

Lighting Assessment

Condition 4

"External lighting in association with this development shall comply with Institution of Lighting Engineers Guidance Notes for the Reduction of Obtrusive Light, Obtrusive Light Limitations for Exterior Lighting Installations."

Lighting Zone

The ILP guidance table 1 lists 5 'environmental zones' for exterior lighting control from the most rigorous of E0 for protected UNESCO Starlight Reserves, to E4 for urban zones.

We note that condition 4 does not specify which environmental zone the lighting is to comply with and we assume the ILP guidance referred to is the "Guidance Notes for the Reduction of Obtrusive Light GN01:2011 (copy attached).

The site is located adjacent to a Dual Carriageway on the edge of a suburban area with street lighting less than 100 yards away and can reasonably be described to fall within the E3 environmental zone.

Types of Intrusive Light

Obtrusive light is designed in four categories:-

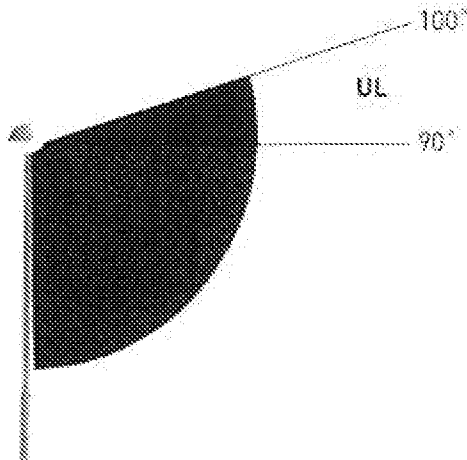
- Sky glow, the brightening of the night sky, and
- Glare, the uncomfortable brightness of a light source when viewed against a dark background
- Light intrusion ("Trespass"), the spilling of light beyond the property or area being lit.
- Building Luminance, façade lighting as a feature.

Sky Glow

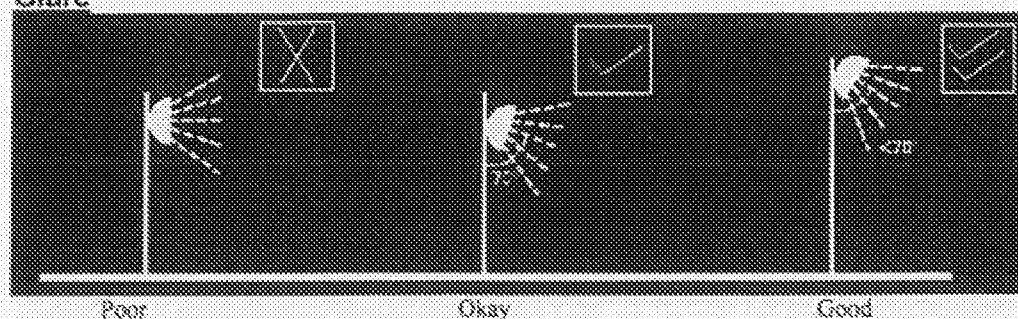
The level of sky glow is measured by looking at the luminaire's ability to spill light 'upward' with the most sensitive/critical zone for minimizing sky glow being those between 90 and 100 degrees to the vertical (see diagram).

The existing luminaires mounted are asymmetric in design aimed at an angle below 70 degrees limiting any uplight.

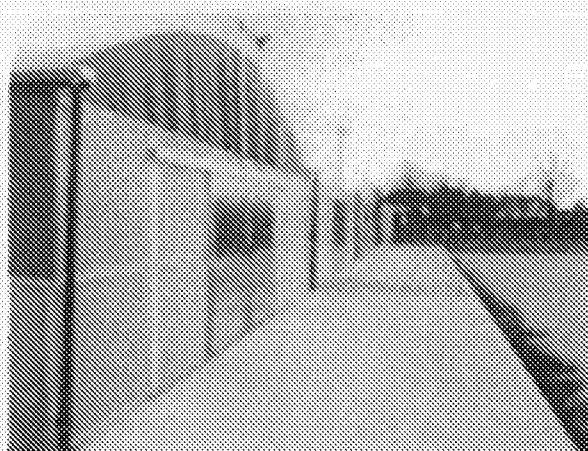
It can therefore be reasonable to assume that the lights would have little or no upward spill and the Skyglow percentage would be below the 5% permissible in the E3 environmental zone and likely to comply with the 2.5% E2 environmental zone restriction.



