



CONTROLLING OBTRUSIVE LIGHTING (*Light Pollution*) AND REDUCING LIGHTING ENERGY CONSUMPTION

Consultation Draft - November 2019

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- 1.1 This non-statutory Planning Guidance (PG) is one of a series which supplements and supports the policies and proposals of the West Lothian Local Development Plan 2018 (LDP).
- 1.2 The LDP was adopted by the council on 4 September 2018 and is framed within the context of [Scottish Planning Policy \(2014\)](#); [Circular 3/2012: Planning Obligations and Good Neighbour Agreements](#); and [Circular 4/1998: The Use of Planning Conditions in Planning Permissions](#).
- 1.3 This particular guidance addresses two important environmental factors, nuisance light and energy usage with the main purposes being:
 - To help prospective developers better appreciate and understand the impacts of their external lighting proposals at the design stage and prevent it from being a nuisance;
 - To protect the physical and natural environment by encouraging developers, architects, and lighting designers to provide non-obtrusive and energy efficient lighting designs when preparing proposals for any development which incorporates an element of artificial outdoors lighting;
 - To provide detailed guidance about the manner in which the council will deal with those planning applications in which the developments proposed require exterior lighting which may have a harmful effect on the night-time character and ecology of the site and its surroundings; and
 - To provide guidance to assist officers and members in determining planning applications which include elements of exterior lighting.
- 1.4 This guidance relates to all exterior lighting situations regardless of the location of the lighting project or whether it is a stand alone project or part of an overall development. Potential developments and lighting situations include, but are not limited to:
 - Industrial/commercial developments
 - Retail developments
 - Housing developments
 - Transport interchanges
 - Roads and footpaths (either stand alone or as part of an overall development)
 - Exterior sports grounds and arenas
 - Feature lighting for civic enhancement
 - Illuminated advertisements
 - Replacement of existing installations
- 1.5 While this PG is not part of the adopted West Lothian Local Development Plan it has been the subject of both a formal council resolution and a consultation process. It can therefore be treated as a *material planning consideration* when the council, Scottish Ministers and Reporters determine planning applications and appeals.

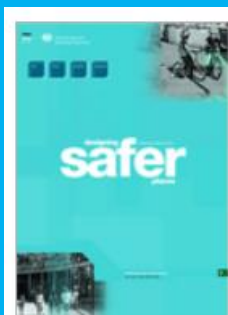
- 1.6 The council aims to balance the need for any lighting proposal against the negative effect it may have on the environment due to obtrusive light. It will always seek to prevent statutory nuisances where lighting forms part of a proposal submitted for planning permission and may seek to regulate lighting as part of planning conditions and obligations where appropriate to do so.
- 1.7 Applicants are encouraged to refer to this guidance at the earliest opportunity and can also make use of the council's pre-application enquiry service in order to clarify the issues to be addressed and to identify the information that will be needed to support any application for planning permission, which can in turn help minimise delays later in the planning process. Details of this service can be accessed on the [council's website](#). *Please note however that this is a chargeable service.*
- 1.8 For the avoidance of doubt, all previous guidance (known as Supplementary Planning Guidance or 'SPG') and specifically relating to the control of light pollution and reducing lighting energy consumption is superseded by this PG from the date it is approved by the council.

- 2.1 Until relatively recently there were no specific legislative controls on light nuisance in Scotland, but the Scottish Government has added artificial light nuisance to the list of Statutory Nuisances under [Part III of the Environmental Protection Act 1990](#), as introduced by the [Public Health etc. \(Scotland\) Act 2008](#) and it has become the primary regulatory control of the nuisance element of obtrusive light in Scotland. Breaching an *Abatement Notice* is a criminal offence, enabling local authorities (principally through its environmental health function) to initiate proceedings against offenders and, where appropriate, to carry out works in default of the Notice.
- 2.2 It is against this background that this PG has been prepared and one of the key objectives has been to address the external lighting component of development proposals wherever practicable at the pre-planning application stage. This is widely recognised as being the ideal time to influence the design or installation of lighting schemes and can serve to pre-empt instances of light pollution or nuisance arising, potentially reducing the council's involvement in dispute resolution and enforcement at a later date.

2.3 Planning Advice Note PAN 51: [Planning, Environmental Protection and Regulation](#) (last revised in 2006) supports the existing policy on the role of the planning system in relation to the environmental protection regimes and makes it clear that it is the responsibility of planning authorities and environmental protection bodies to collaborate in the task of protecting the environment and to apply controls so that duplication is minimised and overlap is avoided whenever possible.



2.4 In 2007 the Scottish Government published a Planning Guidance Note [Controlling Light Pollution & Reducing Lighting Energy Consumption](#). This provides guidance on the factors that require to be considered and the actions to be undertaken to ensure that non obtrusive and energy efficient exterior lighting installations are provided and operated throughout Scotland.



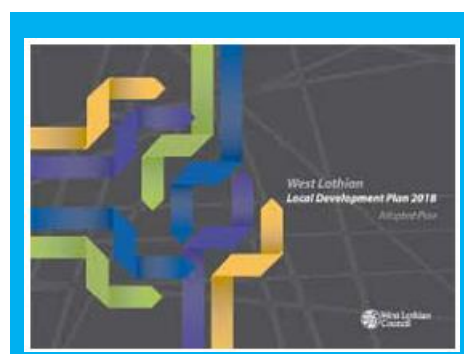
2.5 Planning Advice Note PAN 77: [Designing Safer Places](#) provides advice on how planning can help to create attractive well-managed environments which help to discourage antisocial and criminal behaviour. It addresses the contribution that lighting makes to creating safer places and reducing crime but at the same time recognises that it is important to ensure that lighting does not dazzle or create pockets of darkness.

2.6 [Scottish Planning Policy SPP](#) (2014) requires that the planning system supports resource efficient development and helps prevent future resource depletion. It should help to reduce emissions and energy use in new buildings and from new infrastructure by enabling development at appropriate locations that contributes to, amongst other things, energy efficiency.



