INSTITUTION OF LIGHTING PROFESSIONALS

PROFESSIONAL LIGHTING GUIDE 05/23

THE BRIGHTNESS OF ILLUMINATED ADVERTISEMENTS INCLUDING DIGITAL DISPLAYS

Professional Lighting Guide

PLG 05/23

The brightness of illuminated advertisements including digital displays

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This Professional Lighting Guide is dedicated to Henk Stolk, who sadly passed away during its development.

Contents

1. Introduction

1.1 This publication has been prepared on behalf of the ILP Technical Committee, for study and application. The document reports on current knowledge and experience within the specific fields of light and lighting described, and is intended to be used by the ILP membership and other interested parties.

1.2 Lighting Guidance as issued by the ILP is recognised as the authority document when it comes to assessing illuminated advertisements by Local Planning Authority Planning Officers, Planning Inspectors, lighting professionals and advertising industry Planning professionals. It is also specifically referenced in Government guidance. It is the only authoritative lighting guidance in the United Kingdom on which those involved in the Planning process can rely.

1.3 Whilst every care has been taken in the compilation of any information, up to the time of going to press, these may not be comprehensive. Compliance with any recommendations does not itself confer immunity from legal obligations.

1.4 This document is intended to provide pragmatic guidance to all involved with exterior illuminated advertisements, or such installations located within premises interned for exterior observers. These installations may be attached or included within a structure or mobile, such as mounted on a bus or other vehicle.

1.5 This document supersedes *PLG05: Brightness of Illuminated Advertisements* published in 2014 and has been updated to reflect changes in lighting practice, technology and legal framework.

1.6 The scope of the guide is to cover installations of advertisements including digital displays within the United Kingdom. Advertisement regulations vary from country to country, and whilst the key requirements are given in section 9 'What planning controls are in place?', it is not possible in a document like this report to exhaustively cover every legal aspect applying to advertisements and signs in each country. The development of digital displays and media facades has 'outpaced' planning regulations and legalisation; this document provides guidance and recommendations for such installations. Moreover, in many sections of this guide the processes follow a template derived from the England Advertisement Regulations.

1.7 Illuminated signage and advertisements have long been an integral part of our street scene, and over recent years we have seen the growth and development of small and large format digital displays and some media facades which, like all advertisements, are intended to attract attention. Digital displays represent the latest form of illuminated advertisement.

2. Background and identification of issues

2.1 Illuminated advertising installations are generally designed for a purpose which is normally to convey images, messages and information to observers located at ground level. For such installations the illuminated image should be directed towards the desired observers, restricting light emitted in other directions.

2.2 Such installations need to be balanced, as over lighting can ruin the day and night scape and cause annoyance, distraction or even visual discomfort. Where the installation brightness is too low, the information or images displayed can become unreadable.

2.3 The luminance of the lighting installation, in a nominated direction, is an indicator of this effect.

2.4 The tolerable levels of each of the lighting technical parameters will be influenced by the ambient lighting present in that environment.

2.5 The effects on road users (e.g. motorists, cyclists, pedestrians) can involve:

- A reduction or impairment in the ability to see caused by disability glare from light sources.
- Spill light onto the road / network.
- Obscure or hinder the ready interpretation of any traffic sign, signal, railway signal, or aid to navigation by water or air.
- The loss or impairment of vision of objects in the critical field of view (e.g. vehicles, cyclists, pedestrians, signals ahead) when a digital or other illuminated display forms a large percentage of the observable background.
- Distraction to driving task caused by dynamic displays, transition effects between images within both direct and peripheral vision.

2.6 Many illuminated advertisement installations are designed to operate during the day and night, so their performance requirements will normally vary during a 24-hour period and will include:

- Daytime operation.
- Night-time operation.
- Curfew operation which will require a reduced luminance, or even switch off during defined hours.

2.7 The limiting luminance values recommended for the control of obtrusive effects mainly apply to night-time operation, and have been developed taking account of the following:

- Level of brightness or ambient lighting existing in the area.
- Times that the proposed installation lighting is to operate.
- Type of lighting technology available to light the activity.
- The use of readily available and easily understood technical data on the lighting installations that can easily be verified at the design and assessment stages.

2.8 Limiting lighting levels for daytime operation has received less consideration under previous guidance, and has been either ignored within planning conditions referencing only night-time operation, or misapplied through the imposition of unfeasibly low operating levels, making the display unreadable.

2.9 The lighting performance of digital displays is expressed in terms of luminance and is dependent on the position of the observer, but independent of the surrounding conditions. Generally, the display image is non-uniform and the luminance will vary across it depending upon the image / message being displayed. The luminance will also vary with direction of viewing, being at a maximum for direct frontal observation. The materials used for the facing of the displays are normally such that the luminance values remain near maximum over a reasonably wide range of observation angles, ranging from 110 degrees in the horizontal to 79 degrees in the vertical.

2.10 The appearance of an illuminated advertisement depends on its luminance relative to the luminance of the background against which it is viewed. Increasing the difference in luminance between the advertisement and its background will make it appear brighter. An advertisement with the same luminance performance may appear dull when viewed against a bright background (low contrast), yet be very bright when viewed against a dark (high contrast) background. The same can be considered when a bright, mainly white advertisement, is followed by one that is comparatively dark.

2.11 The aims of this document are to provide guidance on how to assess the impact of any illuminated advertisement including digital displays and media facades with the following considerations:

- Legibility of display based upon the existing lit environment within which it lies.
- Mitigation factors regarding obtrusive light.
- Effects on the local ecosystem.
- Mitigation effects regarding skyglow.

2.12 When considering any application for illuminated signage, thought should be given to who are the intended observers and how it is to be viewed within the street scene. One sign on its own may have a minimal impact on the street scene, however many signs may have a negative impact on the street scene confusing the visual task and/or harming visual amenity.

2.13 This document provides clear guidance on individual illuminated advertisements, through to large format digital displays and media facades which display changing images. However, it is the duty of the competent designer to apply this document with regard to the constraints of each application and the environment the application refers to.

3. Brightness versus luminance

3.1 The fundamental relationship on which the recommendations contained within this report are based, is that between luminance and brightness.

3.2 Luminance is a characteristic of the advertisement/display, dependent on the position of the observer, but independent of the surrounding conditions. Generally, a sign face is non-uniform and the luminance will vary across it. The luminance will also vary with the direction of viewing, being at a maximum for direct frontal observation. The highly diffusing plastic materials normally used in signs result in the luminance remaining near the maximum over a fairly wide range of viewing angles, falling off steeply for very oblique viewing.

3.3 Brightness is the visual sensation associated with luminance, experienced by an observer. It depends on four main factors:

a) luminance.

b) size.

c) contrast.

d) the observer.

3.4 In addition, other factors which may affect brightness, are the position of the sign with respect to the observer's field of view, particularly when it appears on the periphery; the effect of phototropism and the uniformity of luminance across the sign face.

3.5 The difficulties associated with the problem of sign luminance may be appreciated by considering two identical signs in different settings. If one is placed in a well-lit shopping area it will appear to be considerably less bright than its counterpart in a dark country lane. The one may be appropriate and the other offensive, although the signs themselves are identical. The luminance is the same for both signs but the contrast between the sign and its surroundings and therefore the brightness is quite different.

3.6 The Local Planning Authority (LPA) is concerned primarily with brightness, whilst the manufacturer is only able to control luminance. It is possible to set upper limits of luminance for defined types of location and graded size of sign, such that compliance with them will minimise the number of illuminated advertisements that are subjectively too bright, yet will permit them to be adequately bright for their purpose.

3.7 During the preparation of this report many observations and measurements have been taken of illuminated advertisements in a variety of locations including Central London, provincial cities, suburban areas, mixed residential and shopping areas, retail parks, pedestrian precincts and areas of special historical and architectural interest. The measured luminance has been related to acceptable degrees of subjective brightness for many sizes of illuminated advertisements in widely different environments.

