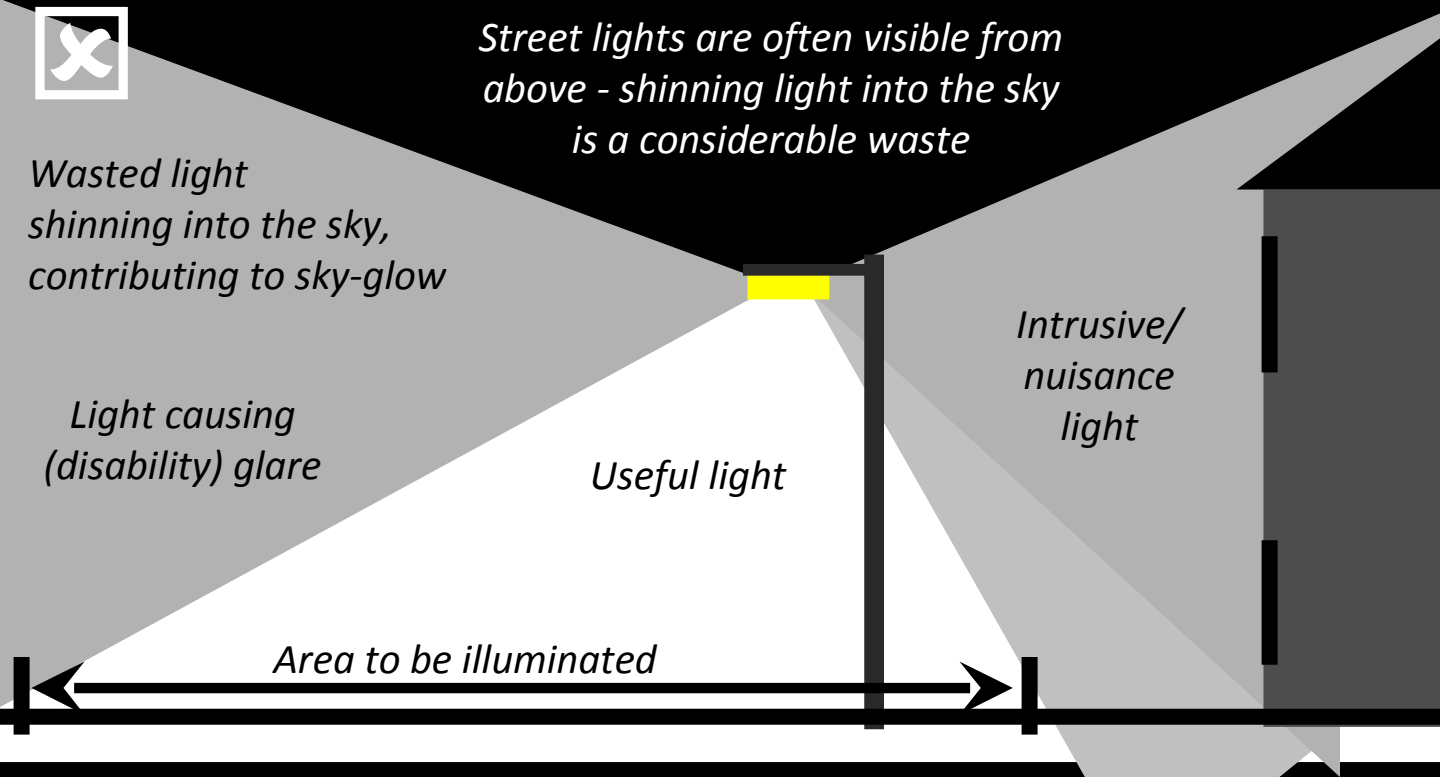
- Lights should shine only *where* needed
 - With the exception of aircraft runways, lights should always shine downward, towards the target
 - Lights should be shielded from shining into neighbouring homes, to avoid causing nuisance and a range of health problems
 - Lights should not shine onto peoples property without their permission
- Lights should only shine *when* needed
 - Lighting is simply not needed in the vast majority of areas over-night. Often, not a single person will pass by a light between midnight and 5am.
- These guidelines should be applied everywhere
 - Inefficient lighting in either urban or rural locations can be visible for many miles
 - Wasted light is wasted money – approximately £1bn per annum is wasted by inefficient lighting in the UK alone

Street lighting ^{1/3}

Inefficient street lighting is still the main contributor to light pollution, shining into people's homes and into the sky, causing the orange smog (sky-glow) that hangs over urban areas that can be seen for many miles.