2.7 The [Strategic Development Plan for South East Scotland](#) (2013) provides for the development needs of Edinburgh and south east Scotland in accordance with the principle of sustainable development and Policy 1b identifies the need for energy efficient development.

2.8 Although the adopted [West Lothian Local Development Plan](#) (2018) does not include an explicit policy regarding external lighting, Policy DES 1 (Design Principles) requires that new development should have no adverse impact on landscape character, built heritage, habitats or protected species as a result of light, and at the same time Policy NRG 1 promotes sustainable design and development.



- 2.9 It is important to be aware that when not an integral component of a development proposal, planning permission may not be required for lighting installations in many commercial/industrial situations where they do not materially affect the external appearance of a building or structure.
- 2.10 The installation of external lighting on a domestic property is by and large *permitted development*, i.e., exempt from formal planning control, with the notable exception of properties where an Article 4 Direction Order is in force and restricts permitted development in terms of Class 1 of the [Town and Country Planning \(General Permitted Development\) \(Scotland\) Order 1992](#). Where there is any doubt as to whether planning permission is required for the installation of a lighting scheme, it is important that advice is sought from the council's Development Management team.
- 2.11 In the case of listed buildings however, consent is almost always required for external lighting. Unsympathetic light fittings can detract from the appearance of the listed building, both at night-time and during the day. While sensitive lighting and the appropriate choice of luminaires can also benefit the historic environment, it is important that the principle of external lighting and the detailed design receives careful scrutiny. Once again, the council's Development Management team should be contacted for advice.

- 2.12 By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation. The council as Planning Authority is empowered to attach conditions to planning permissions for new developments that include the design and operation of lighting systems (for example, requiring energy-efficient design) and prevent light pollution and a 'model condition' which embraces such requirements is set out in Annex D for information and as an example of what developers may expect.
- 2.13 Even where planning permission is not required for external lighting installations this does not dispense with the need for developers and individuals to approach the subject with thoughtfulness and sensitivity for the environment together with an overarching ambition to minimise energy consumption. Lighting and the power it uses is a significant contributor to the carbon emissions we create and lighting schemes which have been thoughtfully designed with regard to this guidance will not only prevent/minimise light pollution but could also reduce energy wastage, offering significant cost savings to businesses and individuals. The Scottish Government encourages reduction of energy use and promotes more energy efficient lighting to reduce overall carbon emissions.
- 2.14 Whilst this guidance is primarily aimed at providing guidance for developers and those submitting planning applications for new developments there are a number of small but significant steps that can be taken by residents and public bodies to reduce obtrusive lighting at existing properties including;
- *considering the installation of low-wattage bulbs but with sufficient light intensity which is measured in lumens;*
 - *considering the installation of motion detectors on external lighting;*
 - *considering shielding or down-tilting external lights and using asymmetrical or double asymmetrical lights; and*
 - *switching off lights when not needed and installing timer switches and dimmers*
- 2.15 These measures can be implemented as part of routine maintenance when repairing or replacing light fittings and bulbs and should therefore not be unduly costly. In due course they will reduce energy wastage, save money (payback) and lead to a reduction in the incidences of obtrusive light.
- 2.16 Building Standards guidance on the efficiency of fixed external lighting is given in the Non-domestic [Building Services Compliance Guide for Scotland](#). It applies to new systems and replacement, in whole or in part, of existing systems. It also addresses improvement [work](#) to existing systems as a consequence of replacing components.

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Light pollution and saving energy

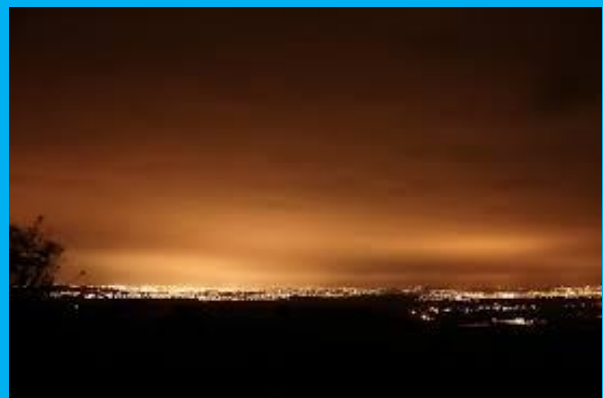
- 3.1 Artificial light is essential in our modern society and we all use it for many different things including lighting our streets and roads and helping to prevent road accidents, as a security measure to protect homes and businesses, to promote access to sport and recreation facilities outwith daylight hours, for enhancing and enlivening the night-time environment generally and for enhancing historic and architecturally important buildings. It has become an accepted and feature of day to day living and is clearly something that can be beneficial.
- 3.2 Obtrusive light (or light pollution) can however also have a profound negative impact, changing the character of a locality and significantly altering wildlife habitats and ecological patterns. On the widest scale, dark skies and unimpeded views of the stars are now becoming a thing of the past except in the most remote of rural areas.
- 3.3 Light is a type of radiation and forms part of the electromagnetic spectrum visible to the eye. It is measured in lumens (lm). A modern electric light takes in power in watts, and its efficiency can be measured in lumens per watt (lm/w). The amount of light falling on a surface is known as the illuminance and is measured in lumens per square metre or lux. This is straightforward to calculate and measure and is therefore widely used.
- 3.4 Light in itself is not a pollutant. It is only when it is obtrusive, finds its way into areas not intended to be lit and starts to have an adverse and unreasonable impact on peoples' environment and activities that it becomes problematic. If not properly designed, installed and controlled, external lighting can constitute an environmental, visual and health nuisance.

