

SILVERTOWN TUNNEL

Volume 8

Development Consent Order Application

Response to ExA's First Written Questions:

8.14 Principal Issue: Lighting

The Infrastructure Planning (Examination Procedure)

Rules 2010

November 2016

Silvertown Tunnel

Response to ExA's First Written Questions:

Lighting

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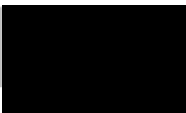
Silvertown Tunnel

Development Consent Order Application Response to ExA's First Written Questions: Lighting

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LI LIGHTING

LI.1 Question

ES paragraph 4.5.53 [APP-031] states that all highway lighting, including that within the tunnel would be in accordance with the appropriate design standards and guidance and use energy efficient illumination throughout.

(a) What are the appropriate design standards and guidance?

(b) Where is this information provided in the ES??

Response

LI.1.1 (a) The appropriate lighting design standards and guidance used for the preliminary design for the road lighting is:

- BS 5489-1:2013 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
- Institute of Lighting Professionals GN01:2011 - Guidance Notes for the Reduction of Obtrusive Light

LI.1.2 Subsequent to the Application, BS EN 13201-2:2003 has been superseded by BS EN 13201-2:2015 Road lighting - Part 2: Performance requirements. The detailed design will be undertaken with the standards current at the time.

LI.1.3 (b) Particular design standards are not prescribed in the ES (APP-31) for all aspects of future detailed design.

LI.1.4 Requirement 3 of the dDCO (APP-013) requires the authorised development to be designed and implemented in accordance with the Design Principles (APP-096). Paragraph 2.9.1 of the Design Principles sets out that all highway lighting should be in accordance with relevant design standards and guidance.

LI.2 Question

The NPPF at paragraph 125 requires that planning decisions limit the amount of light pollution from artificial light on local amenity.

Please explain where in the ES the measures that would be taken to meet this NPPF requirement are described?

How are these measures secured in the dDCO?

Response

- LI.2.1 Paragraph 4.5.52 of the ES [APP-031] states that a preliminary lighting design has been undertaken in accordance with BS 5489-1:2013 and the guidance contained in the Institution of Lighting Professionals (ILP) document Guidance Notes for the Reduction of Obtrusive Light GN01:2011 (attached as Appendix A to this report).
- LI.2.2 Paragraph 4.5.53 of the ES [APP-031] states that all highway lighting, including within the tunnel, would be in accordance with the appropriate design standards and guidance and use energy efficient illumination throughout. ILP parameters for reduction of obtrusive light will be adhered to in the detailed design. Similarly the detailed design for building lighting will also be undertaken in accordance with ILP guidelines (GN01:2011).
- LI.2.3 The ILP guidelines have been devised to limit the amount of light pollution from artificial light on local amenity.
- LI.2.4 Requirement 3 of the dDCO (APP-013) requires the authorised development to be designed and implemented in accordance with the Design Principles (APP-096). Section 2.9 of the Design Principles [APP-096] sets out that lighting should be in accordance with relevant design standards and guidance. Compliance with the ILP is therefore secured through the dDCO.
- LI.2.5 During construction, paragraph 12.2 of the Code of Construction Practice (APP-092) makes provision for the Contractor to produce a Lighting Management Plan, which will reflect appropriate industry standard procedures, and so as to prevent unnecessary interference with local residents. Furthermore, the Code of Construction Practice has been amended at Deadline 1 to make specific reference to the ILP guidance.

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Compliance with the CoCP is secured through Requirement 5 to the dDCO.

LI.3 Question

Paragraph 4.5.52 of the ES [APP-031] states that a preliminary lighting design has been undertaken in accordance with BS 5489-1:2013 and the guidance contained in the Institution of Lighting Professionals (ILP) document Guidance Notes for the Reduction of Obtrusive Light GN01:2011. Indicative lighting drawings for the operational stage are provided in ES Appendix 4B (Doc 6.3.4.2).

(a) Please consider whether Requirement 9 of the dDCO (External lighting details) should be redrafted to refer to this preliminary design and to the guidance identified in the ES?

(b) Please provide a copy of the Guidance document that is referred to here.