- Only full cut-off lighting should be used in lighting streets. These provide excellent spread along the street, and prevent light being wasted into the sky. Because they are more efficient, often less FCO lights are required compared to bowled lighting.

Below: Typical inefficient street lighting showing a sag lens non cut-off lamp

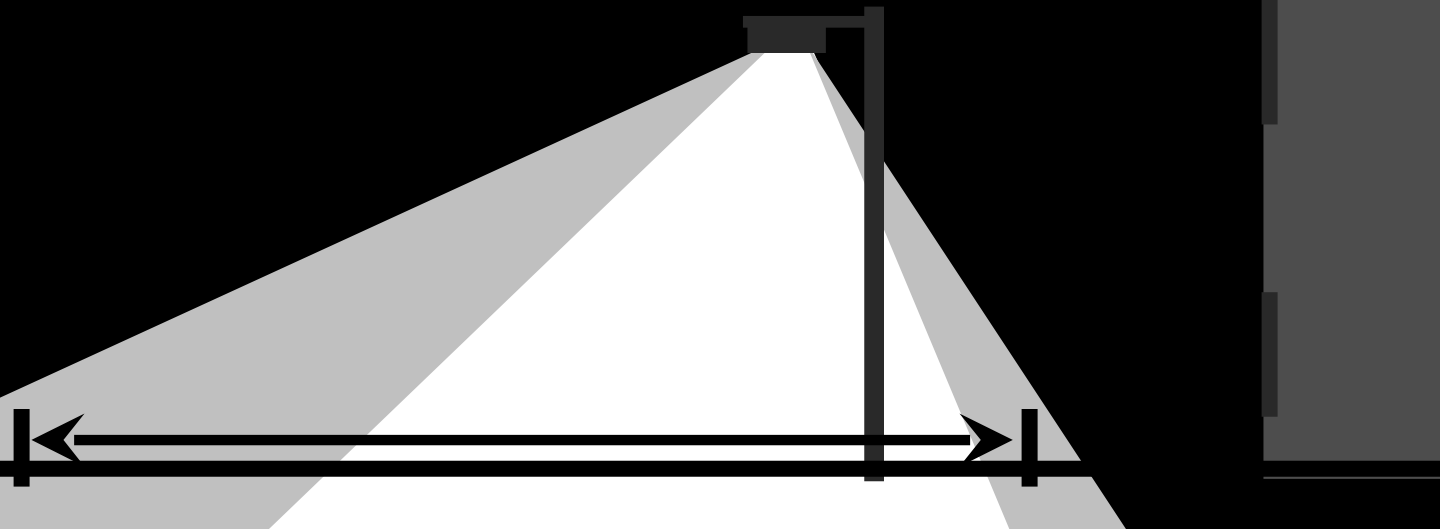


Street lighting 2/3

- Street lights should be shielded to prevent light spilling into people's homes and properties
- Street lights should be dimmed overnight, when few (if any) cars or people are around. Such technology also allows newer (cleaner and brighter) lights to be run at lower power. In testing*, significant dimming (over 30%) and energy savings were achieved without being noticeable by the public.



Below: Typical efficient full-cut off street lighting, with shields



Street lighting 3/3

- Contemporary lighting using reflectors are very inefficient and so should be avoided. Much of the light shining upwards is wasted, shining either side of the reflector, and a large amount of the light is scattered with little control of where the light ends up. Also, as both the reflector and lamp accumulates dirt, they dim more rapidly than other forms of street lighting.

Below: Contemporary reflecting street lighting is very inefficient, shining light directly into the sky.