Types of light pollution

- 3.5 Light pollution is the term used to describe the unnecessary brightening of the night sky as a result of upwardly directed light which is then reflected off dust and water droplets in the sky and it is a legitimate material planning consideration. Light pollution is largely caused through a combination of poorly designed development schemes and inappropriate lighting equipment.
- 3.6 Light pollution can have many different characteristics with the most common being:

Sky glow

This is the visible pink or orange glow, mainly seen around urban areas, which occurs when stray or poorly directed light reflects off particles of water and dust in the atmosphere back toward the ground. The glow is not always localised and can be seen from many miles around, often spreading into dark rural areas and is one of the most difficult forms of light pollution to deal with. Lighting energy directed into the sky like this impedes astronomy and also wastes energy.



Glare

This is perhaps the most serious form of obtrusive light. It is the result of excessive contrast between bright and dark areas in the field of view and reduces visibility and can seriously impair human vision. It can however be avoided by the use of properly controlled and directed lighting of an appropriate brightness.



Light trespass

This is where light, direct or reflected, spills beyond the boundary of the intended illuminated subject area into neighbouring areas where it is not desired or required and becomes a nuisance. At the same time, it wastes energy and ultimately results in the unnecessary emissions of greenhouse gases.



- 3.7 While light pollution can be a problem in both urban and rural areas, residential amenity is most likely to be affected in an urban setting whilst sky glow may be the most significant consequence in a rural area and can lead to a suburban feel, losing the sense of distinctiveness associated with the countryside.
- 3.8 Lighting also need not be static to be obtrusive. The flickering of light, often used for advertising, can prove to be a distracting feature, and like glare, it can be a source of irritation and can in extreme situations be detrimental to the health of some individuals.

Common sources of light pollution

- 3.9 Problems associated with external lighting can arise from many different artificial light sources:
- inefficient street lighting which throws light upwards into the sky rather than downwards onto the road or pavement it is supposed to illuminate;
 - proliferation of road lighting, extending further out from towns and villages into the countryside;
 - all night (and sometimes daytime) floodlighting of buildings;
 - illuminated shop windows and advertising signs which are switched on overnight;
 - domestic security lighting which is inappropriately positioned and which intrudes on neighbouring properties and which can at the same time accentuate the darkness of surrounding areas;
 - temporary lighting associated with construction and engineering projects; and
 - floodlit sports facilities, such as golf driving ranges, or football pitches which bathe neighbouring land in unwelcome brightness.

Consequences of light pollution

3.10 The consequences of light pollution are extensive:

- in terms of sustainability, a significant amount of energy is wasted as a consequence of inappropriate lighting and it is therefore also a waste of money;
- the production of electricity using fossil fuels causes continued pollution of the atmosphere and is at odds with the Scottish Government's climate change policy of reducing the country's overall energy usage;
- when artificial lighting is used during the hours of darkness it is potentially damaging to human health in so far as it can infiltrate houses and disturb natural sleep patterns which in turn can lead to stress. Indirectly, glare can also contribute to road accidents;
- it can interfere with the way in which adjacent occupiers choose to use their property, diminishing their residential amenity;
- it is potentially disruptive to ecology and wildlife (e.g. some birds, bats, insects), affecting their established migration, feeding and breeding patterns; and
- it brightens the night sky to the extent that observation of the stars becomes difficult.



Control of light pollution

3.11 There is now widespread awareness of light pollution as a phenomenon and of the negative consequences associated with it. Light pollution can however be dramatically reduced by developers exercising forethought and by making informed choices about the hardware employed. At the same time significant advances can be made in tackling climate change by saving finite energy resources and ultimately helping to reduce carbon emissions.

3.12 Where an external lighting component within a development site is proposed, applicants will be required to submit supplementary information with their planning application which comprehensively details the lighting scheme and satisfactorily demonstrates that the proposed scheme is appropriate in terms of its purpose and in its particular setting.

3.13 This should include:

- a statement setting out why the lighting scheme is required;
- a report prepared by a lighting engineer which provides details of the luminaires and columns, including their type, height and location;
- a technical specification of the luminaires, including an explanation of what design attributes have been chosen to minimise light pollution; and
- a plan illustrating illuminance levels across the site and at the boundary of the property. Illuminance levels beyond the boundary of the site, together with the *downward light output ratio* of the lights may also be required.



3.14 In some cases the statement may be required to consider how the lighting scheme will be viewed against the wide landscape, both urban and rural and the potential role of landscaping in minimizing the day and night-time visual impact of the installation.

3.15 An *operational statement* should also be provided, the purpose of which is to ensure that the developer and the lighting designer have considered operational regimes that can provide energy savings.

3.16 The submission of lighting proposals will also be required in relation to temporary lighting installations, as commonly associated with construction works and site compounds.

3.17 Where the council decides to grant planning permission, it may decide to impose conditions covering such matters as:

- Hours of illumination
- No distraction to the highway
- Light levels
- Levels of impact on nearby dwellings
- Column heights
- Use of demountable columns
- Specification and colour treatment for lamps and luminaries
- The need for full horizontal cut-off
- Retention of screening vegetation
- Use of planting and bunding to contain lighting effects

3.18 The council may in some circumstances seek the erection of temporary lighting or require a review of the lighting impact following completion of the scheme.

3.19 It is recommended that applicants have regard to and make use of the lighting design process detailed in **Annex A** and it is required that all lighting proposals should be submitted with a completed Lighting Design Check List as provided in **Annex B** to this PG.

Climate change and carbon reduction

3.20 Internationally, climate change has been recognised as the greatest long-term environmental threat, posing far reaching impacts upon our lives, health and well-being, our economy and natural environment.

The [Climate Change \(Scotland\) Act 2009](#) sets out national targets for the reduction of greenhouse gas emissions of 42% by 2020 and 80% by 2050. These are the most ambitious greenhouse gas reduction targets in the world to date, meaning Scotland is a world leader in this field. Scottish Local Authorities, therefore, have a duty to put measures in place to achieve these targets.

