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Client

Davies Homes Ltd

Report

Street lighting design at Dragon Park, Merthyr Tydfil

Rev B

Date 14 May 2025

Author of this Report

Alan Tulla, FSLL, FILP, is a Fellow and Past President of the Society of Light and Lighting and has been awarded the CIBSE/SLL Lighting Diploma. He is also a Fellow of the Institution of Lighting Professionals, ILP and lectures for them on the topic of exterior and amenity lighting. He is author of the Society of Light and Lighting "Guide to the Exterior Environment" LG06.

Issue date: as front cover.

Contents

Rev A: This report is substantially as our report of 13 April 2023. The only differences are some additional light spill calculations on the path parallel to the river Taff and to the central spine road which runs north south where it crosses the dark E-W corridor.

Rev B: Minor mods to text. Otherwise, as Rev A.

Changes/additions to the previous report are highlighted.

As before, this report comprises two parts.

The first part, this Word document, is a description of the lighting scheme. It considers issues such as ecology, light spill, conformance to standards, assumptions made, mitigation measures, description of the equipment used etc.

It also shows the approximate positions of all the luminaires.

The second part is the detailed lighting layout showing the position of each luminaire. It also shows isolux contour lines (the spread of illumination) down to 0.2 lux. A Maintenance Factor, MF, of 1 has been used so that spill light contours are “worst case”.

This is a large file (approx. 5Mb) and is attached as a separate PDF.

Summary of the lighting design and ecological impact

The roads are illuminated to an average of 5 lux. This is classified as P4 in BS 5489. The riverside path is also illuminated to P4.

The existing southern entrance road to the site is illuminated to 7.5 lux, P3, since this will receive the highest traffic flow.

Generally, 6m columns are used throughout except for some 8m on the southern roundabout. The riverside path uses 1m high bollards.

We have used Warm, 3000K LEDs for the streetlighting. The bollards are a warmer Amber 1750K.

The SUDS pond to the south receives very little light, most is below 0.5 lux, but we recommend that rear visors are fitted to the streetlighting lanterns on the nearby roads.

The Riverside footpath lighting is illuminated using bollards with rear baffles to minimise any light towards the Taff. The results are shown on the attached PDFs. A summary of the results is shown at the end of this report for clarity.

Detailed calculations showing the extent of the illumination down to 0.2 lux (the level recommended by the Bat Conservation Trust) are shown in the attachment.

The streetlights emit zero upward light. The bollards emit less than 1.5% upwards; this is within the recommended upper limit for a location such as this.

Background and site location

Davies Homes Ltd are proposing to build a residential development of 200 homes on land adjacent to the River Taff, Merthyr Tydfil. The site is currently disused industrial land situated between the river and the A470 dual-carriageway.

Whilst the area is predominantly industrial, bat activity has been recorded on the site. As such, Natural Resources Wales, has asked for full details of a Lighting Plan. This will include the siting and type of all external lighting. It should also include drawings setting out the light spillage in key sensitive areas, in particular the River Taff corridor, all retained vegetation surrounding the site, and the proposed new SUDS pond to the south.

Alan Tulla Lighting is an independent lighting consultancy specialising in the exterior environment and has been asked to provide such a design.

Location

The proposed development runs alongside the river Taff on the opposite side to the Hoover Factory.



North is at the top of this drawing.

Merthyr Tydfil Council advise us that this location is considered to be an E3 Environmental Zone and our design and report are based on this classification. Other Environmental Zones are described below:

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	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 of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

Table taken from ILP Guidance Note, GN01/2021

Environmental considerations

A residential development such as this will require some form of road and outdoor lighting for the safe movement of residents and visitors. Lighting will be required for the main distributor roads and might also be required for the cul-de-sacs, shared surfaces and footpaths.

The Alder Ecology report of November 2022 confirms that this is an E3 zone and that the main bat foraging routes are north/south along the boundaries. There is also some movement E/W.

Note that the Landscape, Biodiversity and Amenity strategy by Catherine Etchell Associates recommends that the N/S footpath along the eastern boundary, between the housing and the river Taff, should have low level or no lighting along the footpath.

