

Proposed Residential Development, Glounthaune, Co. Cork

Site Lighting Design Proposal

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Quality information

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Table of Contents

1.	Introduction.....	5
2.	Design	7
3.	Standards.....	8
	3.1 Reference Standards	8
	3.2 Standards Used	9
4.	Light Pollution	11
5.	Lighting Controls.....	12
6.	Conclusion.....	13
	Appendix A Lanterns.....	14

1. Introduction

This report was generated for planning requirements and outlines the design intent and considerations to be taken with regard to the Public lighting scheme within the proposed development of Glounthaune, Ballynaron, Glounthaune, Co. Cork. Refer to Figure 1 below.

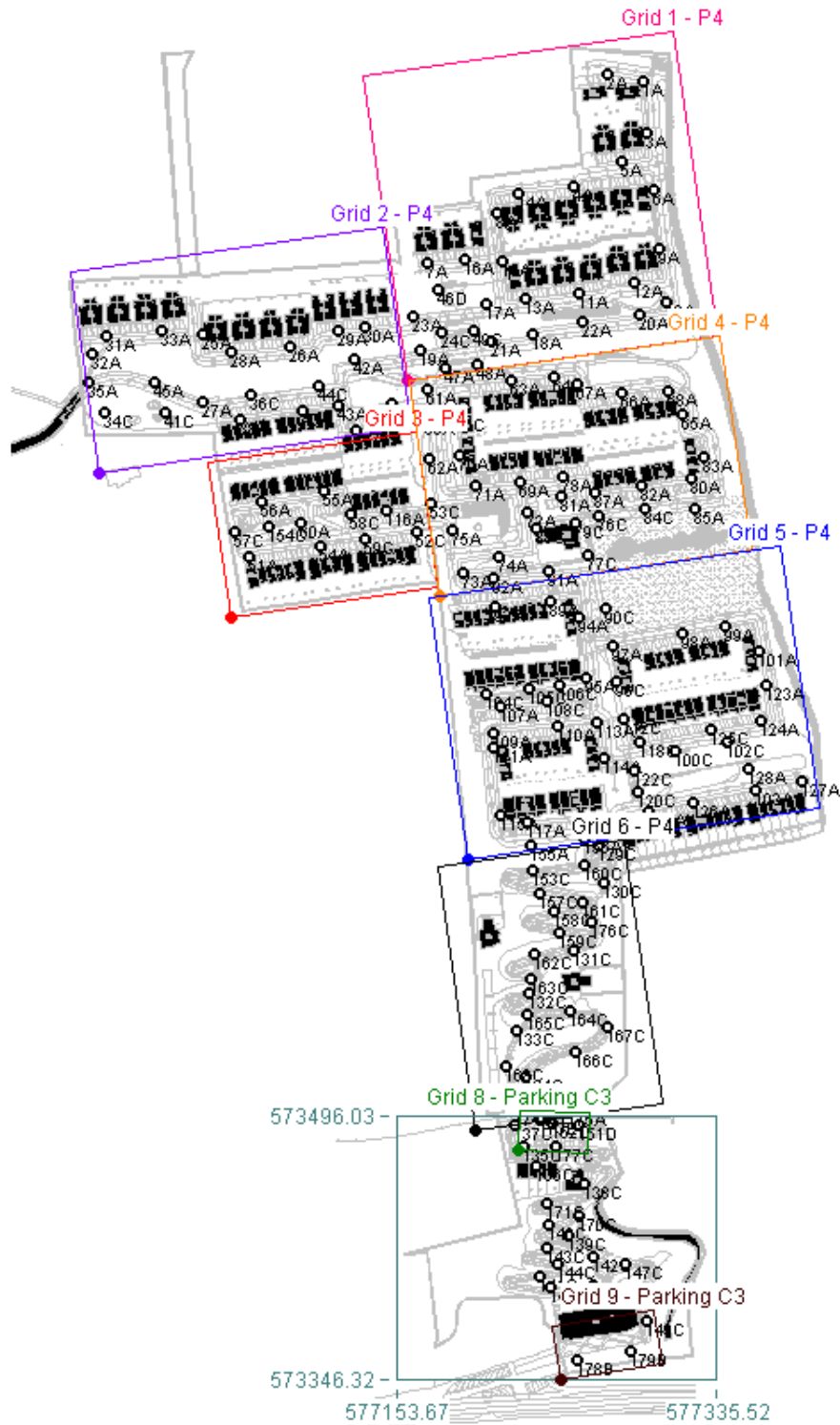


Figure 1: Proposed Development

The report considers the lighting design as developed by AECOM. The report has been developed with the following principal considerations:

- I. Provide adequate illumination to contribute towards the safe use of the road and footpath by both vehicles and pedestrians.
 - II. Provide adequate illumination to contribute towards the safe use of the walkways and footpaths by pedestrians within the residential development.
 - III. Minimise light pollution and visual glare for pedestrians and neighbouring areas.
 - IV. Provide a visually interesting environment.
 - V. Minimise the impact of Public lighting on ecological creatures (Bats).
- I. The complete external lighting installation will be designed in accordance with the regulations for electrical services as ETCI National Rules for Electrical Installations I.S. 10101: 2020 as well as BS5489-1:2020 Code of practice for the design of road lighting, IS EN 13201:2003-2, Cork County Council (Cork CoCo) – Product Lighting Manual and Product specification 2020.