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Detailed design considerations

General principles for new and existing lighting schemes

- 4.1 The lighting of roads, footpaths, domestic and commercial property should be an integral element of all development proposals at the outset and not, as has sometimes been the case in the past, addressed as an afterthought.
- 4.2 There is clearly a need to balance the provision of lighting to enhance safety, help in preventing crime and the perceived risk of crime, and to allow activities like sport and recreation to take place, whilst also respecting the amenity of neighbouring land uses, protecting the natural environment, areas of biodiversity and geodiversity importance and areas whose open and landscape character qualities could be adversely affected.

4.3 When formulating proposals for an external lighting scheme or where external lighting is integral to a development proposal, the designer of the lighting scheme should have regard to the following key principles:

- Consideration of what lighting is necessary to a development should be undertaken at an early stage in the design process.
- The purpose of the artificial lighting should always be clearly defined and must be provided for a specific purpose, e.g., to illuminate a given area, to mark out pathways, to highlight obstacles or objects of interest within an area. Clearly, the effectiveness of the installation can only be measured after the purpose is defined, and this should be the starting point of any design.
- The object or area to be lit should not be viewed in isolation but should be seen as part of a larger area with its own individual lighting environment. The relative brightness, lighting style and prominence of surrounding lit elements should be taken into consideration as context for the proposal.





- The power consumption and output of a lighting scheme should be an integral part of the design process and must relate to the ambient night time levels surrounding the site to be illuminated. The lighting scheme must not exceed that which is required for the satisfactory undertaking of the task involved. This will help to ensure there is not a sharp contrast between illuminated subjects.

- Illumination should always be appropriate to the surroundings and character of the area as a whole. Five 'environmental zones' are internationally recognised, see Table 1 below, and the design will require to show that control of overspill light is limited to the level required by the particular environmental setting. The corresponding *obtrusive light limitation values* are produced as Annex C.

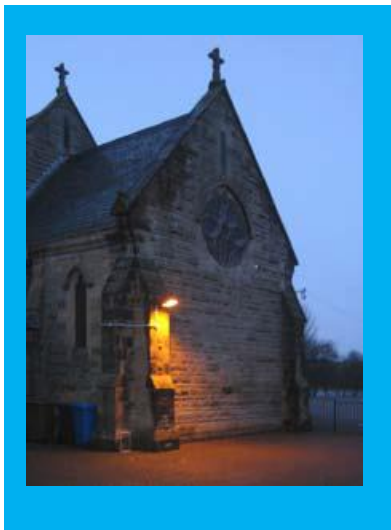
Table 1: Typical Environmental Zones in the UK

Environmental Zone	Surrounding	Night Environment	Typical Examples
E0	Protected	Dark	'Dark Sky' Parks and typically uninhabited areas e.g. National Nature Reserves
E1	Natural	Intrinsically dark	National parks, Areas of Outstanding Natural Beauty
E2	Rural	Low district brightness	Rural, small villages or relatively dark outer urban locations (industrial and residential)
E3	Suburban	Medium district brightness	Small town centres or urban locations
E4	Urban	High district brightness	Town/city centres/commercial area with high levels of night time activity

Lighting schemes for specific situations

Lighting for security

- 4.4 Domestic and commercial security lighting is usually installed with the best of intentions but often fails to meet its basic objective of providing or enhancing security. It is often assumed that a generous use of artificial lighting, whether it is street lighting or domestic security lighting, reduces the risk of crime. However, it has been shown that whilst lighting can reduce the fear of crime, poorly positioned, misdirected lights or over bright lighting can deter or hamper observation and can actually assist would-be burglars to find easy access points and can create deeply shadowed areas for concealment. In addition the type of lighting installed often consumes excessive amounts of electrical energy, causes glare and contributes to light pollution.



- 4.5 It is therefore particularly important that care is taken to ensure that the intensity and focus of security lighting, whether domestic or commercial, respects the amenity of others. At the same time, the most efficient available lamps should be employed for street lighting, to help reduce maintenance and energy costs. For most small scale domestic security lighting a 150W (2000 lumen) tungsten halogen lamp operated by a passive infra-red detector is adequate. High power lamps (300/500W) create too much glare and darker shadows, reducing security. A compact fluorescent porch light of 9W (600 lumen) is adequate for all-night lighting in most domestic situations.

- 4.6 Commercial premises are more likely than domestic premises to use lighting which makes a material change to the external appearance of the building and is therefore more likely to require planning permission, particularly when introduced post construction.

Floodlighting for sports pitches

- 4.7 In an attempt to increase the viability of facilities, to enable more people to participate and give more choice and flexibility of playing time, it is increasingly common for sports clubs and schools to want to install external floodlighting. Although the apparatus associated with floodlighting is often more readily assimilated in urban areas, and the wider impact of the light generated less intrusive, particular problems can occur in respect of residential amenity. The proximity of housing and the way in which the floodlighting and use of the site impacts on the amenities enjoyed by the occupiers will be an important factor in determining the acceptability of proposals.



- 4.8 Applicants may therefore be required to commission the preparation of light scatter diagrams that will accurately predict the performance of the scheme, both inside and outside the pitch areas.
- 4.9 Generally speaking, the taller the mast the greater the scope for directing the light downwards, thereby controlling *light spillage*. The main beam angle of lights should not exceed 70° from the vertical. Light shields should be fitted to avoid both upward glare and the direct illumination of areas beyond a distance of 10 m from the pitch. The power of each lamp should normally be limited to 1kw with internal louvres fitted and asymmetric beams utilised that permit the front glazing of the unit to be kept at or near parallel to the surface being lit.
- 4.10 Strong floodlighting used for sport pitches can create a genuine disturbance to neighbours and therefore it will generally be the case that floodlights will not be used between the hours of 10.00 p.m. and 9.00 a.m.