The Bat Conservation Trust document “Bats and Lighting in the UK” 2018 recommends no more than 0.5 lux along foraging routes. In this case, this would apply to the river corridor. Our calculations show the 0.2 lux contour line and its relation to the Taff.

Again, the BCT document recommends LED light sources with a colour temperature, CCT, of Warm White, preferably 2700K although 3000K is acceptable. This lighting design uses Warm, 3000K LEDs throughout but note that the bollards are Amber 1750K.

Lighting buffer zones to minimise impact on bats.

Extract from the Bat Conservation Trust document “Bats and Lighting in the UK” 2023.

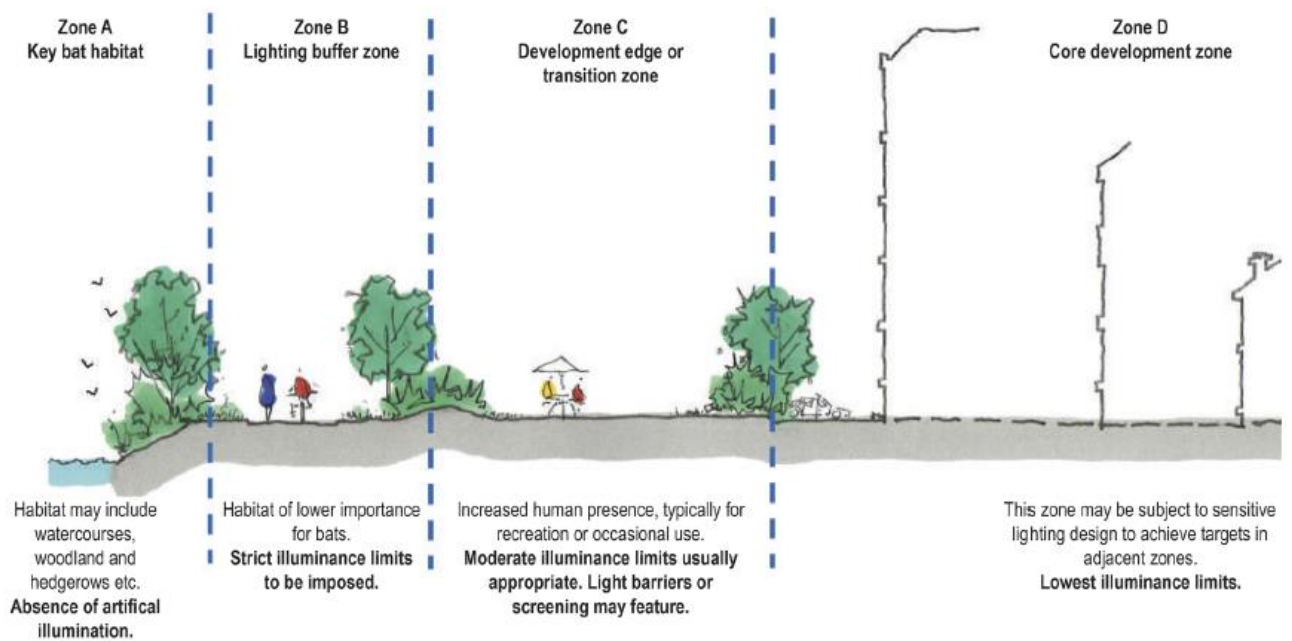
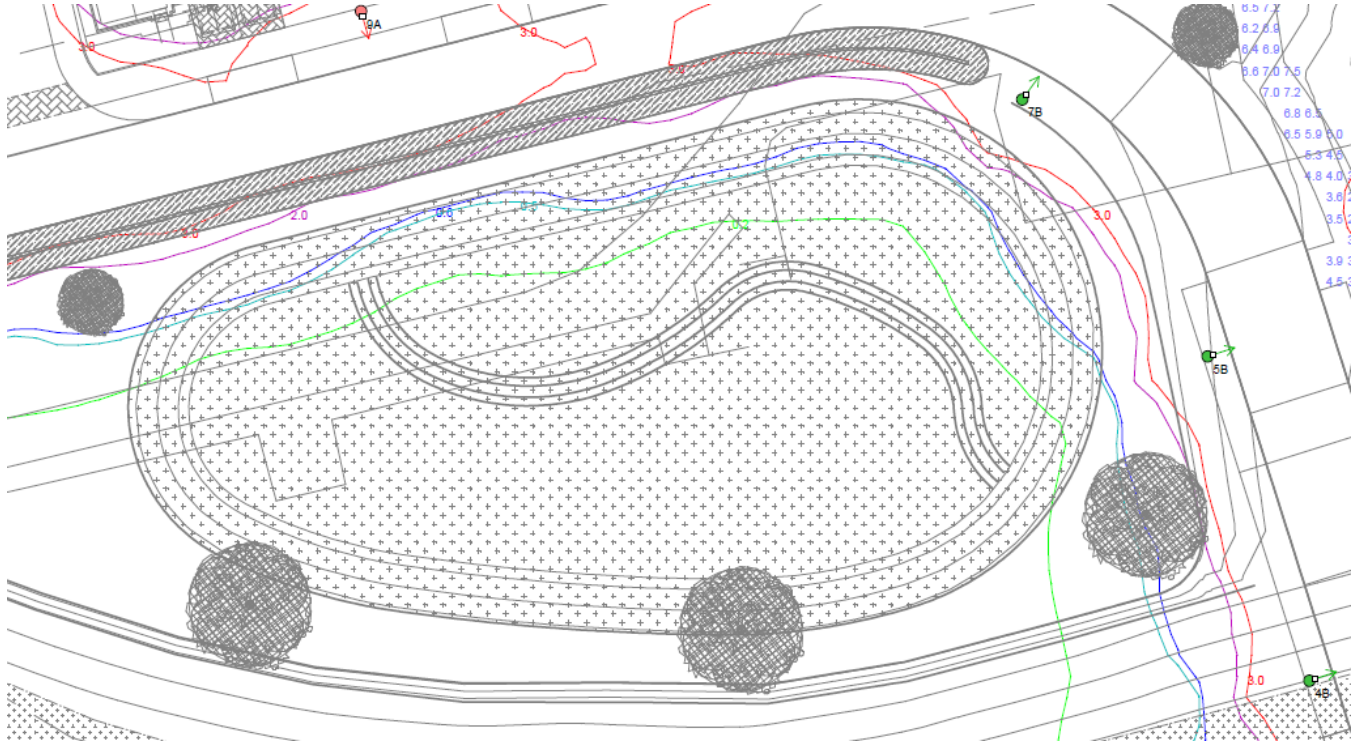


