



# The Institution of Lighting Engineers

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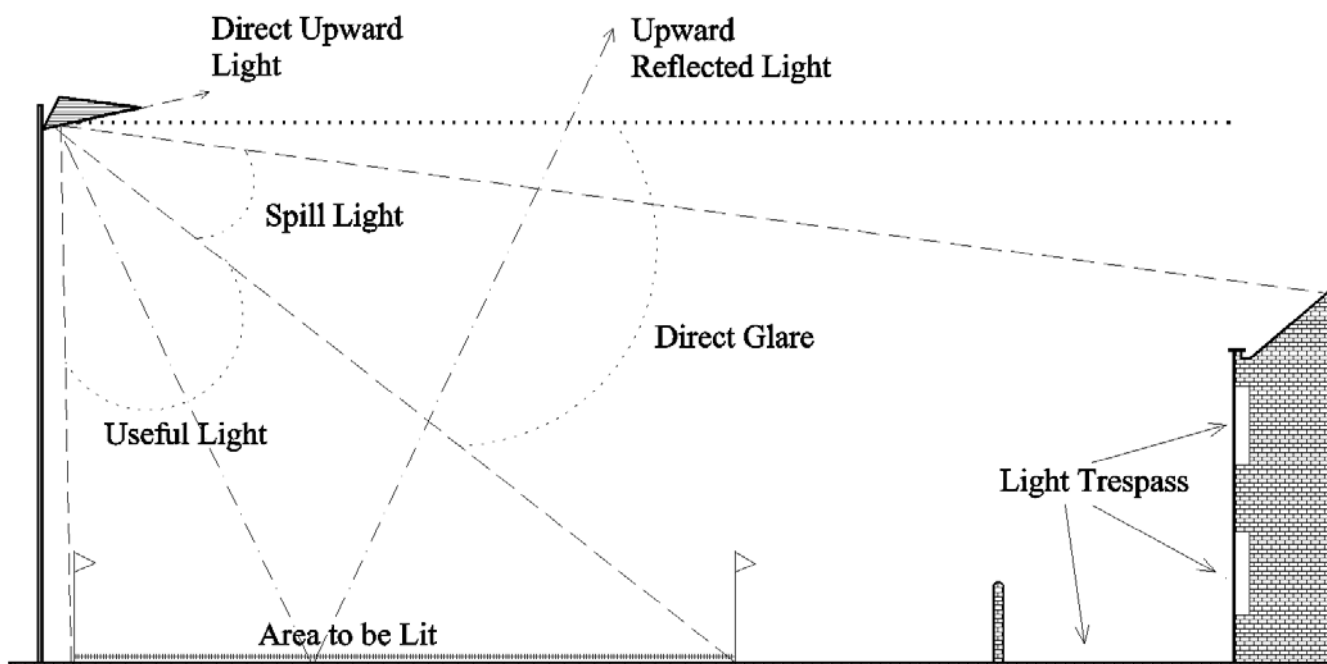
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## GUIDANCE NOTES FOR THE REDUCTION OF LIGHT POLLUTION

ALL LIVING THINGS adjust their behaviour according to natural light. Man's invention of artificial light has done much to safeguard and enhance our night-time environment but, if not properly controlled, **obtrusive light** (commonly referred to as light pollution) can present serious physiological and ecological problems.



**Light pollution**, whether it keeps you awake through a bedroom window or impedes your view of the night sky, is a form of pollution and could be substantially reduced without detriment to the lighting task.

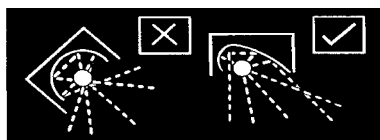
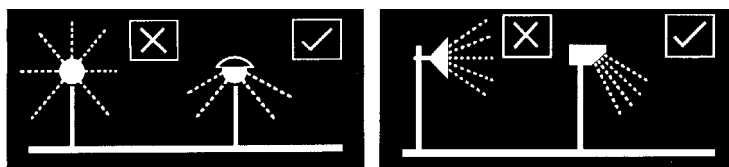
**Sky glow**, the brightening of the night sky above our towns and cities, **Glare**, the uncomfortable brightness of a light source when viewed against a dark background, and **Light Trespass**, the spilling of light beyond the boundary of the property on which the light source is located, are all forms of obtrusive light. This is not only a nuisance, it wastes electricity and thereby large sums of money, but more importantly it helps destroy the Earth's finite energy resources, resulting in the unnecessary emissions of greenhouse gases.

Listed below are some easy ways to reduce the problems of unnecessary, obtrusive light:

[A1] Do not "over" light. This is a major cause of light pollution and is a waste of money. There are published Standards for most lighting tasks. Organisations from which full details of these standards can be obtained are given on the last page of this leaflet.