Street lighting

- 4.11 Street lighting forms a highly visible and vital part of the urban street scene. It is principally provided to enable the safe use of roads and is one of the measures used to reduce night-time traffic collisions. It can allow pedestrians to see hazards, orientate themselves, recognise other pedestrians and feel more secure. It also has a wider social role, with the potential of helping to reduce crime and the fear of crime, and can contribute to commercial and social use at night of town centres by improving both the daytime and night-time appearance.
- 4.12 There are however environmental downsides, most notably the substantive contribution that street lighting makes towards light pollution, especially the phenomenon of 'sky glow', and the fact that street lighting can consume a great deal of energy and increases carbon emissions.
- 4.13 Legacy street lighting is largely a mixture of High Pressure Sodium (SOM) and Metal Halide lamps which are expensive to operate and not particularly energy efficient. Street lighting is therefore high on the agenda of many local authorities as a potential area for change and making efficiency savings and as part of the Climate Change (Scotland) Act 2009 there is also a legal obligation to reduce carbon emissions from all of the council's activities. The council's approved [Climate Change Strategy and Carbon Management Plan](#) identifies a target of achieving a 20% reduction in CO₂ emissions by 2020.
- 4.14 The council has already embarked upon an ambitious capital funded phased programme to upgrade and replace legacy street lighting with the key objectives being to reducing unmetered energy charges and mitigate against future cost pressures, reduce energy consumption, reduce CO₂ emissions, reduce maintenance costs over life of installation and provide efficient and effective lighting for life of installation.
- 4.15 The council began installing energy efficient LED street lighting in 2014 and, subject to budget approval, is scheduled to complete the programme by 2027. It has been facilitated by advances in modern lamp technology and electronic programmable control gear, together with the lower and variable lighting levels permissible by revised British Standards (BS 5489) and EN 13201.

- 4.16 In the case of new residential and commercial development in West Lothian street lighting is provided by the developer and is usually adopted by the council under the terms of Section 21 of the Roads (Scotland) Act 1984
- 4.17 Street lighting requirements of new development are assessed against the criteria set out in [SCOTS National Roads Development Guide](#) together with West Lothian Council Local Variations and advice is provided to the developer on the lighting classes required in order to ensure consistent outcomes. Post adoption, the council becomes responsible for all street lighting repairs, maintenance and operational energy costs, so it is particularly important that the street lighting hardware is initially specified to a standard which achieves maximum energy efficiency and durability.
- 4.18 The use of lanterns with good optical control help maximise the spacing needed for a lighting scheme, reducing the number installed and minimising energy consumed. A reduction in the number of units installed will also help to reduce light intrusion in to neighbouring properties and light pollution. Generally, the requirements are that lighting is installed to comply with statutory and other regulations, Codes of Practice, Department of Transport and British Standards, including [British Standard BS5489 – Code of Practice for the Design of Road Lighting](#), [British Standard EN13201 – Road Lighting](#) and [BS7671 Requirements for Electrical Installations](#).

Illuminated advertisements

- 4.19 Most illuminated signs require express consent under the [Town and Country Planning \(Control of Advertisements\) \(Scotland\) Regulations 1984 \(as amended.\)](#) and the two forms of advertisement that have the potential to cause problems in lighting terms are large scale outdoor illuminated hoarding and poster advertisements and internally or externally illuminated shop fascias.
- 4.20 As a general rule traditional hoarding/poster type advertisements, where illuminated, should be lit from the top down (not up-lit) using a lighting system that ensures no light spill beyond the extent of the advertisement. Integrated lighting and the use of slim LED technology is also recommended.
- 4.21 Technological innovation has heralded the introduction of large digital media screens and facades. The brightness of such signs is dependent on the luminance, its size, contrast and the observer. Overly bright signage will be resisted if it is deemed to harm amenity (light spill, light pollution, glare) or safety). Advice may be sought from the council's Roads and Transportation Service on a case by case basis in respect of proposals for large electronic signs. Night time levels of luminance should be based on the luminance of other signs and surfaces in the area. Typical values in urban areas would be in the range of 75-300Cd/m². Day time levels of luminance may need to be higher, this should be controlled by light sensors to measure the ambient brightness and dimmers to control the lighting output and ensure that it is within acceptable limits.
- 4.22 Shop fascia signage should not be significantly brighter than those of neighbouring shops. Shopfront and fascia lighting should not contribute to light pollution and sharp contrasts caused by overbright shopfronts should be avoided. Halo lighting can often be used to effectively reduce the extent of illumination by limiting it to the lettering or logo rather than the whole sign. Care must be taken to ensure that they are not positioned where they may affect the clarity of traffic signs or disturb those living close by. In commercial areas generally, advertisements and lighting should not be used simply or primarily to create a *presence* at night.

- 4.23 As the requirements for obtaining planning permission and/or advertisement consent for illuminated advertisements are not straightforward it is strongly suggested that developers obtain written confirmation from the council before such signs are commissioned.

Common lighting design problems

- 4.24 A light fitting will deliver light where it is needed, but will potentially also give four areas of unwanted, and wasted, light.
- Spill light - falls outside the area where it is needed, it can be avoided by pointing the light in the right direction.
 - Upward light - this is wasted light shining above a light fitting, it is entirely avoidable by the use of the correct light fitting. Direct the light downwards wherever possible (this can also reduce glare).
 - Upward reflected light - this is unavoidable and dependant on the reflectances of the surfaces below the light fitting, (dry tarmac will commonly reflect 7%, grass about 20-25%). This is another source of **sky glow**. Remedies are to use only as much light on the surface as is really needed, and to try to select a surface which minimises reflectance.
 - Direct glare – this is the result of seeing the bright filament of an unshielded light, troublesome and dangerous unshielded bright lighting. Direct glare is more wasted light and can be a major problem.