3.8 The measurements taken on signs and fascias covered maximum luminance and average luminance. There is always some variation of luminance over a sign and the average, even after several measurements have been made, can only be approximately estimated. Therefore, the recommendations within this report deal with limits on the maximum luminance of a sign. This has the advantage that:

a) Where, as often happens, the brightest area can be selected by eye, only one measurement is required and the maximum is a definite figure.

b) Signs with large variations of brightness are more likely to infringe limits imposed upon the maximum luminance than upon the average.

3.9 The uniformity of luminance across a defined illuminated area must be kept within reasonable limits so as to ensure a pleasing and effective result. It may be of help to designers and manufacturers of signs to consider the luminance gradient of illuminated advertisement signs. A method for testing both luminance and luminance gradient is described in Section 12.

3.10 In setting upper limits for the luminance of signs, it is important to take account of the considerable reduction in brightness which may occur during the life of the installation. The overriding consideration must be that it should not present a hazard when the lighting is commissioned. In practice design calculations would normally be set at a datum point of 100 hours after the initial light source lumen output, and therefore measurements should not be taken before the light sources have been in commission for 100 hours. In practice, it is considered that installations are likely to have a luminance between 50% and 80% of the initial value for a major part of their life, depending on quality and maintenance.

3.11 Digital displays pose additional problems when trying to assess brightness, this is because the luminance of the sign varies with both time and position of the sign. For this reason it is recommended that the sign be set to a full output white when it is being measured to ensure that the maximum luminance of the sign is measured.

4. Limiting the luminance of illuminated advertisements

4.1 In all cases the limit of luminance should be determined by relating the details of the installation in Section 10 of this report, taking into account its method of illumination, size, location and orientation.

4.2 Consideration should be made to the provision of a system of control that imposes a limit on the maximum luminance and time of operation of an advertisement. Any system of control must be easy to understand, interpret, apply and enforce within the present National Planning Policy Framework, which requires these limits imposed by condition to be necessary, relevant to planning, relevant to the development to be permitted, enforceable, precise and reasonable in all other respects, having regard to the way the illuminated advertisement operates.

4.3 It is essential that any luminance limits imposed should have regard to amenity and public safety factors. At the same time, account must be taken of the amenities to which illuminated advertisement installations contribute, and of the necessary and reasonable requirements of the advertisement operator.

4.4 For externally illuminated advertisements the provisions of the ILP Guidance Notes GN01 for the Reduction of Light Pollution, should be applied. In particular:

a) Luminaires should be positioned such that the light source itself is not directly visible from any usual viewing angle (e.g. to road users or residents).

b) Luminaires should be adequately secured and positioned such that they light away from adjacent properties or highways. Diffusers, shields or louvres should be incorporated where necessary to control spill light.

c) Illumination should be switched off when not required, e.g. during the day and after agreed curfews.

d) Light should be directed downwards. If there is no alternative to up-lighting, then specifically designed lighting equipment should be used, that once installed, minimises the spread of light near to, or above the horizontal, complete with all necessary shields and baffles to minimise skyglow.

Pictures 4.1 & 4.2: Digital displays during the day.

4.5 The recommended limits of luminance also apply to externally illuminated advertisements and such lighting should be examined to ensure that luminaires are positioned so that the light source itself is not directly visible from any usual viewing angle (e.g. to road users or residents).

4.6 The ILP has produced Guidance Notes for the Reduction of Light Pollution, and the general principles contained therein are worthy of consideration for all lighting installations. In particular, the Guidance Notes detail a number of ways which may be used to reduce the problems of unnecessary, obtrusive light:

a) Switch off illumination when not required – one possible solution is a curfew with further limitations on lighting levels between agreed hours (e.g. off between 23.00hr and dawn).

b) For signs with external illumination direct light downwards whenever possible. If there is no alternative to up-lighting, then the use of shields and baffles to help reduce light spill. Use specifically designed lighting equipment, that once installed minimises the spread of light near to, or above the horizontal.

c) Do not 'over' light.

d) For large self-luminous signs consider louvers, or shields, above the sign, this will also reduce the amount of daylight falling on the sign.

5. Controls

5.1 Most illuminated advertisement installations are designed to operate during the day and night, so their performance requirements will vary during a 24-hour period and will include:

- Daytime operation.
- Night-time operation.
- Curfew operation which will require either reduced luminance, or switch off during defined hours.

5.2 At present, Local Planning Authorities sometimes set maximum performance limits for luminance that do not take account of the difference between night-time and daytime operation requirements, or that set daytime limits that are unreasonable or unnecessary, and therefore unviable for the operator. Examples of such conditions are:

- The digital display advertisement hoarding hereby approved shall operate at an illumination level no greater than 300cd/m^2 at any time.
- The digital advertising display hereby approved shall operate at an illumination level no greater than 600cd/m^2 during the day and 300cd/m^2 at night.

5.3 A daytime limit of 600cd/m^2, while adequate for twilight, dawn, dusk and very overcast conditions when ambient light levels are low, does not allow for higher ambient conditions as found on bright days with cloud cover, bright sunny days or in direct sunlight conditions. As a daytime limit it is therefore unnecessary and unreasonable, thereby at odds with the six tests for planning conditions as set out in the National Planning Policy Framework. The recommended daylight operation performance should be broadly in line with Table 10.5 of this guide.

5.4 It is understood that many operators use a photocell to control the display according to rises or falls in ambient light, whilst others use a timer to switch between daytime and night-time modes. A combination of the two is also common, whereby the photocell monitors the ambient lighting levels and controls the level of sign luminance by day, and at night a timer switches the display to a set night mode and / or switches the display off after curfew.

6. Fauna and flora considerations

6.1 Studies conducted so far show that lighting installations (including digital displays) impact negatively on flora and fauna, which have adapted naturally to life during the night. Artificial lighting primarily interferes with the functioning of living organisms such as birds, fish, insects, bats and other animals. Excess artificial light, particularly visible light of different wavelengths, can have a huge impact on the lives of nocturnal species, upsetting their circadian rhythm. The preference of animals and insects for nocturnal activity may result from factors such as avoidance of predators, heat aversion, safer feeding, or reproduction.

6.2 Consequently, the colour and changes in the intensity level of ambient light at night can lead to problems with reproduction, avoidance of suitable habitats and changes in seasonal migration routes, and even to a reduction in numbers and extinction of certain species. Concerning flora, night lighting can have an effect on the shape of their leaves, their pigment, bud dormancy, the time when a tree drops its leaves in autumn, or root system growth.

7. Energy consumption & net zero

7.1 Net zero and hence energy consumption, are key considerations to meet climate change targets. The construction and technologies used in digital advertisement infrastructure are not part of this guide, but through designers, planners and users following the recommendations laid down in this document, the energy used during an installation, and its consequential use phase can be minimised and the environmental impact mitigated.

8. Definition of illuminated area

8.1 Where the illuminated advertisement consists of an illuminated background upon which a legend, words, or symbols have been superimposed, the illuminated area is defined as the overall area of the panel.

Picture 8.1: Example of an illuminated box advertisement

8.2 Where the illuminated advertisement consists of fret cut, individual letters, or individual elements such as exposed light sources, the illuminated area shall be defined as the background of the advertisement. That is the area of the background in a simple geometric shape, or a combination of such shapes in which the letters or elements are completely contained.

Picture 8.2: Example of a cold cathode 'Neon' advertisement

8.3 In the case of those illuminated advertisements containing dished panels, or those with two panels at an angle to each other, the illuminated area should be defined as the area capable of being viewed at one time at any angle not exceeding 40 degrees to the normal.

8.4 'Halo' advertisements shall be designed so that the light source cannot be viewed directly from any angle. The illuminated area is defined as the background of the advertisement. This is the area of the background in a simple geometric shape, or a combination of such shapes in which the letters or elements are completely contained, rather than the letters or elements themselves, which would be seen in silhouette.

Picture 8.3: Example of a 'halo' type advertisement

Digital displays

8.5 In the case of digital displays, these typically have a non-illuminated border/ frame around the illuminated part of the display. The illuminated area is defined as the maximum area of the display that is illuminated.