Glare



The ILP guidance gives good practice guidance on how to avoid glare by the positioning of lights so that the light fitting is recessed and faces only the direction of intended lighting (see diagram above)



The existing exterior lighting is located at high level above the ends of the polytunnels (see picture) and is directed downward angled toward their intended source (the outdoor beds).

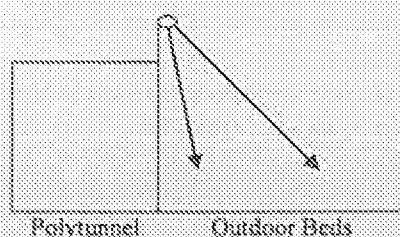
This is in line with the third diagram above, recognized as 'good' practice and likely to avoid light glare so that the even allowing for some light spill, luminaire intensity would be below the 10,000 candelas (pre curfew) and 1,000 candelas (post curfew) permissible for zone E3.

Furthermore, with restrictions on the timing of the light use to outside the curfew hours (23:00 to 05:00) below the permissible levels for all zones down to E1.

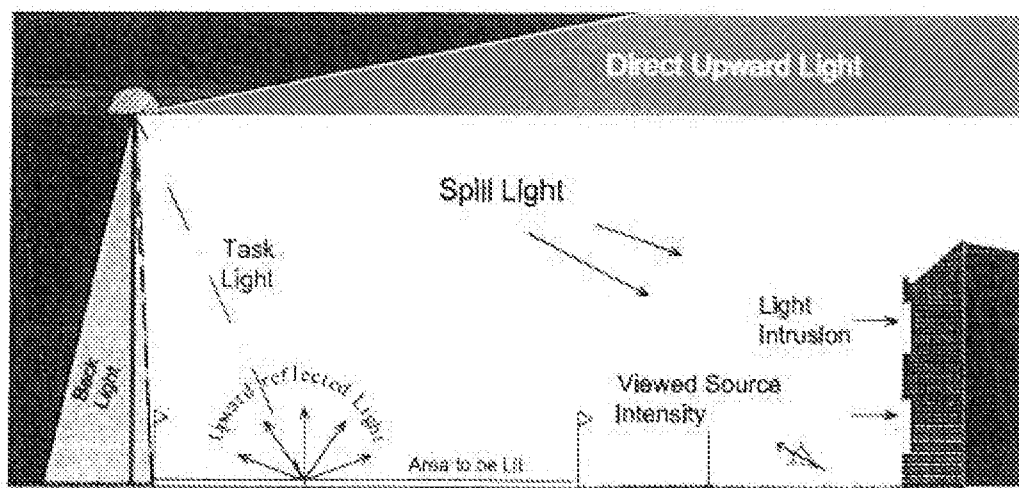
Light Intrusion

This is measured from the source of an area that is not intended to be lit, i.e. neighboring land and is related to the direction of light from the light source.

The lighting for the outdoor beds is located on the ends of the polytunnels, directed at an angle of below 70 degrees, lighting an area of ground close to the centre of the applicants site.



This is likely to result in the intensity level of light intrusion onto neighbouring land being zero, conforming to environmental zone E0 and above



Building Luminance

The existing lights are not directed at the face of the polytunnels and not intended to be lit as a night time feature but as 'task lighting' manually switched and used when tending plants.

Therefore building luminance of external lighting is not relevant to the application.

Analysis

ILP Table 1 – Environmental Zones			
Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

ILP Table 2 – Obtrusive Light Limitations for Exterior Lighting Installations – General Observers						
Zone	Sky Glow ULR	Light Intrusion Ev [Lux]		Luminare Intensity (Glare) I [Candelas]		Building Luminance L [Cd/m ²]
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

ULR = Upward Light Ratio of the installation is the maximum permitted percentage of luminaire flux that goes directly into the sky.

Ev = Vertical Illuminance in Lux – measured flat on the glazing at the centre of the window of the property that is affected by the intrusion.