Response

- LI.3.1 (a) We consider that Requirement 9 of the dDCO does not need to be amended as the relevant planning authorities will approve the written details of the external lighting. In discharging this requirement, the relevant planning authority would consider whether appropriate design standards and guidance have been followed.
- LI.3.2 The requirement for all highway lighting, including within the tunnel, to comply with relevant design standards and guidance is further secured through paragraph 2.9.1 of the Design Principles (APP-096), which are in turn secured by Requirement 3 to the dDCO.
- LI.3.3 (b) Institute of Lighting Professionals GN01:2011 - Guidance Notes for the Reduction of Obtrusive Light is provided as an Appendix A.

LI.4 Question

Here Paragraph 15.3.20 of the ES [APP-031] states that the “design of lighting for Scheme buildings has not been completed at this stage and has therefore not been assessed...detailed lighting design would be carried out in accordance with guidelines for the reduction of obtrusive light (refer to Section 15.5...”.

Please can the Applicant explain why a lighting assessment could not be undertaken on the basis of the information provided within Doc 6.3.4.2 [APP-047]?

Please can the LPAs confirm whether they consider this approach acceptable?

Response

- LI.4.1 A lighting assessment has not been carried out on the buildings as the detailed design of the buildings has not yet been developed. The detailed design for the buildings will be developed by the Contractor once appointed and must be in accordance with the lighting design principles submitted as part of the Design Principles – LTNG.06 [APP-096].
- LI.4.2 Appendix 4B of the ES Indicative Lighting Drawings [APP-047] provides the external lighting design for highways, with corresponding ISOLUX Contour Plans, and does not include the design of lighting for Scheme buildings.
- LI.4.3 Whereas the highway lighting occupies a relatively large proportion of the above ground Scheme footprint, the building lighting would be confined to the building locations at each tunnel portal. Paragraph 15.4.6 of the ES [APP-031] identifies that these locations fall within high district brightness areas, with high levels of night-time activity. As set out in paragraph 15.3.20 of the ES [APP-031], there are not anticipated to be significant increases in ambient light emissions as a result of Scheme buildings, as detailed lighting design would be carried out in accordance with guidelines for the reduction of obtrusive light, (ILP guidelines - GN01:2011 and lighting design standards) and the lighting design principles outlined within the Design Principles [APP-096] and secured by the requirement 3 of the dDCO [APP-013].

LI.5 Question

Paragraph 10.6.110 of the ES [APP-031] sets out the limitations to the lighting to be used at the new temporary jetty.

Please explain how this is secured in the dDCO?

Response

- LI.5.1 The limits on lighting of the new temporary jetty are secured by the Code of Construction Practice (APP-092) ('the CoCP') at the final bullet point of paragraph 8.1.1 in respect of marine ecology concerns (revised at Deadline 1 to now include the full measures set out in paragraph 10.6.110 of the ES), and in paragraph 12.2.2 which explains that lighting will be designed, positioned and directed so as to prevent unnecessary interference with navigation lights for air or water traffic.
- LI.5.2 Compliance with the CoCP is secured by Requirement 5 in Schedule 2 to the dDCO (APP-013).

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Appendix A. Lighting Professionals (ILP) Guidance Notes for the Reduction of Obtrusive Light

