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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Institution of Lighting Professionals
Regent House
Regent Place
Rugby
Warwickshire
CV21 2PN

Tel: (01788) 576492
Email: info@theilp.org.uk
Website: www.theilp.org.uk
Registered Charity Number 268547

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This document has been prepared by the following experts:

Allan Howard (Chair)	WSP
Professor Peter Raynham	UCL
Assistant Professor Karolina Zielinska-Dabkowska	GUT LightLab, Faculty of Architecture, Gdansk University of Technology
Henk Stolk	Dutch Foundation for Illumination (NSVV)

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

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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

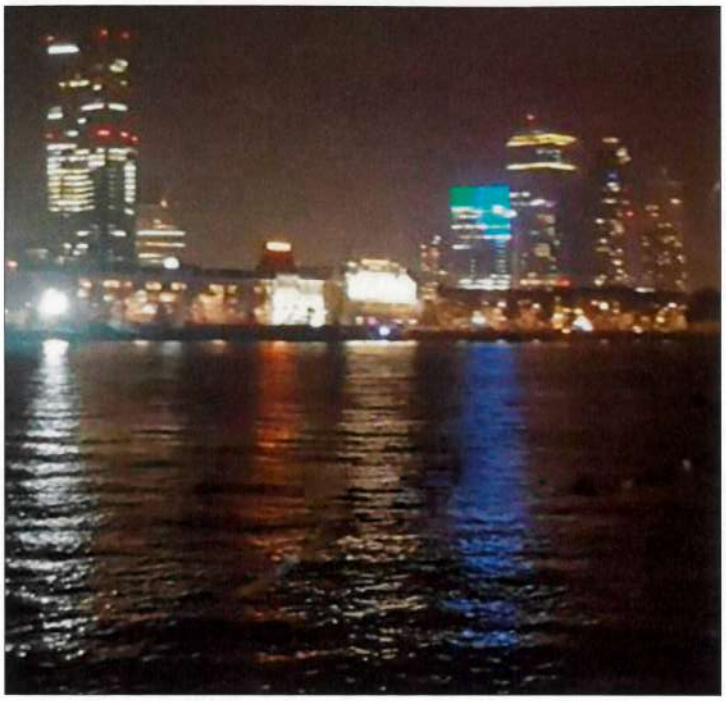
Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness	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