Figure 4. Example of illuminance limit zonation.

Sensitive ecological areas.

SUDS water storage

This is located at the south of the development



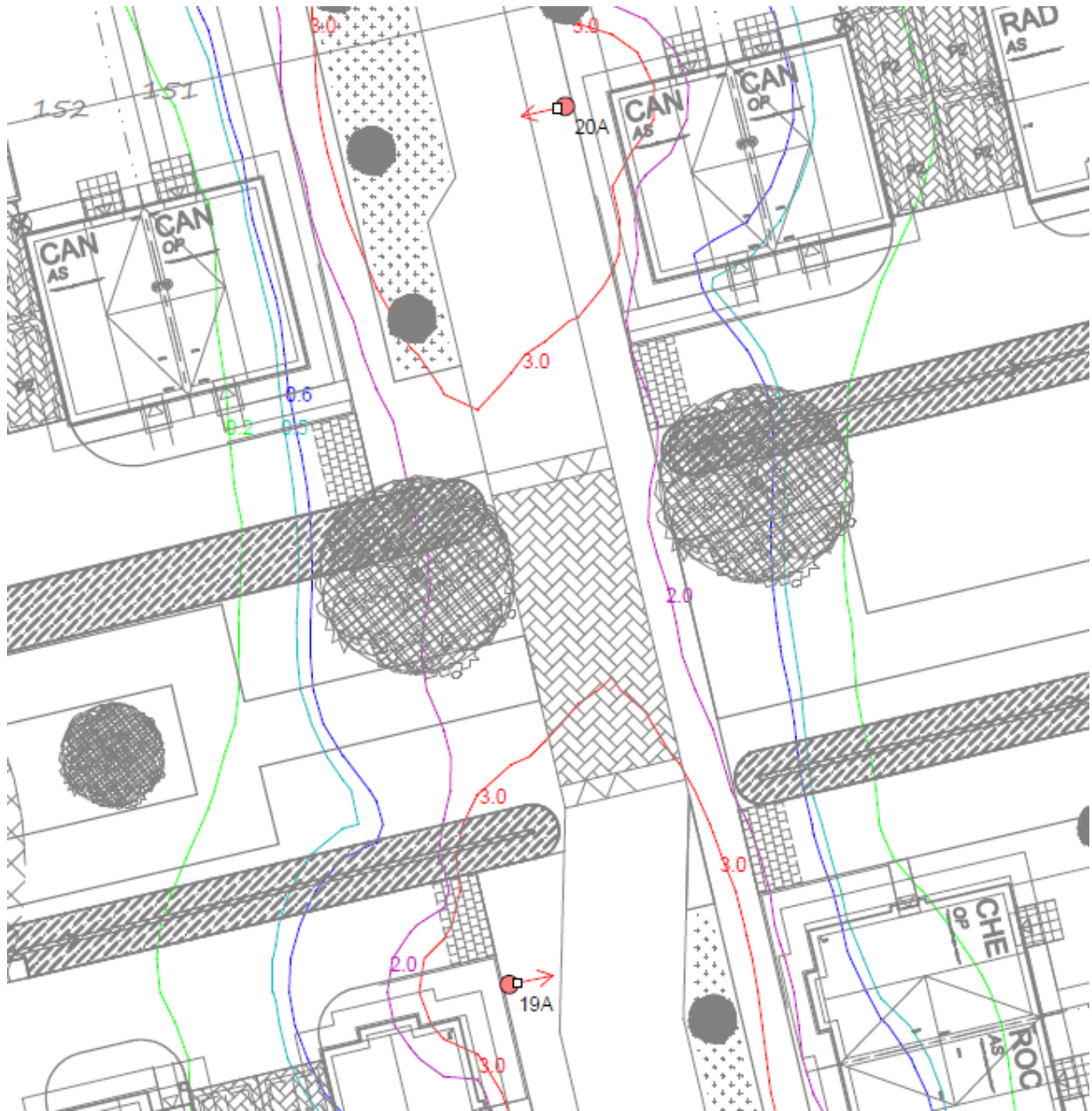
There is street lighting on both the northern and eastern flanks. There is no lighting on the southern and western faces sides. We recommend that rear visors are fitted to the streetlighting lanterns along the N and E roads.

The green line is the 0.2 lux contour; the adjacent cyan line is 0.5 lux.

Central dark corridor running East-West.

At one point, this corridor runs across the main spine road running North-South. This spine road needs to be illuminated for Health and Safety reasons. The current streetlighting uses 3000K LEDs. Whilst 3000K, is acceptable to the Bat Conservation Trust, it may be that more bat and wildlife friendly LEDs are used.

If so, we propose that Amber 1750K LEDs are used. Note that only two columns are affected, 19A and 20A.