8.6 In the UK, digital displays come in the standard, commonly used, small format and large format display sizes, as advised in Tables 8.1 & 8.2.

Table 8.1 Small format: Illuminated area dimensions

Description	landscape / portrait	Width	Height
6-sheet display	portrait	1200 mm	1800 mm

Table 8.2 Large format: Illuminated area dimensions

Description	landscape / portrait	Width	Height
48-sheet display	landscape	6096 mm	3048 mm
96-sheet display	landscape	12192 mm	3048 mm
7.5m x 5m	portrait	5000 mm	7500 mm

Picture 8.4: Example of a small format display

Picture 8.5: Example of a large format display

9. What planning controls are in place?

Overview

9.1 Advertising is a familiar feature of our environment that can contribute to a vibrant and competitive economy. All advertisements affect the character and appearance of the building or place where they are displayed. Given the potential impact of outdoor advertising on amenity, both positive and negative, there is a need to balance the requirements of the industry with the protection and, where possible, enhancement of the character and appearance of our cities, towns and villages. There is a corresponding need to ensure that advertisements will not prejudice public safety, including the risk of collisions caused by driver distraction, and to educate all road users about the dangers of distraction.

9.2 Each country within the UK has their own Advertisement Regulations, and National Planning Policy Framework. These only address advertisements in general terms.

Planning (Control of Advertisements) Regulations

9.3 For example, in England these comprise the *Town and Country Planning (Control of Advertisements) (England) Regulations 2007.*

9.4 Within the UK they define a similar definition of classes of advertisements. In general, these do not consider digital displays separately, or advertisements located within, or in the proximity of the highway / public realm. The only class where illumination requirements are really advised is under Class 4 illuminated advertisements on business premises which includes signage within retail parks. It is from these requirements that guidance is currently taken.

It should be noted that:

- The performance requirements advised within the Regulations are for **night-time operation** and do not advise on any day-time or post curfew performance requirements.
- The levels advised are not suitable for all lighting Environmental zones.

9.5 The night-time performance values are based upon a white display (white being the most bright / worst-case scenario) and are advised as:

Table 9.1: Luminance limits in England as per the Regulations

Illuminated area	Maximum luminance cd/m²
Not more than 10m²	600
More than 10m²	300

Table 9.2: Luminance limits in Wales & Northern Ireland

Illuminated area	Maximum luminance cd/m² [1]
Up to 0.5m²	1,000
>0.5m² to 2m²	800
>2m² to 10m²	600
For any size greater than 10m²	400

Note:

1 The Northern Ireland Regulations state performance in terms of luminance (cd/m²) but the required values stated in terms of intensity (cd). This is an error in the Regulations and the units advised should be in terms of luminance.

9.6 There are no defined limits advised for Scotland.

9.7 Local authorities may have developed their own Local Development Plans which address requirements for illuminated advertisement signage, for example:

The Belfast Local Development Plan (Draft plan strategy 2035)

9.8 Policy DES4 – Advertising and signage requires that advertisement signage:

a) Are of good design quality, located sensitively within the streetscape and do not have a negative impact on amenity.

b) Will not result in clutter when read in addition to existing advertising and signage in the area.

c) Will not adversely impact listed buildings, conservation areas, or areas of townscape character and their settings.

d) Do not prejudice road safety and the convenience of road users.

Light nuisance

9.9 The Clean Neighbourhoods and Environment Act (CNEA) 2005 gives Local Authorities and the Environment Agency additional powers to deal with a wide range of issues by classifying artificial light emitted from defined premises as a statutory nuisance.

9.10 The CNEA 2005 amended section 79(1) of the Environmental Protection Act 1990 to extend the statutory nuisance regime to include light nuisance stating the following:

> "(fb) artificial light emitted from premises so as to be prejudicial to health or a nuisance".

9.11 Guidance produced on Sections 101 to 103 of the CNEA 2005 by DEFRA (April 2006) extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances, including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists, or may occur or recur, local authorities must issue an abatement notice (in accordance with section 80(2) of the Environmental Protection Act 1990), requiring that the nuisance cease or be abated within a set timescale.

9.12 It is therefore possible that illuminated advertisements and digital displays can be considered as a potential nuisance to adjacent occupiers of premises by day (in the case of digital displays) or at night. By following the principles laid out within this document, illuminated advertisement and digital displays should be successfully designed, installed and operated, so that the potential for a nuisance to be found will be negated.

9.13 Nuisance could either be due to display intensity or illuminance (spill light) levels, for example at ground level or on windows, or be prejudicial to health due to disturbing effects relating to the images being displayed by both day and night, especially when these are animated or video in nature.

9.14 Conforming with the performance requirements will help avoid nuisance effects, as will applying appropriate controls, including the operation of performance level curfews. Nuisance effects can potentially be mitigated through design of the screen optics (e.g. to limit the angle of light spread) to further reduce or eliminate the display impact on local sensitive receptors, such as homeowners.

9.15 It is important that illuminated displays do not become a source of nuisance to the surrounding area, especially where this involves residences and other premises occupied at night. Displays should not provide an illuminance on the windows of such properties greater than that shown in the Table 10.3; taken from the ILP's GN01 guide.

10. Considered performance requirements

10.1 It should be noted that the current advised illumination values (within regulations discussed in Section 8 and PLG05 2014) are for night-time operation and take no account of ambient lighting levels within the area. For this reason the Professional Lighting Guide, *"The Brightness of Illuminated Advertisements including Digital Displays"* has been developed. This guide establishes the requirements for different internationally agreed environmental zones, taking account of digital displays and media façade requirements in terms of size, location, and design images.

10.2 To align to international convention, as advised within CIE 150 *"Guide on the limitation of the effects of obtrusive light from outdoor lighting installations"* there are five lighting environmental zones described as follows:

Table 10.1: Lighting environmental zones

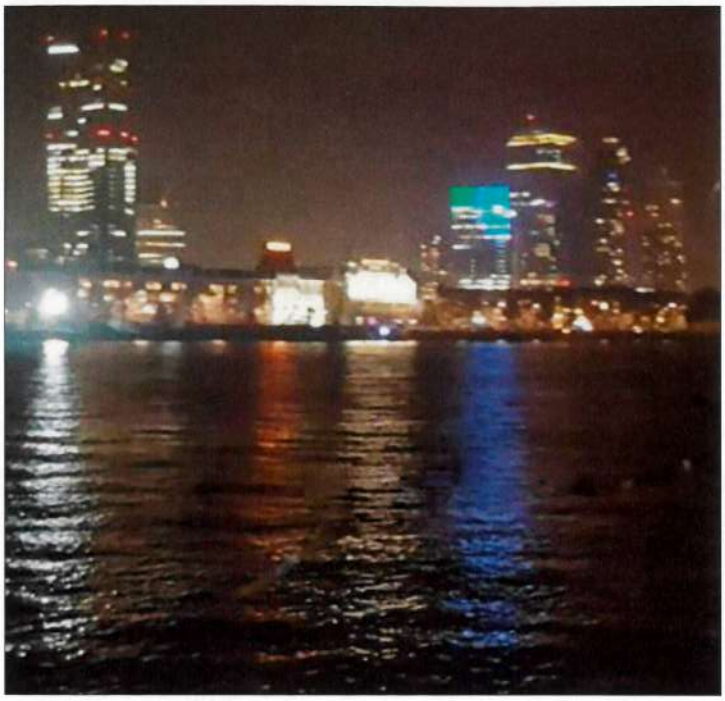
Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres or suburban locations
E4	Urban	High district brightness	Town and city centres and other commercial areas with high levels of night-time activity

10.3 Each zone can be established through a series of five pre-curfew illuminance measurements on site, four are taken vertically at a height of 1.5m above ground level each facing north, south, east and west, and the fifth taken horizontally at ground level. The maximum measured value is taken as the indicator and then compared with the limiting values in Table 10.3. For example, if the maximum measured value is eight lux then the zone will be considered as E3.