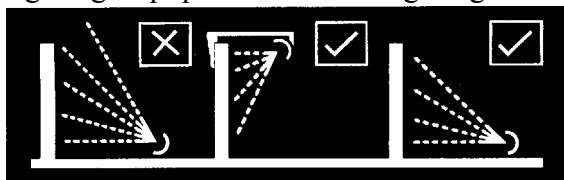
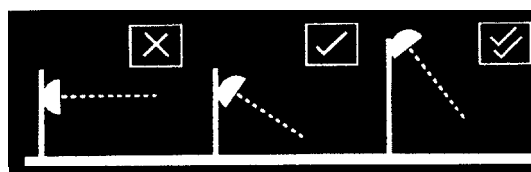
[A2] Switch off lights when not required for safety, security or enhancement of the night-time scene. In this respect one can introduce the concept of a curfew, i.e. a period in which more restrictive controls are applied to obtrusive light. In all new developments there is scope for Local Planning Authorities (LPA's) to impose conditions relating to curfew hours in determining planning applications. For instance, the LPA may determine that non-essential lighting, such as decorative floodlighting, should be switched off between 23.00hours and dawn. In the case of new non-residential developments, LPA's are encouraged to impose such curfews. In determining applications for illuminated advertisements, it is recommended that LPA's impose similar curfew hours. The attachment of domestic security and decorative lighting to residential buildings often does not require planning permission. However, as the floodlights are operational throughout the night it is considered that the after curfew levels of lighting control shown in Table 1 should be used at all times.

[A3] Use specifically designed lighting equipment that minimises the upward spread of light near to, or above the horizontal. Care should be taken when selecting luminaires to ensure that the units chosen will reduce spill light and glare to a minimum. The use of luminaires with double-asymmetric beams designed so that the front glazing is kept at or near parallel to the surface being lit will assist in the reduction of glare provided the units are correctly aimed. Similarly, modern well-controlled projector type luminaires, which can be aimed very precisely, can give an excellent cut-off beyond the lit area so reducing spill light and glare.



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[A4] Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is kept below 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. In areas with low ambient lighting levels, glare can be very obtrusive and extra care should be taken when positioning and aiming lighting equipment. When lighting vertical structures such as advertising signs direct light downwards, wherever possible, to illuminate them not upwards. If there is no alternative to up lighting, then the use of shields, baffles and louvres will help reduce spill light around and over the structure to a minimum.



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[A5] For road lighting installations, light near to and above the horizontal should be minimised to reduce glare and visual intrusion (Note ULRs in Table 1). The use of full horizontal cut off luminaires installed at 0° uplift will minimise visual intrusion within the landscape as well as upward light. However in many urban locations luminaires fitted with a shallow bowl providing good control of light near to and above the horizontal can provide a satisfactory solution whilst maximising the spacing of the luminaires.

**ENVIRONMENTAL ZONES:**

It is recommended that in their Development Plans, Local Planning Authorities specify the following environmental zones for exterior lighting control.

<b>Category</b>	<b>Examples</b>
<b>E1: Intrinsically dark areas</b>	National Parks, Areas of Outstanding Natural Beauty, etc
<b>E2: Low district brightness areas</b>	Rural or small village locations
<b>E3: Medium district brightness areas</b>	Small town centres or urban locations
<b>E4: High district brightness areas</b>	Town/city centres with high levels of night-time activity

Where an area to be lit lies on the boundary of two zones or can be observed from another zone, the obtrusive light limitation values used should be those applicable to the most rigorous zone.

<b>TABLE 1 – OBTRUSIVE LIGHT LIMITATIONS FOR EXTERIOR LIGHTING INSTALLATIONS</b>							
<b>Environmental Zone</b>	<b>Sky Glow ULR [Max %]</b>	<b>Light into Windows <math>E_v</math> [Lux] (1)</b>		<b>Source Intensity I [kcd] (2)</b>		<b>Building Luminance Before curfew (3)</b>	
		<b>Before curfew</b>	<b>After curfew</b>	<b>Before curfew</b>	<b>After curfew</b>	<b>Average, L [cd/m<sup>2</sup>]</b>	<b>Maximum L [cd/m<sup>2</sup>]</b>
<b>E1</b>	<b>0</b>	<b>2</b>	<b>1*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>E2</b>	<b>2.5</b>	<b>5</b>	<b>1</b>	<b>20</b>	<b>0.5</b>	<b>5</b>	<b>10</b>
<b>E3</b>	<b>5.0</b>	<b>10</b>	<b>2</b>	<b>30</b>	<b>1.0</b>	<b>10</b>	<b>60</b>
<b>E4</b>	<b>15.0</b>	<b>25</b>	<b>5</b>	<b>30</b>	<b>2.5</b>	<b>25</b>	<b>150</b>

- Where:**
- ULR** = **Upward Light Ratio of the Installation** and is the maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky. (formerly UWLR)
  - $E_v$**  = **Vertical Illuminance in Lux normal to glazing**
  - I** = **Light Intensity in Candelas**
  - L** = **Luminance in Candelas per Square Metre**

**Notes:**

- (1) **Light Into Windows** – These values are suggested maximums and need to take account of existing light trespass at the point of measurement.