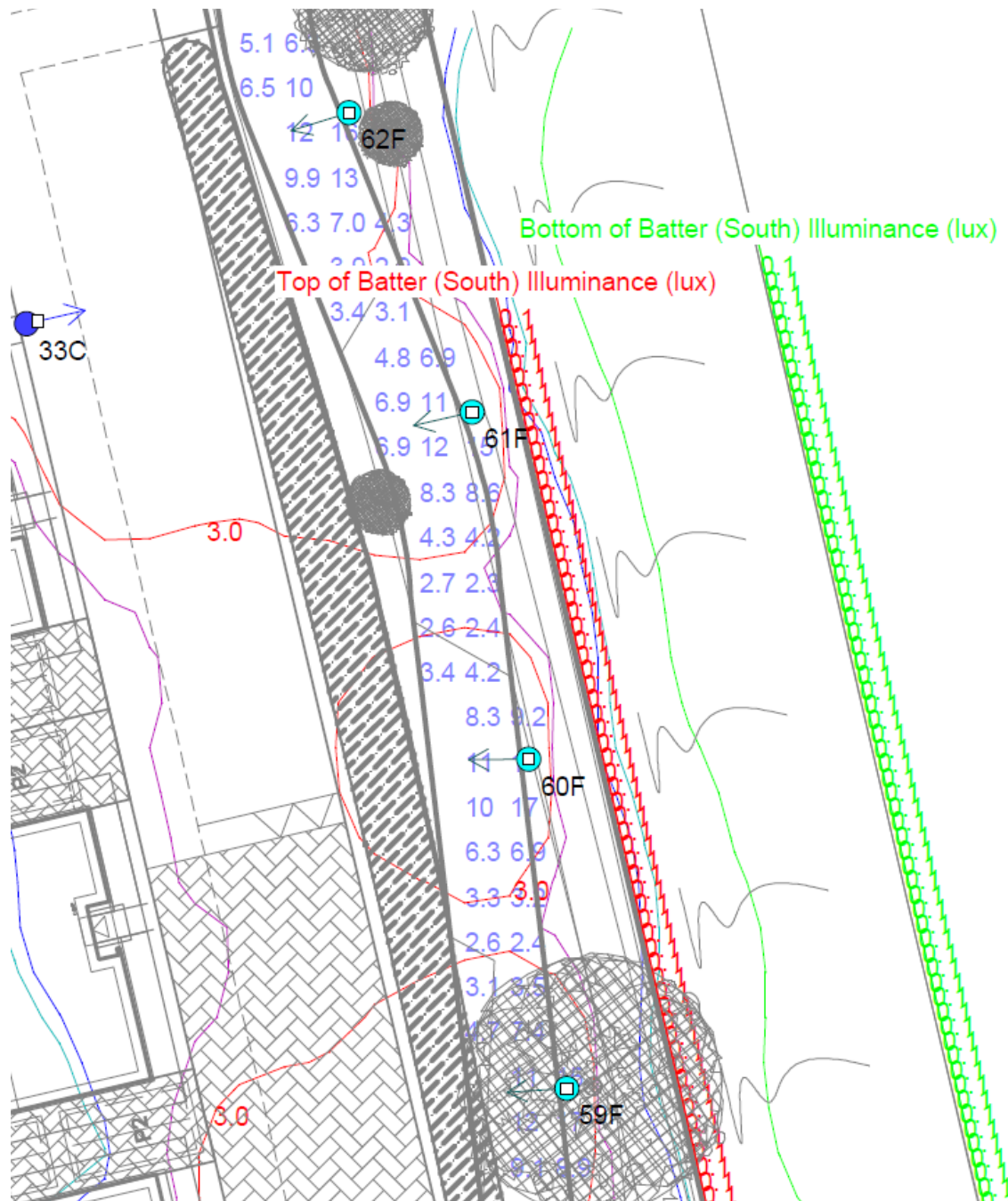
The green line represents the 0.2 lux contour.

Riverside path

This is the winding pedestrian route situated between the housing and the river Taff. The path is illuminated with bollards. Since the path bends, the distance of the bollards from the Taff will vary. For this reason, the illumination (lux) contours will also vary. The cyan line below shows the region between 1.0 lux and 0.5 lux. The bollards have an internal switch which can reduce the output (and hence illumination) by half.



Typical section of path with bollard lighting



The bollards are spaced approximately 11 m apart. The river Taff is on the right. Summary results for the whole path are shown below. The green line represents 0.2 lux.