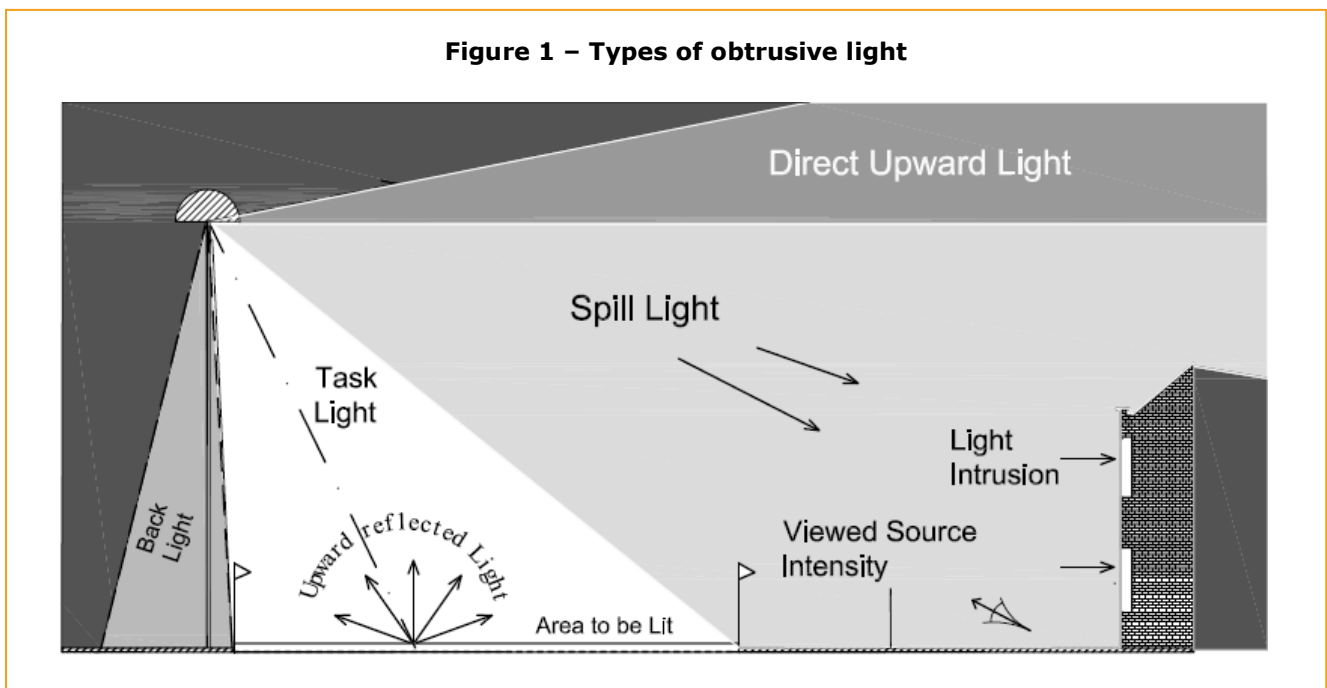
GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

“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?



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.

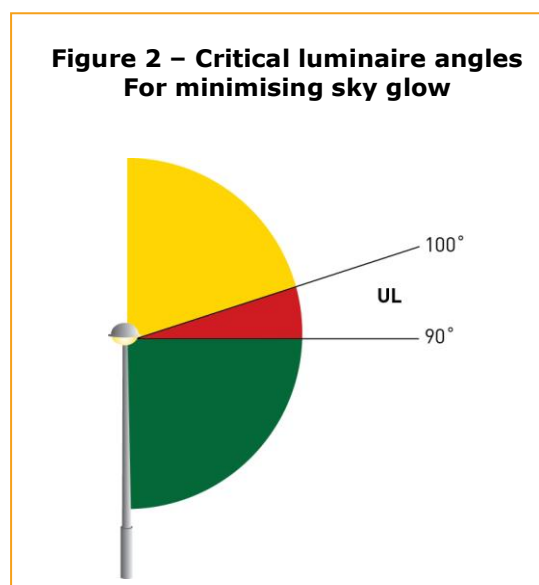
Most nighttime visual tasks are only dependant on light radiated within the visual spectrum. It is therefore NOT necessary for light sources to emit either ultra-violet or infra-red radiation unless specifically designed to do so. It is also understood that light from the shorter wavelengths of the spectrum 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).



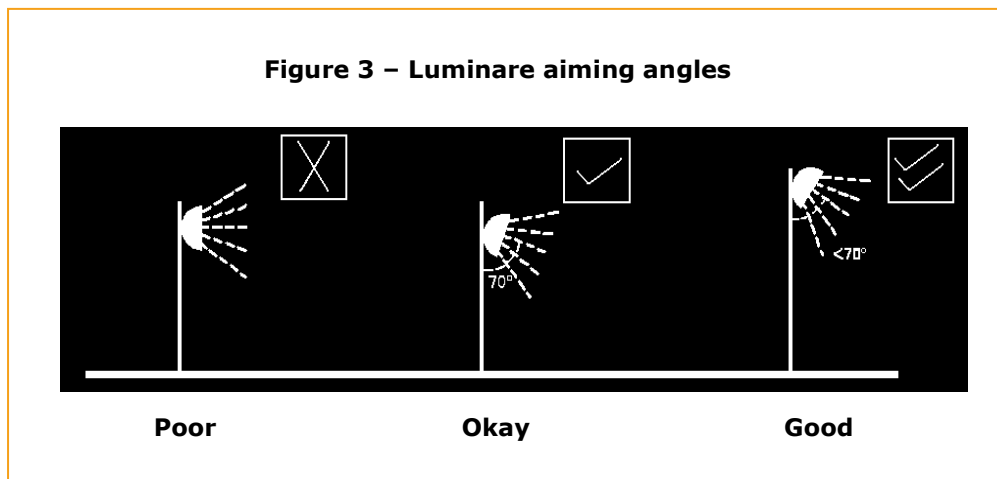
For most sports and area lighting installations the use of luminaires with double-asymmetric beams designed so that the front glazing is kept at or near parallel to the surface being lit should, if correctly aimed, ensures minimum obtrusive light.