Digital facades

10.4 Digital facades comprise of a number of discrete luminaires located a meter or two apart on a building façade or structure and are intended to form a digital display where the intended observer may be a hundred or more metres distance away. At such a distance, as shown in Picture 10.1 the display appears as a uniform source, so the displayed information is easily understood. To local observers tens of meters from the display however, as indicated in Picture 10.2, they present a non-uniform light source and the information displayed is not readily understood. Each luminaire has the potential to be a nuisance

due to its ever-changing intensity and colour. Each luminaire shall therefore be considered separately from a local observer perspective, and the principles shall be applied as laid down in Table 10.2, taken from ILP GN01 limits for the luminous intensity of bright luminaires.



Picture 10.1: Digital media façade from designed viewing distance, uniform light source

Picture 10.2: Digital media façade viewed locally, non-uniform light source

Table 10.2: Maximum values for luminous intensity of luminaires in designated directions (modified from ILP GN01 Guidance notes on the reduction of obtrusive light)

Light technical parameter	Application conditions	Maximum individual luminaire projected area A_p in m^2	
		$A_p \leq 0.13$	$0.13 < A_p$
Maximum luminous intensity emitted by luminaire (I in cd)[5]	E0 Pre-curfew Post-Curfew	 0 0	 0 0
	E1 Pre-curfew Post-Curfew	 2.5 d 0	 5.1 d 0
	E2 Pre-curfew Post-Curfew	 5.0 d 2.5 d	 10 d 5.1 d
	E3 Pre-curfew Post-Curfew	 7.5 d 2.5 d	 15 d 5.1 d
	E4 Pre-curfew Post-Curfew	 13 d 2.5 d	 26 d 5.1 d

Notes
1. *d* is the distance between the observer and the glare source in metres
2. A_p is the surface of the light source
3. A luminous intensity of 0 cd can only be realised by a luminaire with a complete cut-off in the designated directions
4. For example, the pre-curfew limiting luminance for a luminaire of projection area 0.1m view from a distance (d) of 40m within an E3 zone would be 7.5 d = 7.4 * 40 = 300 cd
5. For further explanation see ILP GN01

Requirements for illuminated advertisements including digital displays

10.5 The following details the limiting performance requirements for external and internal outward facing illuminated advertisements, including digital displays.

Vertical illuminance

10.6 This is a measure of the illuminance (measured in Lux) that falls on any vertical surface, in general it is used as a measure when considering obtrusive light / light nuisance from the perspective of an observer within a premises, and the assessment is undertaken on all relevant windows. The night-time limiting values based upon environmental zone and curfew considerations are provided in Table 10.3, reference ILP GN01 Guidance notes on the reduction of obtrusive light.

Table 10.3: (ILP GN01) Maximum values of vertical illuminance on premises.

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (Ev)	Pre-curfew	0	2 lx	5 lx	10 lx	25 lx

Note:

1. The values indicated in Table 10.3 are the summation of all lighting sources that impact on the surface. If an additional light source has the likelihood of taking the existing illuminance on the surface over the limit, then it may require the designers to consider the other impacting sources, and through design reduce the impact of these to aid the inclusion of the new installation.
2. Curfew times are not defined within the guidance and are for Local Authorities to agree on a case by case basis if required in the interests of amenity. For media owners it is generally considered to be between 00.00hrs and 05.00hrs.

Advertisement luminance

10.7 The luminance of the advertisement needs to relate to ambient lighting levels, as too high a luminance can impact the day and/or night scape unacceptably and cause annoyance, distraction or even visual discomfort, whereas too low a luminance can result in the information, effect or message that it is intended for display being indecipherable.

10.8 Tables 10.4 and 10.5 are derived from research undertaken by the panel members, members of Outsmart and an understanding of research being undertaken by the Commission Internationale De L'Eclairage (CIE), through their technical committee TC4-58 investigating the effects of colourful dynamic lighting (including digital displays) on the day and night-time environment, and the controls that need to be followed to mitigate any adverse impact.

Table 10.4: Recommended maximum night-time permitted values of display luminance

Light Technical Parameter	Maximum sign luminance (L_s) cd/m²				
	Environmental zones				
Sign surface area	E0	E1	E2	E3	E4
0 to < 5 m²	0	25	200	300	300
5 to < 20 m²	0	0	200	300	300
≥ 20 m²	0	0	100	200	300

Notes:

1. The values in Table 10.4 apply to pre-curfew. The post-curfew levels shall generally be the display being off, unless (in zones E2 to E4 inclusive) the installation is still required to be operational, in which case the performance level shall be 50% of the pre-curfew level.
2. Where a digital display is split into separate areas, or displays are placed adjacent to each other with differing images, the assessment shall be made on the total possible display area.
3. The values indicated are recommended maxima, and in practice these may be required to be lower depending upon the proximity of adjacent / opposite premises with a view of the display. The reason is that for premises within fairly close proximity of the display, i.e. across the road, the vertical illuminance on the premises caused by the display, may exceed the limits advised in Table 10.3. A methodology for assessing the impact of display luminance on vertical surfaces is advised in Appendix 2.
4. The values for signs in Table 10.4 do not apply to signs for traffic control purposes.

10.9 During daytime, the background ambient lighting level is generally considerably higher than at night, and therefore the recommended maximum permitted value of sign luminance needs to be increased, as indicated in Table 10.5 below.

Table 10.5 – Recommended maximum daytime permitted values of sign luminance.

Daylight ambient Illuminance (Eh) [lux]	Sign Luminance [cd/m²]
Up to 3,500	≤ 400
3,501 to 8,500 (overcast day)	≤ 1,000
8,501 to 15,000 (bright day with cloud cover)	≤ 2,500
15,001 to 25,000 (bright sunny day)	≤ 3,500
25,001 to 42,000 (direct sunlight)	≤ 5,000
42,001 and above	> 5,000

Note:

1. Suitable lighting controls shall be incorporated to monitor ambient lighting levels and adjust the display luminance accordingly.
2. Blue light hazard. It is possible that some signs, during the daytime, may have luminance above 4,000 cd/m^2. It is therefore possible that they are nearing the limits for permitted radiation exposure. To protect against this, such installations (mainly those located at ground level) shall be assessed against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines[1]. HSE and UK law restrict exposure to radiation from non-natural sources.

10.10 As can be seen from Table 10.5, the appropriate Sign Luminance limit is very much dependent on the ambient lighting conditions and as such will be variable depending on the time of day, time of year and weather. Digital displays shall have a control device or other appropriate technology that ensures that the luminance / performance of the display relates to ambient light levels, as per the values included in the Table. Such control systems should have a short time lag (30 seconds) to avoid unnecessary switching between levels due to short fluctuations in ambient lighting level caused by, for example, clouds or even passing high vehicles.

10.11 The recommended maximum luminance levels would ensure that the display contrast against the background ambient light level is maintained, and thus the brightness of the advertisement displayed is controlled. This would ensure that whilst the display remains legible, it does not have a negative impact on local amenity or public safety.

10.12 The above recommendations may not apply to recognised display centres, such as Piccadilly Circus, which must be considered as special cases.

Image rate of change

10.13 In terms of image rate of change, illuminated advertisements, including digital displays, are separated into four classifications which are described in Table 10.6. The type of advertisement at any location needs to be carefully considered, when such installations are in proximity to the road network, and especially junctions, as variable and dynamic displays could be a distraction for the motorist.

[1] https://www.icnirp.org/en/applications/led/index.html

Table 10.6: Image rate of change categories for illuminated advertisements including digital displays

Category	Description	Example
f1	Static non-changing displays	Unchanging display, traditional billboard, paper display in bus shelter, displays of fuel prices.
f2	Static displays that change sequentially	Digital displays, large and small format, showing static advertisements that change sequentially, road maintenance signage.
f3	Variable displays / partial motion	Pharmaceutical cross, stroboscope light
f4	Dynamic full motion displays	Video / movie advertising display, or live transmission

Note:

1. In accordance with the ILP PLG05, there shall be no moving images, animation, video or full motion images displayed unless consent has been granted for such displays.
2. Static images shall not change more frequently than every 10 seconds, unless approved to do so by the Local Planning Authority.
3. Where multiple displays appear together, then the rate of change of each display shall be co-ordinated and consistent. Where such displays appear as a line together, then the transitions for each display shall be set such that they change all at once, but do not change in sequence along the road.