Careful design and planning

- 4.25 It is possible to reduce many of the negative effects of lighting through careful design and planning, using lighting only where and when necessary, using an appropriate strength of light and adjusting light fittings to direct the light to where it is required. Illumination should be appropriate to the surroundings and character of the area as a whole. Avoid *over lighting* and use shields, reflectors and baffles to help reduce light spill to a minimum. Use specifically designed equipment that, once installed, minimises the spread of light above the horizontal. (Figure 1)

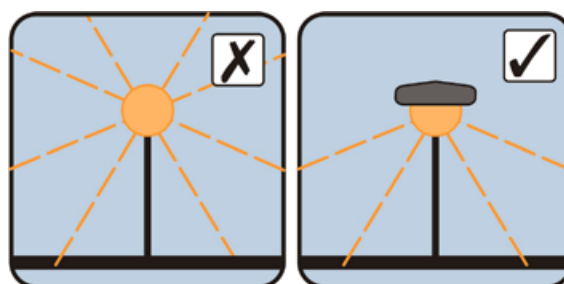


Figure 1:

Direction of light

- 4.26 Direct light downwards wherever possible to illuminate its target, not upwards. Many floodlit buildings are lit from the ground with the beams pointing into the sky. This often leads to columns of stray light pointing up into the sky creating vast amounts of light pollution and wasting energy. Provide lighting that does not glare on approach and which places light onto the ground and not into the sky where it is wasted. In other cases, simply lowering the angle of the beam will stop light from overshooting the building into the sky. (Figure 2)

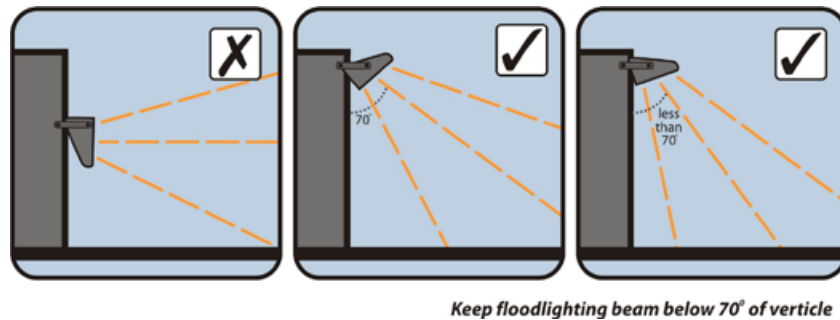
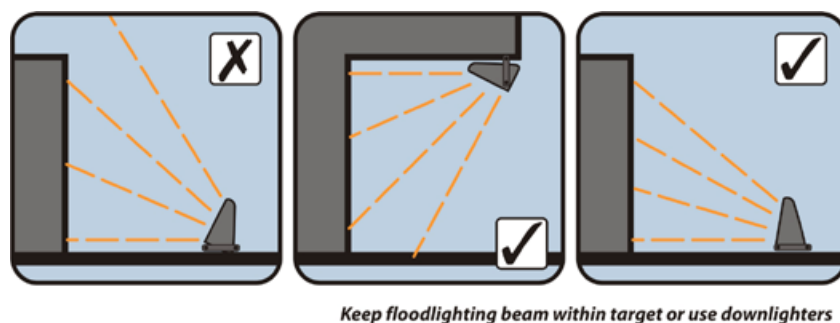
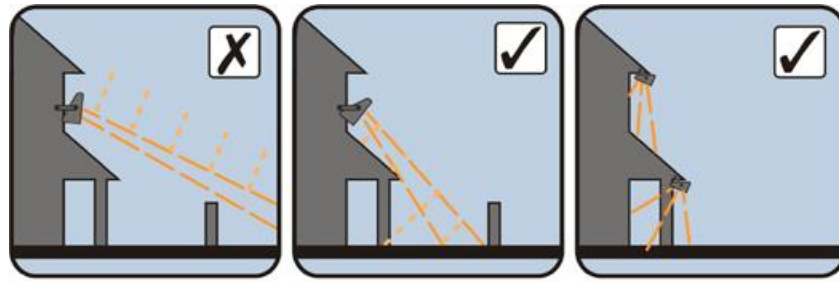


Figure 2:

- 4.27 To keep glare to a minimum, ensure that the main beam of all lights directed towards any potential observer is kept below 70°. It should be noted that the higher the mounting height, the lower the main beam angle can be. In places with low ambient light, glare can be very obtrusive and extra care should be taken in positioning and aiming. Wherever possible use floodlights with asymmetric beams that permit the front glazing to be kept at or near parallel to the surface being lit. (Figure 3)
- 4.28 If up-lighting absolutely has to be used, hoods or shields above the light should be employed, to reduce the amount of wasted upward light. Do not install equipment that spreads light above the horizontal.





Use sensor controlled lights (PIR) with the beam directed close to the property, or a low porch light

Figure 3:

Amount of light

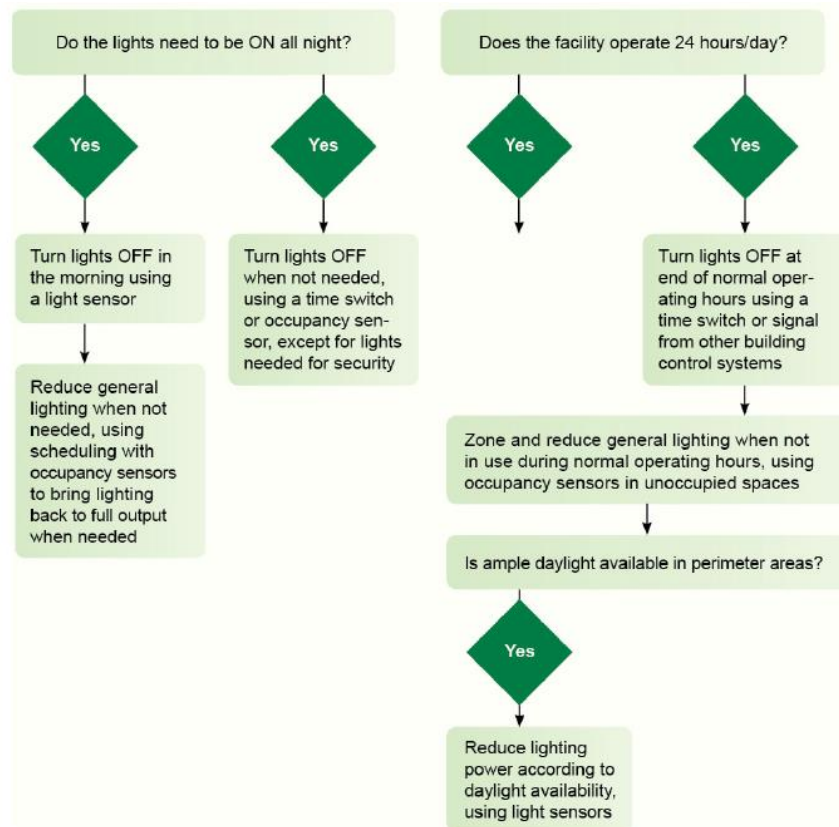
- 4.29 Rural lighting should be kept to a minimum necessary for safety. The council will be encouraged to apply this principle if building new roads in the countryside or upgrading existing installations with the use of low energy, light efficient fittings. Care should be taken where and when they are lit.

Wasted energy

- 4.30 Much energy is consumed and vast amounts of greenhouse gases are produced due to the wastefulness of all night shop advertising and display lighting, building illumination, upward floodlighting and permanent domestic and industrial security lights. Consideration should be given to the energy efficiency of fittings and a strong management policy to reduce running costs and promote sustainability.

Lighting controls (timers and motion/photo sensors)








- 4.31 Lighting controls are input/output devices/systems. The input may be manual or automatic (daylight, time, or motion), and the output may be shutoff (switching) or reduction (dimming). Lighting controls ensure that light is used only when it is needed and in the quantity needed, generating energy cost savings. For domestic and small scale security lighting the use of *Passive-Infrared sensors* (PIR) or all-night lighting at low brightness should be utilized. Generally it is good practice for exterior lighting to be capable of being turned off or for power to be reduced during times of night when it is not being used. Dimming lighting can also significantly extend the useful life of light-emitting diode (LED) lighting and thereby achieving additional financial savings. The following decisions will help minimise energy consumption by turning off or turning down lighting when it is not needed



Light bulbs and energy efficiency

- 4.32 The light bulb industry has changed radically in recent years with the gradual phasing out of incandescent filament bulbs and a range of halogen light bulbs, driven by legislation and a drive for greater energy efficiency. The older style of bulbs are being replaced by new technologies such as Light Emitting Diodes (LEDs) that require significantly less energy to produce the same brightness as the incandescent bulbs. LEDs are better value for money than incandescent and halogen light bulbs and can be used in the majority of existing fittings. LEDs use about 75% less energy than halogen light bulbs and last 5-10 times longer, greatly reducing replacement costs and the number of light bulbs ending up in landfill. The up-front cost of LEDs generally has a payback time of less than 1 year.
- 4.33 Light bulbs have traditionally been rated by their wattage however this is a measure of power rather than light intensity, more recently however manufacturers are rating bulbs in lumens. This is a measure of the total amount of “visible light” to the human eye from a light source. The higher the lumen rating the “brighter” the light will appear. The Table below demonstrates the comparison of the output in lumens contrasted with the varying wattages of the different bulb technologies. For example a 10 watt LED produces an equivalent brightness as a 60 watt incandescent bulb.

Table 2: Comparison of light bulb outputs

		 DIMMER  BRIGHTER 			
LUMENS		450	800	1100	1600
MOST EFFICIENT   LEAST EFFICIENT	Standard Incandescents 	40W	60W	75W	100W
	New Halogen Incandescents  Save up to 28%*	29W	43W	53W	72W
	CFLs  Save up to 75%*	9W	14W	19W	23W
	LEDs  Save up to 77%*	8W	13W	17W	N/A

*Percentage of energy saved by replacing a standard incandescent light bulb; based on usage of approximately 796 hours annually and average residential electricity rate of \$0.15/kWh

Useful contacts

WLC Development Management

(Applications for planning permission and advertisement consent)

t: 01506 280000

e: planning@westlothian.gov.uk

WLC Development Planning

(Planning policy / development plans)

t: 01506 280000

e: dpgeneral@westlothian.gov.uk

WLC Building Standards

t: 01506 280000

e: buildingstandards@westlothian.gov.uk

WLC Environmental Health & Trading Standards

t: 01506 282500

e: environmentalhealth@westlothian.gov.uk

WLC Operational Services

(Street Lighting)

t: 01506 284815

e: neil.wilson@westlothian.gov.uk

Further technical guidance

The Institute of Lighting Professionals

e: info@theilp.org.uk

Lighting Industry Association

w: www.thelia.org.uk

The Chartered Institute of Building Services Engineers

w: <https://www.cibse.org/about-cibse/what-we-do>

Commission for Dark Skies (CfDS)

w: https://www.britastro.org/dark-skies/cfds_issues.php?topic=about

The Energy Saving Trust

w: www.energysavingtrust.org.uk

Electrical Contractors' Association

w: www.eca.co.uk

SELECT (Scotland's Trade association for the electrical industry)

w: www.select.org.uk

Annex A

Lighting design process

1	Statement of client needs/operational statement
2	Site survey
3	Critical viewpoints
4	Existing lighting conditions
5	Baseline conditions
6	Task analysis
7	Establishment environmental setting
8	Lighting design objectives
9	Lighting design methodology
10	Calculated predictions
11	Obtrusive light calculation
12	Comparing design with baseline values
13	Designers critique
14	Viewpoint visualisation
15	Virtual walkthrough
16	Surface colour schedule
17	Luminaire schedule
18	Energy usage
19	Schedule of luminaire profiles
20	Layout plan

Annex B

Lighting design checklist

General considerations

Why is external lighting required? Is it necessary at this location, could the development proceed without it and are there alternative measures which may be less intrusive?