I = Light Intensity in Candelas (cd) looking directly at the light source

L = Luminance in Candelas per square metre (cd/m²)

Curfew = time after which stricter requirements (for the control of obtrusive light) will apply; if not otherwise stated – 23:00hrs is suggested by the ILP

* = Permitted only from public road lighting installations

Table 3 – Existing Lighting Values*						
	Sky Glow	Light Intrusion		Luminare Intensity (Glare)		Building Luminance
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	
	0-2.5	0	0	1000	0	N/A

Curfew = 23:00-05:00hrs

* Estimated values

Conclusion

Table 1 gives the ILP definitions of the environmental zones

Table 2 gives the ILP suggested limits for these zones

Table 3 gives the likely expected levels from the proposed design

As can be seen from comparing these tables, with the imposition of a lighting curfew to control lighting between 23:00-05:00, the proposals comply with all the requirements down to zone E1:Natural and without a curfew down to the glare requirements for zone E3:suburban (i.e. the zone in which the application site is located).

Therefore, despite the planning condition of the previous consent not specifying an environmental zone that should be applied to the development, the proposal is likely to comply with appropriate lighting requirements for the existing environmental zone.

Appendix Contents

A – Institute of Lighting Professionals Guidance Notes for the reduction of obtrusive light

GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

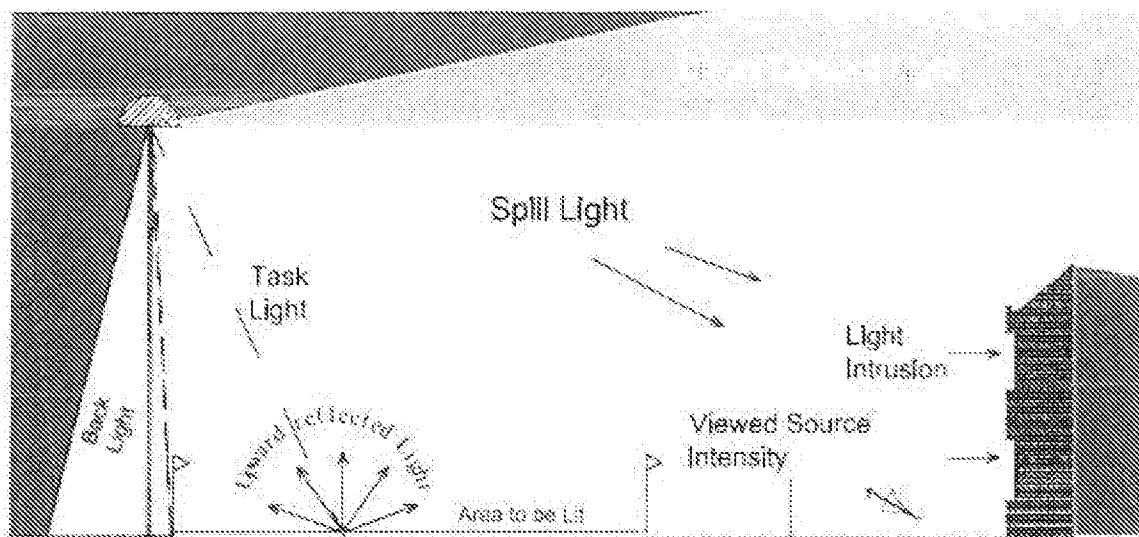
"Think before you light - The right amount of light, where wanted, when wanted."

Man's invention of artificial light has done much to safeguard and enhance our night-time environment but, if not properly controlled, **obtrusive light** (sometimes referred to as light pollution) can present serious physiological and ecological problems.

Obtrusive Light, whether it keeps you awake through a bedroom window or impedes your view of the night sky, is a form of pollution, which may also be a nuisance in law and which can be substantially reduced without detriment to the lighting task.

Sky glow, the brightening of the night sky, **Glare** the uncomfortable brightness of a light source when viewed against a darker background, and **Light Intrusion ("Trespass")**, the spilling of light beyond the boundary of the property or area being lit, are all forms of obtrusive light which may cause nuisance to others and waste money and energy. Think before you light. Is it necessary? What effect will it have on others? Will it cause a nuisance? How can you minimise the problem?

Figure 1 ~ Types of obtrusive light



Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light. Organisations from which full details of these standards can be obtained are given on the last page of this leaflet.