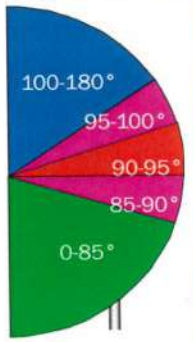
Skyglow

10.14 Skyglow is the general diffuse sheen that is visible in the direction of large cities, airports, and industrial complexes, and has become a greater concern over the years effectively preventing the night view of the stars.

10.15 Much has been successfully done to combat skyglow effects from street lighting and other artificial lighting installations, however illuminated advertisements, including digital displays, are a light source that emit light in directions beyond perpendicular from the display face, and more should be done to combat skyglow which can be achieved through optical design as is discussed later.

10.16 Skyglow occurs from both natural and artificial light sources, and does not depend exclusively on the lighting design. It also depends on the atmospheric conditions (humidity, aerosols, clouds, haze, atmospheric pollution, etc.). Light propagating into the atmosphere either directly from upward directed or incompletely shielded sources, or after reflection from the ground or other surfaces, is partially scattered back towards observers on the ground; the impact being shown in Table 10.7 taken from ILP GN01.

Table 10.7: The effect on the ability to view the night sky at various angles



Indicative diagram

Angle of light emitted (degrees)	Skyglow effect	Glare effect
100 - 180	Local	Little
95 - 100	Significant	Some
90 - 95	High	High
85 - 90	Significant	High
0 - 85	Minimum	Some

10.17 As can be seen the greatest impact on skyglow is light emitted between 85 and 100 degrees from the downward vertical.

10.18 For normal lighting installations skyglow can best be addressed by managing the upward light ratio (ULR) from the lighting installation. This is the proportion of light that is emitted at, or above, the horizontal when a light source is mounted in its installed position. This assessment approach is suitable for luminaires and associate light sources where full photometric photometry files are available and the detailed assessment can be undertaken. This information is not available for digital displays, so ULR is not a suitable metric to be applied.

10.19 Digital displays are normally mounted vertically, so resolution to mitigate skyglow from the displays should be through optical control, limiting the light emitted at various angles depending upon display location.

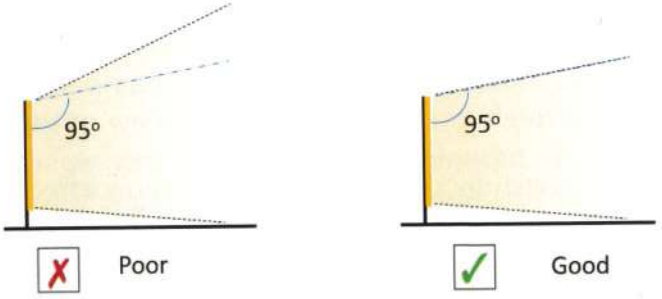


Figure 10.1: Digital display mounted at ground level, generally within an urban environment

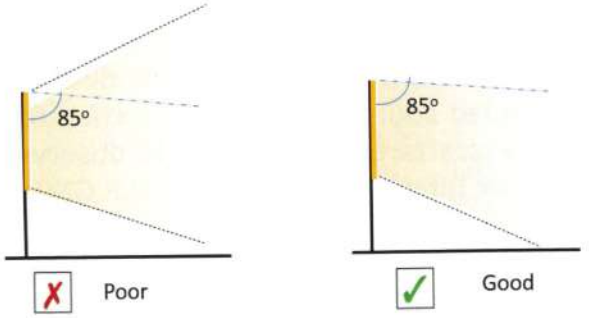


Figure 10.2: Digital display mounted on purpose-built structure / buildings up to 15m above ground level

Picture 10.3 – Digital displays ground mounted, and on purpose design structure.

10.20 For digital displays mounted over 15m above ground level, then the angle of emitted light should be such that it suits the display mounting height when considering the intended observer, for example digital displays such as those used for hotels. Digital displays at the upper storey of high-rise properties of say 20+ storeys may have a limiting angle of 45 degrees.

11. Digital display design

General

11.1 All illuminated advertisements should be designed and constructed so that the display performance meets the requirements within this document.

11.2 As discussed, as we move from a linear make, use, and dispose society the providers and manufacturers of illuminated advertisements are encouraged to consider net zero requirements which include for circular economy considerations which extend to the product being serviceable, repairable, maintainable, upgradable and can then be repurposed rather than recycled and disposed.

Digital media

11.3 A digital media installation is designed to convey information, imagery and messages to an intended audience, generally observing the installation from ground level. Depending upon the size and location of the digital media installation, the intended observer may be in close proximity to the installation, but for large media façade installations, where the display covers for example the whole side of a building, the intended observer may be over 1,000 metres away. The design objective is to ensure that the digital media installation display meets the performance requirements advised within this guide, by day and night, at levels to suit the environment within which it is located, with respect to ambient lighting levels, environmental zones and surrounding adjacent observers, such as those within premises or using the transportation infrastructure.

11.4 The objective is to ensure that light towards the unintended audience / obtrusive light is controlled to be within the limits advised within this guide.

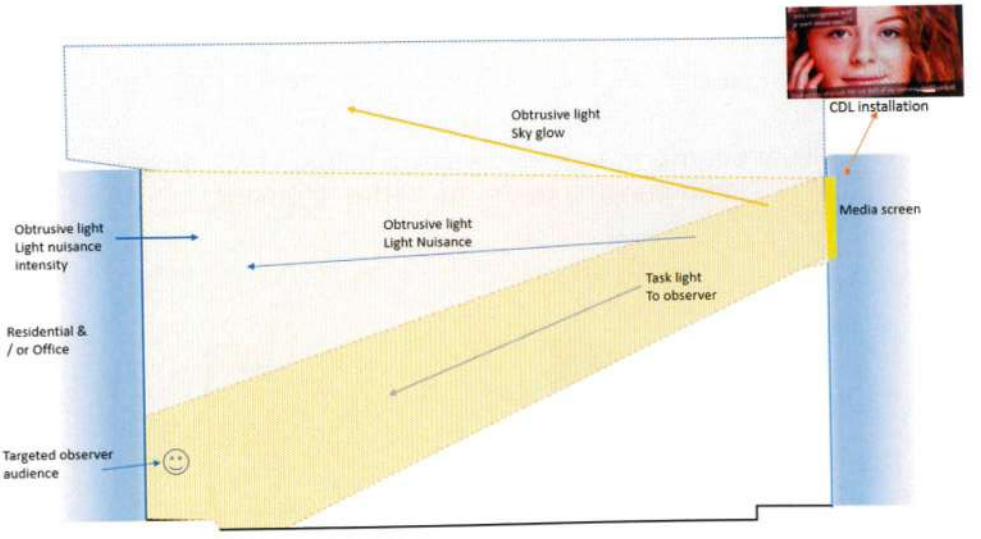
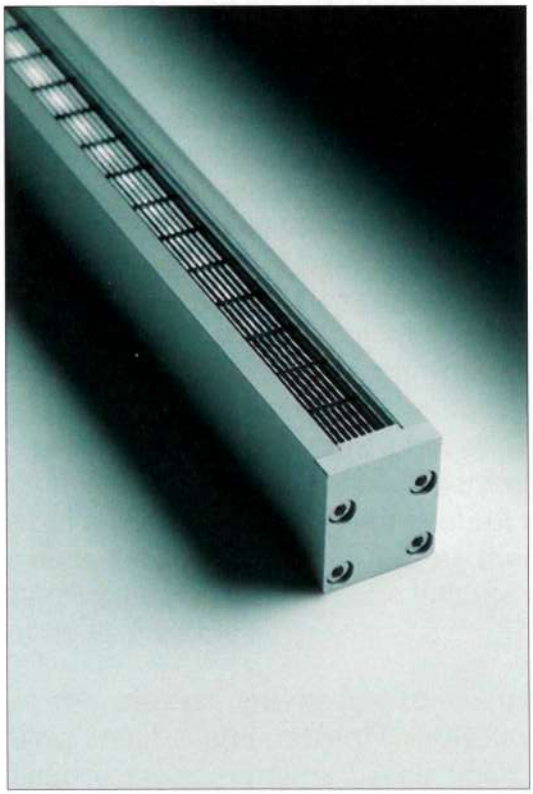


Figure 11.1: Types of obtrusive light

Design guidelines

11.5 It is clear that digital media displays need to become more directional and controlled. At the time of publication, the current industry displays (small format LCD and large format LED displays) make this very difficult without causing adverse impact on the quality of the display, and hence issues with advertisers. With current industry displays, themselves the result of long development cycles, optical control was not specified. Optical control displays that meet obtrusive lighting requirements need to be developed and tested in order to become available and commercially viable, and this will take some time.