Results Grid 1	
Eav	6.28
Emin	1.26
Emax	19.54
Emin/Emax	0.06
Emin/Eav	0.20
Results Grid 2	
Eav	5.64
Emin	1.01
Emax	17.66
Emin/Emax	0.06
Emin/Eav	0.18
Results Top of Batter (South)	
Eav	0.50
Emin	0.04
Emax	2.38
Emin/Emax	0.02
Emin/Eav	0.09
Results Bottom of Batter (South)	
Eav	0.14
Emin	0.04
Emax	0.50
Emin/Emax	0.08
Emin/Eav	0.26
Results Top of Batter (North)	
Eav	0.08
Emin	0.02
Emax	0.70
Emin/Emax	0.03
Emin/Eav	0.30
Results Bottom of Batter (North)	
Eav	0.04
Emin	0.02
Emax	0.09
Emin/Emax	0.26
Emin/Eav	0.52

Lighting design criteria

We are advised by the Council to use 6m columns. The Council has also specified the type of streetlighting lantern to be used the TRT Mini Aspect.

We assume from the BS 5489 Table below that being in an E3 environmental zone that the internal roads would have a P4 classification (average of 5 lux with a minimum of 1.0 lux).

Note that the entrance road to the site from the roundabout is illuminated to P3 classification (average of 7.5 lux with a minimum of 1.5 lux). This is because it will receive more traffic than the inner roads.

LIGHTING CLASSES FOR SUBSIDIARY ROADS BS5489-1: 2020 TABLE A.5

TRAFFIC FLOW	LIGHTING CLASS		
	E1 TO E4 ^{A)}	E1 TO E2 ^{A)}	E3 TO E4 ^{A)}
	PEDESTRIAN AND CYCLISTS ONLY	SPEED LIMIT $\leq$ 30MPH	SPEED LIMIT $\leq$ 30MPH
BUSY ^{B)}	P5	P4	P3
NORMAL ^{C)}	P5	P5	P4
QUIET ^{D)}	P6	P5	P4

The streetlighting luminaires are a “flat glass” type which emit no upward light. Bollards and external house lights should emit no more than 2.5% upward light. The bollards used emit less than 1.5% upwards.

Equipment used



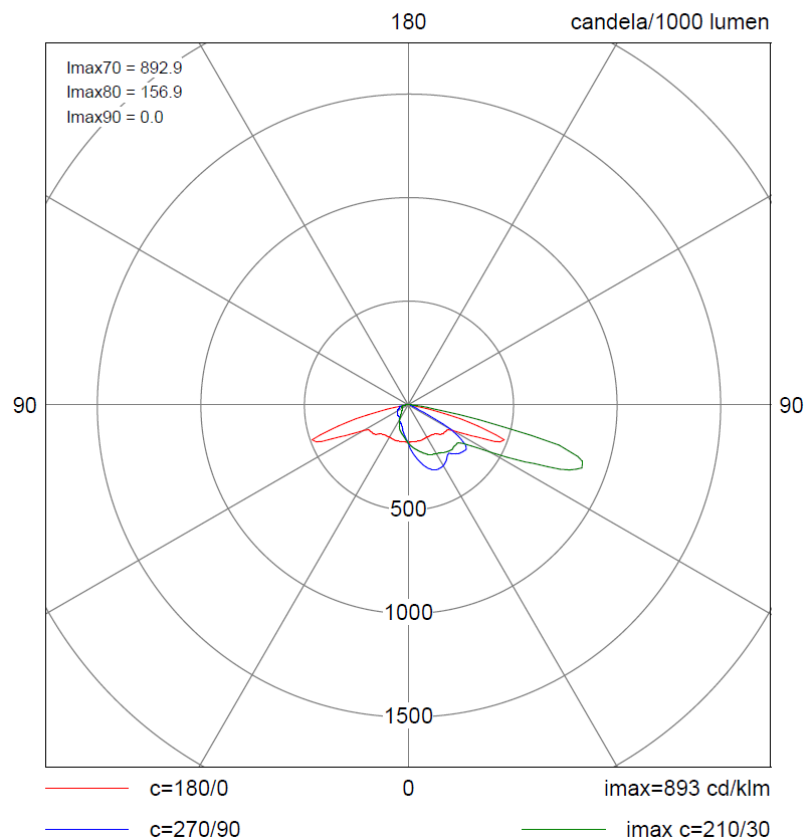
ASPECT MINI

PowerSet

- | | |
|--|--|
|  IP66 Ingress Protection |  I Electrical Class |
|  IK10 Body / IK08 Lens |  -20°C Minimum Ambient |
|  4.2kg Weight |  45°C Maximum Ambient |
|  0.0352m² Wind Area |  LED Light Source |