Dim or switch off lights when the task is finished. Generally a lower level of lighting will suffice to enhance the night time scene than that required for safety and security.

"Good Design equals Good Lighting"

Any lighting scheme will consist of three basic elements: a light source, a luminaire and a method of installation.

Light sources (Lamps)

Remember that the light source output in LUMENS is not the same as the wattage and that it is the former that is important in combating the problems of obtrusive light.

Most nighttime visual tasks are only dependant on light radiated within the visual spectrum. It is therefore NOT necessary for light sources to emit either ultra-violet or infra-red radiation unless specifically designed to do so. It is also understood that light from the shorter wavelengths of the spectrum has important effects on both flora and fauna that should be considered.

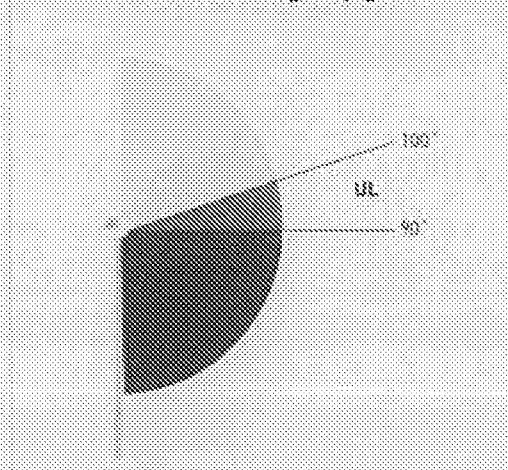
Research indicates that light from the blue end of the spectrum has important non-visual effects on the health of the human body, in particular in our sleep/wake patterns. It is therefore important to appreciate that while in obtrusive light terms the use of blue light should be minimised, there are many night-time tasks such as driving and sports where to be fully awake is an important aid to safety.

Luminaires

Care should always be taken when selecting luminaires to ensure that appropriate products are chosen and that their location will reduce spill light and glare to a minimum.

Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. The most sensitive/critical zones for minimising sky glow are those between 90° and 100° as shown in Figure 2 and referred to as the lower, upward light output zone (UL).

**Figure 2 – Critical luminaire angles
For minimising sky glow**



For most sports and area lighting installations 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 should, if correctly aimed, ensures minimum obtrusive light.

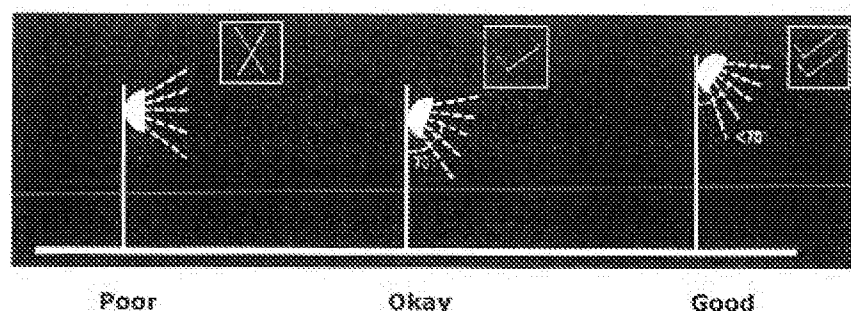
Appendices 1 and 2 to these notes gives more details of how to choose and if necessary modify luminaires.

Installation

In most cases it will be beneficial to use as high a mounting height as possible, giving due regard to the daytime appearance of the installation. The requirements to control glare for the safety of road users are given in Table 3.

Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 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. With regard to domestic security lighting the ILP produces an information leaflet GN02:2009 that is freely available from its website.

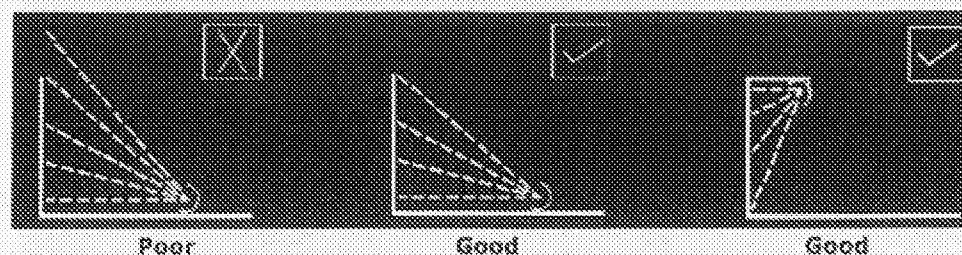
Figure 3 – Luminaire aiming angles



When lighting vertical structures such as advertising signs, direct light downwards wherever possible. If there is no alternative to up-lighting, as with much decorative lighting of buildings, then the use of shields, baffles and louvres will help reduce spill light around and over the structure to a minimum.