\* Acceptable from public road lighting installations **ONLY**.

- (2) **Source Intensity** – This applies to each source in the potentially obtrusive direction, *outside* of the area being lit. The figures given are for general guidance only and for some large sports lighting applications with limited mounting heights, may be difficult to achieve. If the aforementioned recommendations are followed then it should be possible to further lower these figures.

- (3) **Building Luminance** – This should be limited to avoid over lighting, and relate to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent floodlights or floodlights fixed to the building but used to light an adjacent area.

These limitations may be supplemented by a Local Planning Authorities own planning guidance for exterior lighting installations and you are therefore recommended to check with the Local Planning Authority before designing or installing any exterior lighting.

**RELEVANT PUBLICATIONS AND STANDARDS:**

British Standards:	BS 5489	Road Lighting.
Countryside Commission/DOE		Lighting in the Countryside: Towards good practice (1997)
CIBSE Lighting Guides:	LC1	Code for interior lighting (1994)
	LG1	The Industrial Environment (1989)
	LG4	Sports (1990)
	LG6	The Exterior Environment (1992)
CIE Publications:	01	Guide lines for minimizing Urban Sky Glow near Astronomical Observatories (1980)
	83	Guide for the lighting of sports events for colour television and film systems (1989)
	92	Guide for floodlighting (1992)
	115	Recommendations for the lighting of roads for motor and pedestrian traffic (1995)
	126	Guidelines for minimizing Skyglow (1997)
	129	Guide for lighting exterior work areas (1998)
	136	Guide to the lighting of urban areas (2000)
Department of Transport		Road Lighting and the Environment (1993)
ILE Technical Reports:	TR 5	Brightness of Illuminated Advertisements (1991)
	CP 2	Lasers, Festival and Entertainment Lighting Code (1995)
	TR24	A Practical Guide to the Development of a Public Lighting Policy for Local Authorities (1999)
		Domestic Security Lighting, Friend or Foe
ILE/CIBSE		Lighting the Environment - A guide to good urban lighting

**USEFUL ADDRESSES:**

**British Astronomical Association (BAA)**  
Burlington House  
Piccadilly  
London, W1V 9AG  
Tel: 020 7734 4145

**British Standards Institution (BSI)**  
389 Chiswick High Road  
London, W4 4AL.  
Tel: 020 8996 9001  
Fax: 020 8996 7001

**Commission for Architecture  
and the Built Environment (CABE)**  
7 St. James's Square  
London, SW1Y 4JU  
Tel: 020 7839 6537

**Council for the Protection of  
Rural England (CPRE)**  
Warwick House  
25 Buckingham Palace Road  
London, SW1W 0PP  
Tel: 020 7976 6433  
Fax: 020 7976 6373

**Department of Environment,  
Transport and the Regions (DETR)**  
Publication Sales Unit  
Government Building  
Block 3, Spur 2  
Lime Grove  
Eastcote, HA4 8SE

**English Heritage**  
23 Saville Row  
London, W1X 1AB  
Tel: 020 7973 3000

**International Commission on  
Illumination (CIE)**  
Central Bureau  
Kegelgasse 27  
A-1030 Wien, AUSTRIA  
Tel: (001) 431 714 3187  
Fax: (001) 431 713 0838

**Lighting Industry Federation (LIF)**  
207 Balham High Road,  
London, SW17 7BQ.  
Tel: 020 8675 5432,  
Fax: 020 8673 5880

**Royal Town Planning Institute  
(RTPI)**  
26 Portland Place,  
London W1N 4BE.  
Tel: 020 7636 9107

**Society of Light and Lighting**  
222 Balham High Road,  
London, SW12 9BS  
Tel: 020 8675 5211,  
Fax: 020 8675 5449

**Sports England**  
16 Upper Woburn Place  
London, WC1H 0QP  
Tel: 020 7273 1500

**The Countryside Agency**  
Dacra House, 19 Dacra Street  
London, SW1H 0DH  
Tel: 020 7340 2900  
Fax: 020 7340 2911