11.6 Retrofitting optical controls to existing digital displays is not currently viable, but is worthy of investigation. Such technologies have been successfully applied in the exterior lighting industry to control obtrusive light and glare from luminaires, block light in undesired directions, yet permit the full performance of the luminaire in the desired task direction without compromise of light quality.



Picture 11.1: Micro-louvers fitted to luminaire for directional control

11.7 Looking to future installations, the industry needs to engage with suppliers and manufacturers over such innovations. That this may increase production and supply costs should not be a negative consideration as we seek to protect the environment and peoples' enjoyment of the night sky. Manufacturers that provide such solutions may become suppliers of choice, as concerns over obtrusive light, skyglow and waste energy / carbon grow, and net zero requirements increase helping the end client, and potentially advertisers, towards their efficiency targets.

11.8 The planning process can help drive momentum for improved optical control. In the short term, before such systems become readily available, planners should recommend the performance requirements advised within this guide, and optical control measures, as best practice.

Light source

11.9 The light source chosen to illuminate the advertisements should be selected such that it provides the right level of colour reproduction for the displayed images. Light Emitting Diode (LED) and Liquid Crystal Display (LCD) are the current general choices of light source for large format and small format digital displays respectively, although fluorescent lighting is still used. These light sources provide a white light, but are also supplied in a range of colour temperatures. The higher the colour temperature, the colder (bluer) it is, and the lower the colour temperature, the warmer (redder) it is.

11.10 In addition, when considering the choice of light source, the Artificial Optical Radiation (AOR) hazard must be assessed. This is a Health and Safety assessment requirement and it covers the effect of artificial optical radiation on observers. Essentially the wrong, or unintended, exposure can cause chemical damage within the observer's eye and loss of sight. The exposure needs to be at certain blue light wavelengths, above a certain spectral power (intensity of the blue light content) and the length of time / frequency of exposure is also a factor for consideration. The higher the colour temperature of the light source the greater the potential for any AOR hazard.

12. Testing, verification & performance assessment

12.1 The maximum recommended levels of luminance contained within this report are intended to be used in order to satisfy the requirements of all parties, and on the basis of sound engineering judgement and amenity considerations.

12.2 The checking of luminance levels to ensure compliance with the Advertisement Consent, or for the purposes of measurements in those cases when dispute or doubt arises, requires the use of a suitable, reliable instrument capable of direct measurement. It is possible that the Local Authority's Lighting Engineer will already possess a suitable instrument, but if this is not the case it is recommended that one should be acquired for the express purpose of obtaining luminance measurements of illuminated advertisements. It is recommended that any luminance meter used should comply with the requirements for a Type F meter as defined by *BS 7920:2005 Luminance meters. Requirements and test methods.*

12.3 Whenever a performance measurement is carried out there are a number of factors that may impact upon the performance of the lighting installation being tested. There are a number of issues associated with the lighting equipment and others that relate to the environment.

12.4 It is important to ensure that the output of the light source is stable. In general, for LED light sources, no aging period is required unless stated by the manufacturer and they have had time to run up and reach thermal stability, which may take half an hour or so. If the light sources have been in use for a long time then their output may be lower than the nominal output. Similarly, if the sign has been running for a long time the build-up of dirt on the surface may be reducing the light output. Many light sources are sensitive to changes in temperature, so it is important to record the temperature when taking readings. The supply voltage can significantly change the output of some light sources, so ideally the supply voltage should be measured. As there can be a voltage drop in the supply cabling, it is best to measure the voltage in the supply network as close to the luminaires as possible.

12.5 For digital displays the assessment needs to be undertaken on the white element of the display, and it is preferable if the display can be set to just white and a grid of luminance measurements based upon Table 12.1 undertaken, using a suitable luminance photometer. In general, this is not practicable and measurement of only the white section of any displays needs to be undertaken.

12.6 Signs using exposed light sources (e.g. cold cathode tubing) should be measured at right angles to the sign, at a distance such that the shortest dimension of the lit area fills a diameter of the viewing circle.

12.7 Readings should be taken by day and night. At night care should be taken to avoid any misleading readings, such as might be caused by other light sources in the measurement field of a luminance meter.

12.8 The number of points to measure is a function of the size of the sign. It is normal to measure the luminance on a regular grid of points, with the maximum

distance between the points (p) being given by the formula below, where d is the distance of the longest side of the sign.

$$p = 0.2 \times 5^{\log d}$$

12.9 The number of points in this dimension should be selected so that the distance between them is p or slightly less. Then, in the other direction select the number of points necessary to give a similar distance between points, thus giving an almost square grid. Table 12.1 gives information on the spacing of measurement points for a range of sign sizes. The points are laid out uniformly across the whole sign with the edge points being a half spacing in from the edge of the sign.

Table 12.1 Grid point requirements

Sign Size (m)		Points in Width		Points in Height	
Length	Width	No. Points	Spacing (m)	No. Points	Spacing (m)
0.6	0.4	5.0	0.120	3	0.133
1.0	0.6	5.0	0.200	3	0.200
1.5	0.9	6.0	0.250	4	0.225
2.0	1.3	7.0	0.286	5	0.260
3.0	1.9	7.0	0.429	4	0.475
5.0	3.1	9.0	0.556	6	0.517
7.0	4.4	9.0	0.778	6	0.733
10.0	6.3	10.0	1.000	6	1.050

Note:

1. Length relates to the longest edge, and width to the shortest edge of the advertisement

12.10 Measurements should be taken with the luminance meter as close to the centre of the sign as practically possible, and at a distance from the screen such that the diameter of the measurement field (see Figure 12.1) of the meter on the sign only encompasses the white area of the display.

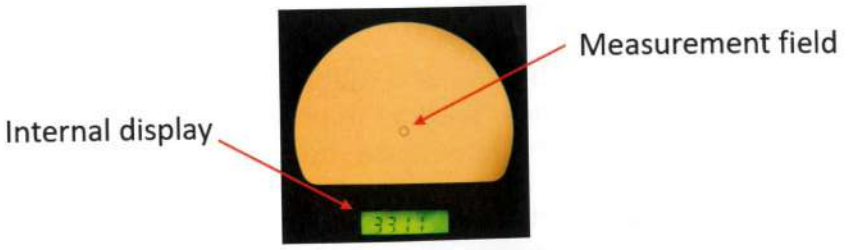


Figure 12.1: View through a luminance meter showing the measurement field

12.11 Assessment of displays can also be undertaken through the use of Image Luminance Measuring Devices (ILMD), such as a luminance camera. This is an electronic device with a lens, adequate photometric matching filter and Charged Coupled Device (CCD) or Complementary Metal Oxide Semiconductor (CMOS) sensor where every pixel is calibrated to determine the luminance values of the spaced image on its surface by the lens. The ILMD enables the entire display to be captured with one measurement, and to examine it for specific characteristics.

13. Maintenance

13.1 The Standard Conditions for all advertisements as contained in the Advertisement Regulations include that any advertisement must be maintained in a condition that does not impair the visual amenity of the site, and any advertisement hoarding or structure is to be kept in a condition which does not endanger the public.