Light wasted directly into the night sky

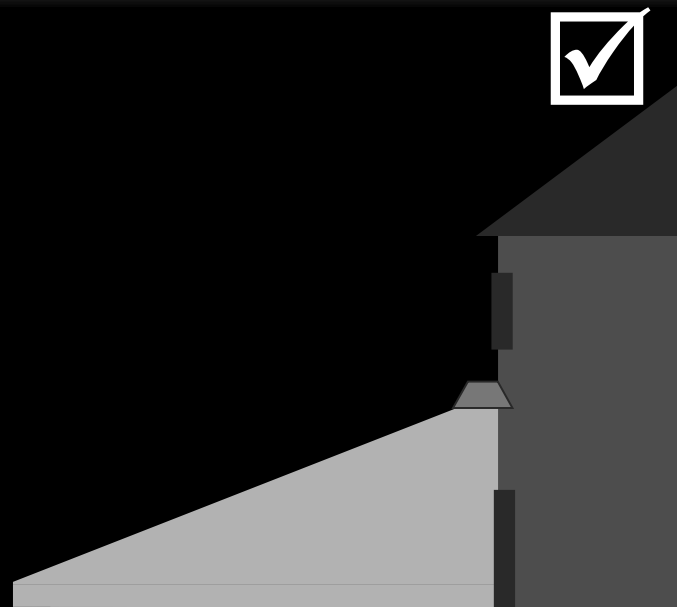
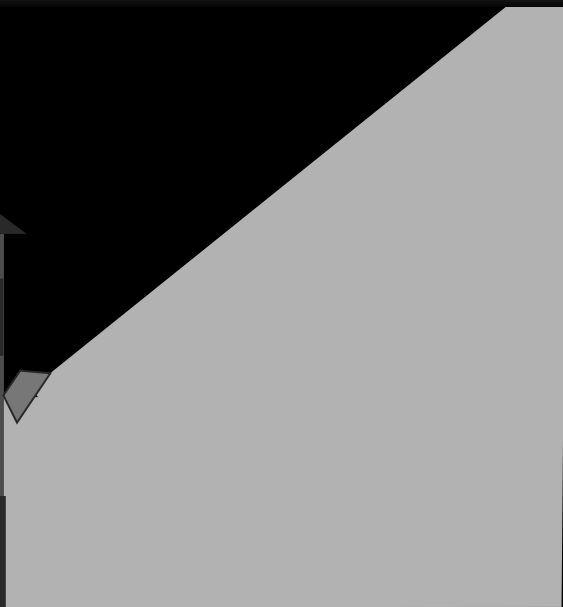


Only a fraction of the light produced is reflected towards the ground, and this fraction reduces as dirt builds up over time.



Home & business floodlighting

- Flood lights are expensive to run due to their usual high wattage. While 500W may be suitable for a sports field, it is 10-20 times that required in a typical domestic setting.
- Flood lights are very inefficient, shining light over a wide area rather than just where it is required. Their intense glare can hide criminal activity.
- In 2000, a pedestrian was killed in Oxford when a car driver was blinded by a pub floodlight.
- If flood lightings is unavoidable, ensure that the light shines downwards, only to where the light is required, and not onto neighbouring homes and property.
- According to the UK Government Crime-prevention website, the popularity of floodlighting is "...unfortunate, as in many locations it is inappropriately installed and other forms of lighting could make for a better choice."





Business lighting

- Unshielded bulkhead lighting should be avoided, since the majority of the light actually shines into people's eyes, causing glare which can actually make an area less visible. This is especially dangerous near moving vehicles, and criminals have broken into buildings directly beneath such lights, using the glare to conceal their criminal activity.
- Shielded bulkhead lighting, that only shines light down where it is needed, is recommended for safety, security and economic reasons.

Below: Good and bad examples of bulkhead lighting



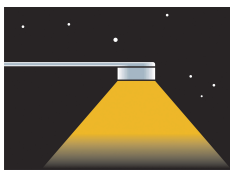
Unshielded bulkhead lights are very inefficient, as only a small fraction of the light shines where it is needed



Shielded bulkhead lights are much more efficient, minimise glare and so are safer.



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Lighting guidelines

Summary of problems cause by inefficient lighting

- **Health**
 - In 2009, the American Medical Association called for a national effort to understand the effects of light pollution on humans. There is now significant evidence showing that light at night can disrupt the body's production of the brain hormone melatonin, which in turn increases the risk of developing breast cancer. Light at night also leads to restless nights and psychological stresses.
- **Economical**
 - Over £1bn per annum is wasted in the UK through inefficient outdoor lighting.
- **Environmental**
 - A vast amount of carbon dioxide is needlessly pumped into the atmosphere to generate the electricity that is wasted by inefficient lighting. Lights at night have a detrimental effect on nocturnal wildlife that has evolved to take advantage of the night (e.g. bats, moths, etc.), and also keep daytime creatures (such as birds) awake throughout the night, without rest.
- **Crime**
 - Lighting can assist criminals in what would otherwise be unfamiliar territory.
- **Dangers**
 - Fatal accidents have occurred when lights have blinded car and aircraft pilots. Research has shown that people drive faster under lit roads, and accidents often involve impact with street lighting columns.