For road and amenity lighting installations, (see also design standards listed on Page 5) light near to and above the horizontal should normally be minimised to reduce glare and sky glow (Note ULR's in Table 2). In rural areas the use of full horizontal cut off luminaires installed at 0° uplift will, in addition to reducing sky glow, also help to minimise visual intrusion within the open landscape. However in some urban locations, luminaires fitted with a more decorative bowl and good optical control of light should be acceptable and may be more appropriate.

Figure 4 – Façade Illumination



Since 2006 "Artificial Light" has been added to the list of possible Statutory Nuisances in England, Wales and Scotland. The monitoring of such nuisances will be the responsibility of Environmental Health Officers (EHOs) for which separate guidance is being produced.

With regard to the planning aspect, many Local Planning Authorities (LPAs) have already produced, or are producing, policies that within the planning system will become part of their local development framework. For new developments there is an opportunity for LPAs to impose planning conditions related to external lighting, including curfew hours.

The Scottish Executive has published a design methodology document (March 2007) entitled "Controlling Light Pollution and Reducing Energy Consumption" to further assist in mitigating obtrusive light elements at the design stage.

ENVIRONMENTAL ZONES

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

Table 1 – Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

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

NB: Zone E0 must always be surrounded by an E1 Zone.

DESIGN GUIDANCE

The following limitations may be supplemented or replaced by a LPA's own planning guidance for exterior lighting installations. As lighting design is not as simple as it may seem, you are advised to consult and/or work with a professional lighting designer before installing any exterior lighting.

Table 2 – Obtrusive Light Limitations for Exterior Lighting Installations – General Observers

Environment al Zone	Sky Glow ULR [Max %] ⁽¹⁾	Light Intrusion (into Windows) E _v [lux] ⁽²⁾		Luminaire Intensity I [candelas] ⁽³⁾		Building Luminance Pre-curfew ⁽⁴⁾ Average, L [cd/m ²]
		Pre- curfew	Post- curfew	Pre- curfew	Post- curfew	
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

ULR = Upward Light Ratio of the Installation is the maximum permitted percentage of luminaire flux that goes directly into the sky.

E_v = Vertical Illuminance in Lux - measured flat on the glazing at the centre of the window.

I = Light Intensity in Candelas (cd)

L = Luminance in Candelas per Square Metre (cd/m²)

Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the local planning authority. If not otherwise stated - 23.00hrs is suggested.

***** = Permitted only from Public road lighting installations

(1) Upward Light Ratio – Some lighting schemes will require the deliberate and careful use of upward light, e.g. ground recessed luminaires, ground mounted floodlights, festive lighting, to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.

- (2) Light Intrusion (into Windows)** – These values are suggested maxima and need to take account of existing light intrusion at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light intrusion into the window down to the post curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.
- (3) Luminaire Intensity** – This applies to each luminaire in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.
- (4) Building Luminance** – This should be limited to avoid over lighting, and related 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 luminaires or luminaires fixed to the building but used to light an adjacent area.

Table 3 – Obtrusive Light Limitations for Exterior Lighting Installations – Road Users

Road Classification ⁽¹⁾	Threshold Increment (TI)	Veiling Luminance (Lv)
No road lighting	15% based on adaptation luminance of 0.1cd/m ²	0.04
ME6/ ME5	15% based on adaptation luminance of 1cd/m ²	0.25
ME4/ ME3	15% based on adaptation luminance of 2cd/m ²	0.40
ME2 / ME1	15% based on adaptation luminance of 5cd/m ²	0.84

TI = **Threshold Increment** is a measure of the loss of visibility caused by the disability glare from the obtrusive light installation

Lv = **Veiling Luminance** is a measure of the adaptation luminance caused by the disability glare from the obtrusive light installation

(1) = **Road Classifications** as given in BS EN 13201 - 2: 2003 Road lighting Performance requirements. Limits apply where users of transport systems are subject to a reduction in the ability to see essential information. Values given are for relevant positions and for viewing directions in path of travel. For a more detailed description and methods for determining, calculating and measuring the above parameters see CIE Publication 150:2003.