Consider what may be affected by night time lighting e.g. neighbouring properties, sites of ecological importance or protected species etc.

Lighting design stages

Survey of surrounding night environment	
Identification of critical viewpoints	
Establishment and calculation of existing lighting conditions	
Summary of baseline measurements and/or calculations	
Analysis of task lighting level recommendations	
Establishment of environmental light control limits	
Statement of new lighting design quality objectives	
Outline of iterative lighting design methodology	
Calculated measurement of task working area(s)	
Overspill area(s)	

Obtrusive light calculation of property pollution	
Viewed source intensities	
Nominal glare assessment	
Direct upward light ratio	
Building luminance	
Combined upward illuminance grid	
Compare design achievement with baseline values	
Designer's critique of final design constraints	
Viewpoint visualisation	
Virtual walkthrough of illuminated site	
Schedule of model reflection factors	
Schedule of luminaire types, mounting height and aiming angles	
Schedule of energy usage and distribution	
Schedule of luminaire profiles	
Layout plan with beam orientation indication	

Regardless of location in designing a lighting scheme within a new development the council expects all applicants to clearly show the location of lights, type of lamps used, their lumen output and periods of night time use. New lighting should be shown on plans and additional information provided on attached schedules. The level of detail required with a planning application will depend on its scale and location.

Annex C

Obtrusive light limitation values

Environmental Zone	Sky Glow ULR (max%)(¹)	Light trespass (into windows) E _v (Lux)(²)		Source intensity I(kcd)(³)		Building Luminescence Pre-curfew(⁴)
		Pre - curfew	Post - curfew	Pre - curfew	Post - curfew	
E0	0	0	0	0	0	0
E1	0	2.0	1.0**	2,500	0	0
E2	2.5	5.0	1.0	7,500	500	5.0
E3	5.0	10	2.0	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

Key to Table

ULR	Upward light ratio of the installation is the maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.
E_v	Vertical illuminance in Lux and is measured flat on the glazing at the centre of the window.
I	Light intensity in Candelas (cd)
L	Luminance in Candelas per square metre (cd/m ²)
Curfew	The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the council as planning authority. If not otherwise stated 23.00 hrs should be adopted.
**	Permitted only from public road lighting installations.
(1)	Upward light ration: some lighting schemes will require the deliberate and careful use of upward light - e.g. ground recessed luminaires, ground mounted floodlights, festive lighting - to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.
(2)	Light trespass (into windows): these values are suggested maxima and need to take account of existing light trespass at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the council as Roads Authority should endeavour to reduce the light trespass into the window down to the after curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.
(3)	Source intensity: this applies to each source in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.
(4)	Building luminance: this should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but not used to light an adjacent area.

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

Annex D

Model planning condition - external lighting

Prior to the start of development on the site, an external lighting scheme shall be submitted for the consideration and written approval of West Lothian Council as planning authority. The scheme shall take into account all of the lighting needs associated with the development during operational hours and shall be the minimum required to perform the relevant lighting task. It shall be specifically designed to minimise the risk of light spillage beyond the development site boundary and into the sky and to avoid dazzle or distract drivers on nearby roads.

The scheme shall include:

- (a) A statement setting out and justifying why the lighting scheme is required;
- (b) A report, prepared by a professional lighting engineer, setting out the technical details of the luminaires and columns, including their location, type, shape, dimensions and, expected luminance output and specifically explaining what design attributes have been chosen to minimise light pollution;
- (c) A plan illustrating illuminance levels across the development site and at the boundary of the site. The level of illuminance should be appropriate to the character of the surrounding area as a whole. Four environmental zones are internationally recognised, and the design will require to show that control of overspill light is limited to the level required by the particular environmental setting. The *obtrusive light limitation values* are produced as Annex C of West Lothian Council's Planning Guidance *Controlling obtrusive lighting (light pollution) and reducing lighting energy consumption* (2019);
- (d) A plan illustrating illuminance levels beyond the boundary of the site, together with the downward light output ratio of the lights;
- (e) A statement which demonstrates how the lighting scheme will be viewed against the wider landscape and, where appropriate, the potential role of landscaping in minimizing the day and night-time visual impact of the installation;
- (f) An *operational statement*, the purpose of which is to ensure that the developer and the lighting designer have considered operational regimes that can provide energy savings; and
- (g) Details of the proposed hours of operation. (Unless explicitly agreed in writing, all external lighting luminaries shall be turned off during daylight hours and when not actively required.

Applicants should have regard to and make use of the lighting design process detailed in **Annex A** of West Lothian Council Planning Guidance (PG) *Controlling obtrusive lighting (light pollution) and reducing light energy consumption*. It is further required that all lighting proposals should be submitted with a completed *lighting design check list* as provided in **Annex B** to the aforementioned PG.

Once approved in writing, the lighting scheme shall be implemented **[APPROPRIATE TIME TO BE INSERTED]** and thereafter operated in accordance with the approved details. The council reserves the right to require periodic testing to be conducted on the lighting installations and if it is confirmed that approved levels are being exceeded the operator of the lighting scheme will be required to implement the necessary works to bring it into compliance within **[APPROPRIATE TIME TO BE INSERTED]**

Reason for condition

To ensure that the council retains control over these matters, to ensure the proper implementation of the lighting proposals in the interests of the amenity of the site and the area as a whole, to prevent light pollution and to maximise energy efficiency.

(PG) Controlling obtrusive lighting (light pollution) and reducing lighting energy consumption

Approved by West Lothian Council Executive
Subsequently adopted as Planning Guidance (PG)

DATE TO BE INSERTED
DATE TO BE INSERTED

West Lothian Council, Development Planning, Civic Centre, Howden South Road, Livingston, EH54 6FF
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