13.2 For any signage to deliver best value, it needs to be maintained throughout its life, although there is no duty to ensure that the illumination is operational, unless this is a requirement of the original consent. All advertisements should be maintained to ensure that they operate within the design parameters, delivering the expected design performance (illumination and uniformity) throughout the installation's life, in accordance with the original consent and in accordance with the limits contained in this guide.

13.3 With advances in technologies:

- The sign design should consider the use of low energy, low maintenance solutions and perhaps with advanced control to ensure that the sign performance can be adapted in the future. By applying this approach, the installation can optimise maintenance obligations and manage energy use responsibly, thereby reducing the carbon impact of the installation.
- Remote monitoring systems within media displays which send alerts about faults and maintenance issues are recommended.
- Displays should incorporate automatic switch off when a fault is detected.

13.4 All advertisement installations should be subjected to general inspection, cleaning, and technical inspection and maintenance to ensure their safe and effective operation.

13.5 With digital displays, maintenance protocols should be developed to ensure they perform as per manufacturer specification, in accordance with the limits contained in this guide, throughout their operational life. These protocols should include:

- **Planned preventative maintenance –** The display operator to conduct planned regular inspection and maintenance of the display.
- **Reactive maintenance –** Typically, digital displays are connected via remote monitoring and management systems which provide data on key operational parameters. These systems alert the operator when operational issues arise, which are then responded to.

13.6 Sign maintenance and regular sign servicing plays an essential role; if managed properly and effectively it can deliver the benefits of enhanced sign performance and extend the design life, thus saving money in the long run.

13.7 Illumination Maintenance Services (IMS) available include preventative, proactive and emergency programs.

13.8 When it comes to maintenance, preventative or planned maintenance will ensure all sign components are as reliable as possible, maintaining brand image and integrity. This would include all aspects of cleaning, inspection, testing, re-lamping and reporting performed on a routine basis.

13.9 Reactive maintenance responds when signs fail and therefore revenue is lost in site closures while remedial work takes place within critical response times.

Planned sign maintenance

- A strategic sign maintenance programme will significantly reduce the possibility of complete sign replacement in the long-run.
- Sign maintenance work is planned around site activity, and can be completed while premises remain fully operational (critical for sites that operate 24hrs).
- Aimed at preventing sign / illumination failure and ensuring an unfaltering corporate image.
- Is significantly less expensive than emergency corrective action for failed sign illumination and can be used for promotional price changes.
- Ensures that all sign components covered by mandatory health and safety regulations are inspected and replaced as necessary.
- Reduces costs in travel, as work can be co-ordinated with other jobs in the surrounding areas.
- Engineers will become familiar with the sites and local problems associated with them.
- May appear pricey as an upfront cost is often incurred, but is significantly less expensive than emergency corrective action for failed sign illumination, and can be used for promotional price changes.
- Allows more reliable, long-term financial planning and forecasting, rather than surprise expense.

Reactive sign maintenance

- A sign maintenance solution that relies entirely on an emergency call-out basis.
- May lead to sites having an unkempt image.
- Each site visit is less cost-effective and will often lead to re-visits, as plans cannot be made for the required signage and servicing kit to be pre-loaded onto vehicles.
- Can sometimes cost less because only what is necessary at the time is spent.
- In the case of a site accident due to faulty or unregulated equipment, the legal and financial repercussions could be crippling.
- Relies entirely on the customer to keep up-to-date with any health and safety requirements.
- Can lead to sudden failure of signage, or a decrease in component quality/ performance over a period of time.
- Can be used in response to sign failure caused by vehicle impact, vandalism, storm damage or other problems.

14. Glossary / Definitions

The definitions in this section are practical definitions of terms based on the various regulations that impact on the use of signs and day to day practice.

Advertisement: Any word, letter, model, sign, placard, board, notice, awning, blind, device or representation, whether illuminated or not, employed wholly or partly for the purposes of advertisement, announcement or direction, and (without prejudice to the preceding provisions of this definition), includes any hoarding or similar structure used, designed, or adapted for use and anything else principally used, or designed, adapted for the display of advertisements, and references to the display of advertisements, shall be construed accordingly.

Note:

1. A range of modern devices for outdoor are within this definition. These include rotating poster panels, advertisements displayed on permanently fixed blinds.
2. The definition excludes anything employed as a memorial, or railway signal.

Amenity: This includes aural and visual amenity. The visual amenity includes general characteristics of the locality including features of historical, architectural, cultural, townscape, landscape or similar interest.

Illuminated Advertisement: An advertisement which is designed or adapted to be illuminated by artificial lighting, directly or by reflection, and which is so illuminated (whether continuously or from time to time).

Business Premises: Any building or part of a building normally used for the purpose of any professional, commercial or industrial undertaking, or for providing services to members of the public, or of any association and includes a public restaurant, licensed premises and a place of public entertainment. It excludes the following:

- A building designed for use as one or more separate dwellings. This is unless
  - It has been used in each of the 10 preceding years for the purpose of any professional, commercial, or industrial undertaking, or for providing services to members of the public, or any association, or
  - It has been adapted for such purpose by the construction of a shop front, or the making of a material alteration of a similar kind to its external appearance.
- A building used as an institution of a religious, educational, cultural, recreational, or medical or similar character.
- Any forecourt or other land forming part of the curtilage of a building.
- Any fence, wall or similar screen or structure, unless it forms part of the fabric of a building.

Colour Temperature: Expressed in 'Kelvin', is a measurement unit for the colour of light that is illuminating the subject. The higher the colour temperature, the bluer it is, and the lower the colour temperature, the redder it is.

Digital Display: A digital display is a uniform structure composed of components that emit light. These components may be able to change intensity and colour, and may be addressed individually and controlled together. The components are sufficiently close together and are furnished with appropriate control such that they may be resolved by the human eye to display a recognisable image and/or alphanumeric text. These images may be static or change dynamically. If changed dynamically, then these images can be read as video or film.

Digital Facades: Digital facades comprise of a number of discrete luminaires located and spaced apart on a building façade or structure, and are intended to form a digital display where the intended observer may be a hundred or more metres distance away.

Environmental Zones: A classification of the ambient brightness of the environment experienced at night-time on a scale of E0 (darkest) through to E4 (city centre / brightest).

Halo Illumination: Illumination of the background of the text of the advertisement, where the light source cannot be viewed directly from any angle.

Lasers, Search Lights, Beams of Light, Projected Illuminated Advertisements: Under the Advertisement Regulations, all illuminated advertisements projected onto buildings, landscapes and into the sky, require express consent.

Light Source: A device that produces light or serves as a source of illumination, the smallest physical component that can be removed from a containing product / luminaire, without physically damaging the containing product / luminaire.

Light Trespass: The term light trespass has been used in the past and should no longer be referenced. Trespass is to physically encroach on land, which light can't do, so the term nuisance or spill light should always be used.

Local Planning Authority (LPA): The authority with local jurisdiction in determining an application for the display of advertisements. This may include a district council, a national park, the Department of Environment in Northern Ireland and the Council of the Isles of Scilly and similar authorities.

Luminous intensity: (of a source, in a given direction) Unit: cd

Night-time: The time between evening and morning; the time of darkness, in light terms the time between when task lighting needs to switch on or off due to the change in ambient lighting levels, to provide the required level of task lighting.

Nuisance: A nuisance can be defined in general terms as an action (or sometimes a failure to act), on the part of a defendant, which is not otherwise authorised, and which causes an interference with the claimant's reasonable enjoyment of his land, or to use a slightly different formulation, which unduly interferes with the claimant's enjoyment of his land. As Lord Wright said in *Sedleigh-Denfield v O'Callaghan* [1940] AC 880, 903, "a useful test is perhaps what is reasonable according to the ordinary usages of mankind living in society, or more correctly in a particular society."

Obtrusive Light: Light which, because of the quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction, or a reduction in the ability to see essential information; this can include but not be limited

to spill light, source intensity, disability and discomfort glare and flicker, as well as skyglow.