Various versions are used from 19W to 50W with light output of 1,800 – 4,900 lm. All are 3000K on 6m columns.

Luminaire C ASM4 LED 19W GR2 3000K EXP



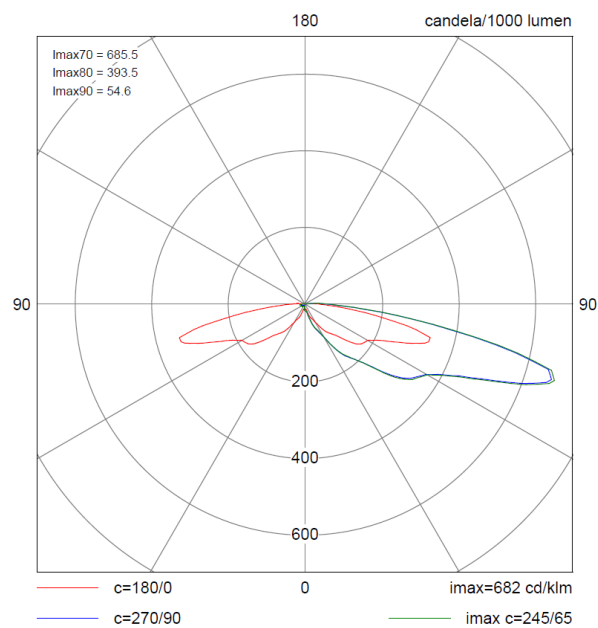
Several different types of optic are used and this shown is the most typical.

-  IP66 Ingress Protection
-  IK10 Impact Resistance
-  10.5kg Weight
-  Electrical Class I
-  -20 to +45°C Ambient



This bollard is used along the Riverside path. Version used is 10W, has an asymmetric light distribution, Amber 1750K.

Luminaire F VIA ASY 330mA PowerSet/OptiSet 3000K LED



Lighting mitigation measures

The actual dimming and/or switching regime should be discussed Merthyr Tydfil Council at the detailed design stage. A typical regime is suggested below:

Peak time, dusk to 20.00 hrs – 100% light output.

20.00 to midnight – 50% output.

Midnight to sunrise – switch off.

Note that actual hours of operation will depend on the season.

[illegible]

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Glossary of Lighting Terms

Illuminance: this is the SI term for what is normally referred to as Illumination level. It is measured in lux. It refers to the light falling on a surface. Normally this is a horizontal plane such as the ground or desktop. It can also refer to vertical surfaces such as windows and building facades. Illuminance is measured in lux.

Lumen: is the SI term for luminous flux or quantity of light. A typical 8w LED “bulb” emits 700 lumens; a 1.5m fluorescent tube emits around 5,500 lm.

Lux: is defined as an illuminance of 1 lumen/m². A residential road is typically 3 – 10 lux, a major traffic route 20 – 30 lux. A typical tennis court would be 300 -500 lux. Note that lux is normally taken to be the horizontal value but the vertical value is often relevant. E.g. vertical illuminance is important in recognising faces or light intrusion on windows.

Luminance: It is a measure of objective brightness and is a function of how much light is reflected off a surface. There are many factors involved but the major one is the reflectance of the surface. For a given level of illuminance, dark surfaces have lower luminance than light coloured surfaces. Its importance is that it is the metric used for classifying traffic routes, signs and advertising hoardings.

Luminaire: is the term for what is usually referred to as a light fitting. A fixture, light fitting or lantern are other commonly used terms. These terms are used to distinguish them from the actual light source or lamp.