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

Installation

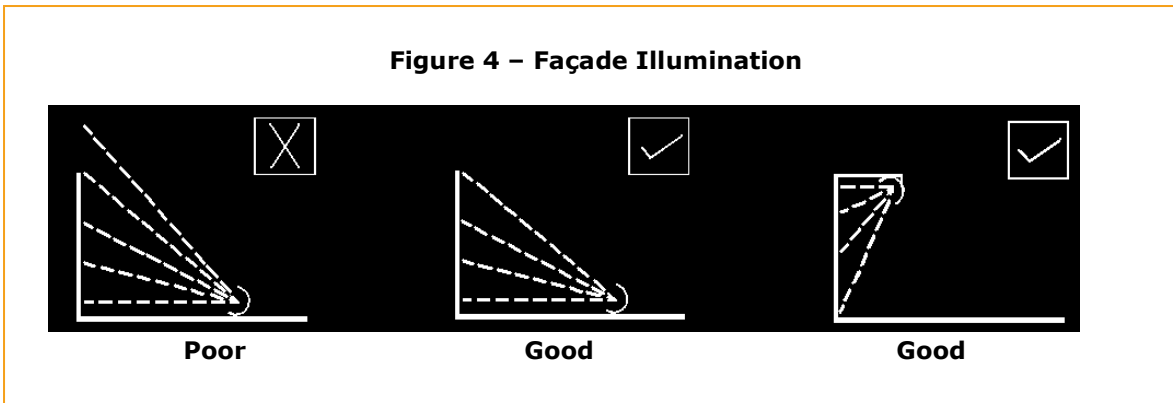
In most cases it will be beneficial to use as high a mounting height as possible, giving due regard to the daytime appearance of the installation. The requirements to control glare for the safety of road users are given in Table 3.

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.



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.



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

Environmental Zone	Sky Glow ULR [Max %] ⁽¹⁾	Light Intrusion (into Windows) E_v [lux] ⁽²⁾		Luminaire Intensity I [candelas] ⁽³⁾		Building Luminance Pre-curfew ⁽⁴⁾
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, L [cd/m ²]
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	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) (<i>Out of Print but available on www.communities.gov.uk/index.asp?id=1144823</i>)
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.

APPENDIX 1 - PROPOSED OUTDOOR LUMINAIRE CLASSIFICATION SYSTEM

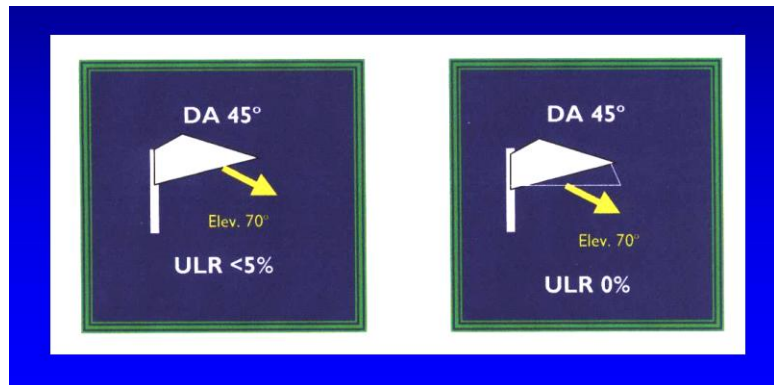
Variable Aim Luminaires – General Classifications:

➤ 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)



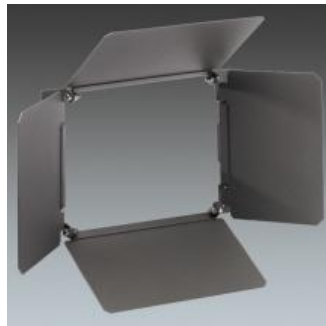
External Louvre



SHIELD



SHEILD "Barn Doors"



Double Asymmetric Luminaire



Simple Hood



Circular Louvre



Cowl & Louvre



Internal Louvre (horizontal)



Internal Louvre (vertical)