Observer: An observer is a person who may be the intended audience for the illuminated advertisement installation, or may be someone to whom it is a source of obtrusive light. Observers may be located within premises, be pedestrians, cyclists, drivers and passengers of motor vehicles, trains, trams, and / or buses.

Premises: A house or building, together with its land and outbuildings, occupied by a business or person.

Retail Park: A group of 3 or more retail stores, at least one of which has a minimum internal floor area of 1,000 square metres and which:

- are set apart from existing shopping centres but within an existing, or proposed urban area.
- sell primarily goods other than food.
- share one or more communal car parks.

Appendix 1 Model conditions

The following are offered as 'Particulars of Decision' model conditions for the approval of all illuminated digital displays. It should be noted that the model conditions may not be suitable in every case, and depend ultimately on the location and other applicable planning circumstances.

Consent to display advertisements

Notice of approval

Town and Country Planning Act 1990

Town and Country Planning (Control of Advertisements) (England) Regulations 2007.

Particulars of Decision

The ..... Council hereby gives notice in pursuance of the above-mentioned Regulations that Consent Has Been Granted for the display of the advertisement material referred to in Part 1 hereof in accordance with the application and plan(s) submitted, subject to compliance with the following condition(s):

1. The consent now granted is limited to a period of five years from the date hereof.

   Reason: To accord with Schedule 2 of the Town and Country Planning (Control of Advertisements) (England) Regulations 2007.

2. The development shall be undertaken in strict accordance with the approved documents for this Advertisement Consent which comprise:

   Documents to be listed

   Reason: To define the permission and for the avoidance of doubt and in the interest of proper planning procedures.

3. Any advertisement displayed, and any site used for the display of advertisements, shall be maintained in a condition that does not impair the visual amenity of the site.

   Reason: To accord with Schedule 2 of the Town and Country Planning (Control of Advertisements) (England) Regulations 2007.

4. Any structure or hoarding erected or used principally for the purpose of displaying advertisements shall be maintained in a condition that does not endanger the public.

   Reason: To accord with Schedule 2 of the Town and Country Planning (Control of Advertisements) (England) Regulations 2007.

5. Where an advertisement is required under these Regulations to be removed, the site shall be left in a condition that does not endanger the public or impair visual amenity.

   Reason: To accord with Schedule 2 of the Town and Country Planning (Control of Advertisements) (England) Regulations 2007.

6. No advertisement is to be displayed without the permission of the owner of the site or any other person with an interest in the site entitled to grant permission.

   Reason: To accord with Schedule 2 of the Town and Country Planning (Control of Advertisements) (England) Regulations 2007.

7. No advertisement shall be sited or displayed so as to:
   a) Endanger persons using any highway, railway, waterway, dock, harbour or aerodrome (civil or military).
   b) Obscure, or hinder the ready interpretation of, any traffic sign, railway signal, or aid to navigation by water or air.
   c) Hinder the operation of any device used for the purpose of security, or surveillance, or for measuring the speed of any vehicle.

   Reason: To accord with Schedule 2 of the Town and Country Planning (Control of Advertisements) (England) Regulations 2007.

8. There shall be no moving images, animation, video or full motion images displayed unless otherwise permitted by this consent.

   Reason: In the interests of amenity and in order to retain effective planning control.

9. In the hours of darkness, the advertisement display luminance shall be no greater than the recommended maximum night time luminance value set out in Table 10.4 within the Institution of Lighting Professionals - Professional Lighting Guide (PLG 05) 'Brightness of Illuminated Advertisements including Digital Displays' (or its equivalent in a replacement guide) in cd/m^2. The environmental zone to be agreed with the Local Planning Authority.

   Reason: In the interests of amenity, public safety and in order to retain effective planning control.

10. In daylight hours, the advertisement display luminance shall be controlled in order to reflect ambient light conditions (to ensure it is neither too bright or too dull), and shall at all times be no greater than the recommended maximum daytime luminance values set out in Table 10.5 within the Institution of Lighting Professionals - Professional Lighting Guide (PLG 05) 'Brightness of Illuminated Advertisements including Digital Displays' (or its equivalent in a replacement guide) in cd/m^2.

    Reason: In the interests of amenity, public safety and in order to retain effective planning control.

11. Unless otherwise permitted, the minimum display time for each advertisement shall be 10 seconds and the advertisement shall not include any features which would result in interactive messages / advertisements being displayed.

    Reason: In the interests of amenity, public safety and in order to retain effective planning control.

12. The interval between successive advertisements shall be no greater than 1 second and the complete display shall change without effect. The display to include a mechanism to default to a blank or black screen in the event of malfunction, or if the advertisement is not in use.

    Reason: In the interests of amenity, public safety and in order to retain effective planning control.

13. No images displayed shall resemble official road traffic signs, traffic lights or traffic matrix signs.

    Reason: In the interests of amenity and in order to retain effective planning control.

Appendix 2 Approximate method to calculate illuminance at point facing a sign

14.1 It is possible to estimate the illuminance at a point due to an illuminated advertisement by treating the advertisement as a single light source and using the inverse square law. This approach is best when the advertisement is a long distance from the point being illuminated. As most illuminated advertisements provide a diffuse light in all directions, the method is a reasonable approximation if the point being illuminated is more than twice the maximum dimension from the advertisement. In most cases this is taken as the diagonal of the advertisement rectangle.

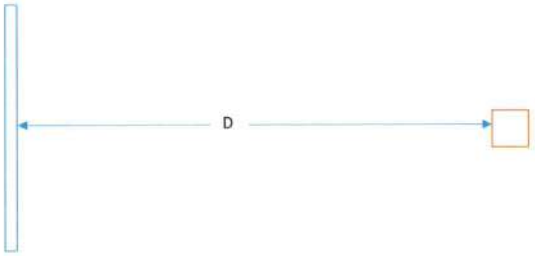
14.2 The diagonal (d) may be calculated from the length (L) and width (W) using the following formula:

$$d = \sqrt{L^2 + W^2}$$

14.3 Procedure

- Check the 2 to 1 ratio holds
- Calculate the intensity of the sign by multiplying the area by the luminance
- Calculate the illuminance by dividing the intensity by the distance squared
- Correct the results using cosines of the angles involved if the sign and point receiving the light are not facing each other.

14.4 Examples



14.5 In this example the sign and the surface being illuminated are facing each other. The sign has length 4m and width 3m, the distance between the sign and point being illuminated (D) is 12m. The luminance of the sign is 400 cd/m^2

14.6 First check that the distance D is greater than maximum dimension of the sign (d).

$$d = \sqrt{L^2 + W^2} = \sqrt{4^2 + 3^2} = \sqrt{16 + 9} = 5$$

As D is more than twice d the method may be used.

14.7 The intensity (I) of the sign is the length multiplied by the width multiplied by the luminance, in this case 4 x 3 x 400, 4800 cd. The next step is to use the inverse square law to calculate the illuminance (E).

$$E = \frac{I}{D^2} = \frac{4800}{12^2} = 33.3\ lx$$

14.8 In this example the sign does not face the point being illuminated and angle φ, between the normal to the normal of the sign, and the line joining the centre of the sign to the point being illuminated is 15°. All other parameters in the calculation are the same as in the example above so the illuminance is given by

$$E = \frac{Icos(\phi)}{D^2} = \frac{4800 \times \cos(\phi)}{12^2} = \frac{4800 \times 0.9659}{144} = 32.2\ lx$$

14.9 In the few cases where the distance from the illuminated advertisement to the observer is less that 2d then assessment has to be undertaken on site.

Appendix 3 Further reading

Impact of artificial light on fauna and flora

Pérez Vega, C.; Zielinska-Dabkowska, K.M.; Schroer, S.; Jechow, A.; Hölker, F. A Systematic Review for Establishing Relevant Environmental Parameters for Urban Lighting: Translating Research into Practice. *Sustainability* **2022**, *14*, 1107. https://doi.org/10.3390/su14031107

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