RELEVANT PUBLICATIONS AND STANDARDS:

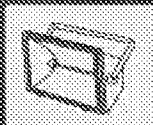
British Standards: www.bsi.org.uk	BS 5489-1: 2003 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas BS EN 13201-2:2003 Road lighting – Part 2: Performance requirements BS EN 13201-3:2003 Road lighting – Part 3: Calculation of performance BS EN 13201-4:2003 Road lighting – Part 4: Methods of measuring lighting performance. BS EN 12193: 1999 Light and lighting – Sports lighting BS EN 12464-2: 2007 Lighting of work places – Outdoor work places
Countryside Commission/ DOE	Lighting in the Countryside: Towards good practice (1997) (Out of Print but available on www.communities.gov.uk/index.asp?id=1144823)
UK Government / Defra www.defra.gov.uk	Statutory Nuisance from Insects and Artificial Light – Guidance on Sections 101 to 103 of the Clean Neighbourhoods and Environment Act 2005 Road Lighting and the Environment (1993) (Out of Print)
CIBSE/SLL Publications: www.cibse.org	CoL Code for Lighting (2002) LG1 The Industrial Environment (1989) LG4 Sports (1990+Addendum 2000) LG6 The Exterior Environment (1992) FF7 Environmental Considerations for Exterior Lighting (2003)
CIE Publications: www.cie.co.at	01 Guidelines 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 – Second Edition (2010) 126 Guidelines for minimizing Sky glow (1997) 129 Guide for lighting exterior work areas (1998) 136 Guide to the lighting of urban areas (2000) 150 Guide on the limitations of the effect of obtrusive light from outdoor lighting installations (2003) 154 The Maintenance of outdoor lighting systems (2003)
ILP Publications: www.theilp.org.uk	TR 5 Brightness of Illuminated Advertisements (2001) TR24 A Practical Guide to the Development of a Public Lighting Policy for Local Authorities (1999) GN02 Domestic Security Lighting, Friend or Foe
ILP/CIBSE Joint Publications	Lighting the Environment - A guide to good urban lighting (1995)
ILP/CSS Publications	Joint Code of Practice for the installation, maintenance and removal of seasonal decorations. (2005)
ILP/CfDS Joint Publication www.dark-skies.org	Towards Understanding Sky glow. 2007
IESNA www.iesna.org	TM-15-07 (R) Luminaire Classification System for Outdoor luminaires

NB: These notes are intended as guidance only and the application of the values given in Tables 2 & 3 should be given due consideration along with all other factors in the lighting design. Lighting is a complex subject with both objective and subjective criteria to be considered. The notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced.

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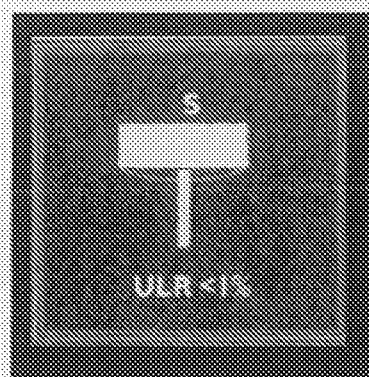
APPENDIX 1 - PROPOSED OUTDOOR LUMINAIRE CLASSIFICATION SYSTEM

Variable Aim Luminaires - General Classifications:

Type A	Symmetrical	
Type B	Asymmetrical	
Type C	Double-Asymmetrical	

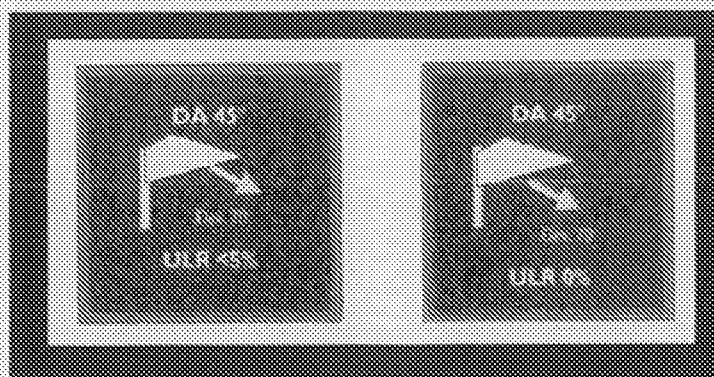
Proposed labelling System:

Fixed Position luminaires



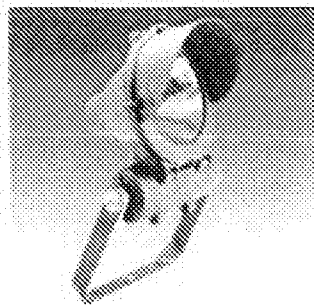
Variable Aim Luminaires

(Shown here for a 45° Double-Asymmetric luminaire aimed at 70° - with and without a cowl).

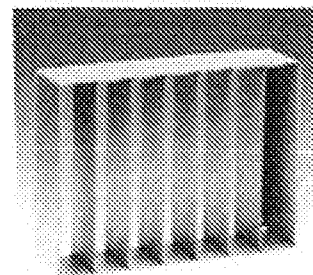
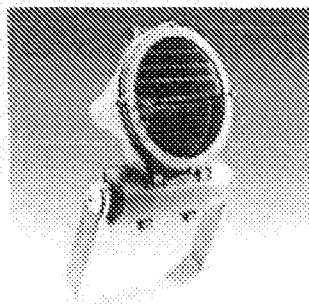


APPENDIX 2 - ILLUSTRATIONS OF LUMINAIRE ACCESSORIES FOR LIMITING OBTRUSIVE LIGHT (images provided by Philips and Thorn)

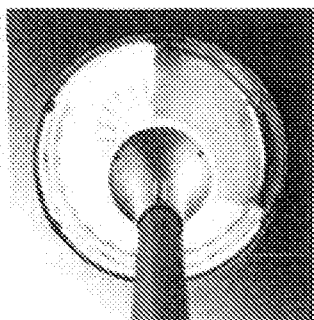
Cowl (or Hood)



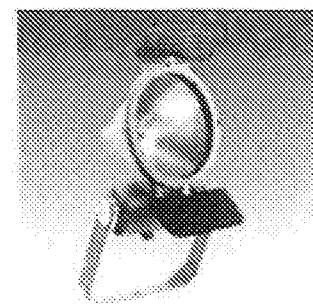
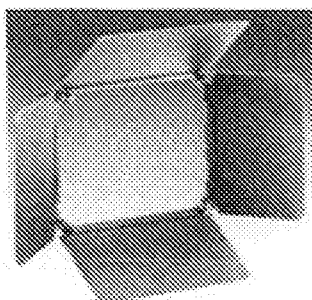
External Louvre



SHIELD



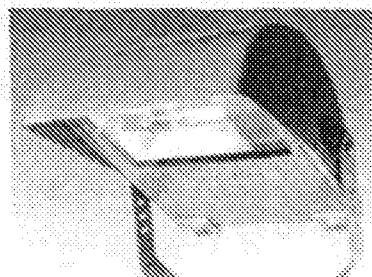
SHEILD "Barn Doors"



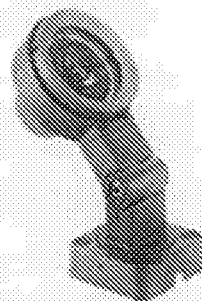
Double Asymmetric Luminaire



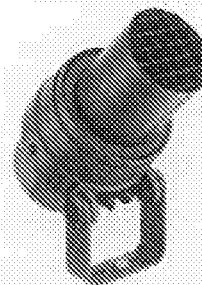
Simple Hood



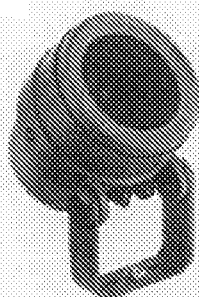
Circular Louvre



Cowl & Louvre



Internal Louvre (horizontal)



Internal Louvre (vertical)