The predicted performance of the external lighting installations has been assessed in detail using predictive lighting simulation software (Lighting Reality V2.1).

Our design comprises of column mounted lighting throughout the Glounthaune residential area is described in Section 6 and lighting control is detailed in Section 5. In each case, an indicative example of the type of luminaire and associated lamp specification has been included.

2. Design

As lighting designers, our proposed external lighting scheme, indicated on the accompanying drawing and associated verification report, is based on best practice, National Transport Authority guidance's and, more importantly, national & international industry standards, incorporating the following considerations.

- I. Light pollution
- II. Disability and discomfort glare
- III. Sky glow
- IV. Cork County Council (Cork CoCo) – Product Lighting Manual and Product specification 2020.

The key items that underpin our design are described below:

- I. Compliance with lighting standards/ regulations for pedestrian footpath & road lighting functionality.
- II. Mitigate light spill onto adjoining trees / neighbouring dwelling

To address the aforementioned the following measures were adopted:

- I. Consciously positioned luminaires, so as to limit negative spill and light pollution whilst also maintaining the required lux levels uniformly across the pedestrian footpath around the development.
- II. An asymmetrical beam optic is employed to physically contain unnecessary light spillage and light pollution.
- III. Illumination levels within Glounthaune estate residential roads were kept to a minimum to meet the conditions of classification P4 (5 Lux average, with a minimum of 1 Lux, as set out in Table 3 of IS EN 13201-2:2015; this uniformity ratio of 0.2 has been achieved in all areas. Said scheme also complies with the National Transport Authority's (NTA) guidance's for cycle/pedestrian routes) at ground level as per Cork County Council requirements while maintaining uniformity. It should be noted that this minimum light level meets the minimum safe levels for pedestrians as set out in BS5489-1:2020.
- IV. It is proposed that 6-metre-high LED lamp standards will provide illumination to the residential estate roads. This design is cognisant of the fact that light pollution both in terms of sky glow and light spill.
- V. Illumination levels on the main road intersection at the entrance to the residential estate were kept to a minimum to meet the conditions of classification C3 (15 Lux average, Uniformity 0.4) at ground level.
- VI. It is proposed that 8-metre-high LED lamp standards will provide adequate illumination at the intersection. This design minimises light pollution both in terms of sky glow and light spill.
- VII. On the pedestrian walkway through the site and the pedestrian walkway exiting the site to the north of the site bollard luminaires are designed. These areas are designed to classification P4 (5 Lux average, with a minimum of 1 Lux, as set out in Table 3 of IS EN 13201-2:2015).
- VIII. All lanterns have a colour temperature of 3000K.

3. Standards

Adherence to the relevant Standards/ Regulations ensures a compliant public lighting design at the proposed residential development.

3.1 Reference Standards

- Energy & Efficiency & Performance Standard for Light Bulbs, Public Consultation Document, October 2008
- ETCI National Rules for Electrical Installations I.S. 10101: 2020
- BS 5489-1 (2020) Code of Practice for the Design of Road Lighting – Part 1: Lighting Roads and Public Amenity Areas
- IS EN 12464-2 (2011) 'Lighting for Workplaces. Outdoor Workplaces'
- IS EN 13201 (2015) Road Lighting – Part 2: Performance Requirements,
- Guidance Notes for The Reduction of Obtrusive Light' Institution of Lighting Engineers, 2021
- Guide to Obtrusive light, The ILE Guidance Notes on the Reduction of Obtrusive Light and CIE
- Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations
- Cork County Council (Cork CoCo) – Product Lighting Manual and Product specification 2020

3.2 Standards Used

Illumination levels on Glounthaune residential roads were kept to a minimum to meet the conditions of classification P4 (5 Lux average) at ground level and a minimum illuminance of 1lx as per Cork County Council requirements, as detailed in Table 1 below.

6 Requirements for pedestrians and pedal cyclists

6.1 General requirements

The P classes in Table 3 or the HS classes in Table 4 are intended for pedestrians and pedal cyclists on footways, cycleways, emergency lanes and other road areas lying separately or along the carriageway of a traffic route, and for residential roads, pedestrian streets, parking places, schoolyards, etc.

NOTE 1 Guidance on the application of the above-mentioned classes is given CEN/TR 13201-1.

The average illuminance (\bar{E}), the minimum illuminance (E_{min}), the average hemispherical illuminance (\bar{E}_{hs}) and the overall uniformity of the hemispherical illuminance (U_o) are to be calculated and measured according to EN 13201-3 and EN 13201-4.

The road area for which the requirements of Tables 3 and 4 apply can include all the road area such as carriageways on residential roads and reserves between carriageways, footways and cycleways.

NOTE 2 Limitation of disability glare can be demonstrated by evaluating f_{T1} values for all relevant combinations of observation directions and observer positions (see Annex C) or achieved by the selection of luminaires according to the classes G*1, G*2, G*3, G*4, G*5 or G*6 (see A.1).

NOTE 3 Limitation of discomfort glare can be achieved by the selection of luminaires according to the classes D1, D2, D3, D4, D5 or D6 of Annex A (see A.2). For the HS classes of Table 4, only the classes D5 or D6 are relevant.

Table 3 — P lighting classes

Class	Horizontal illuminance		Additional requirement if facial recognition is necessary	
	\bar{E}^a [minimum maintained] lx	E_{min} [maintained] lx	$E_{v,min}$ [maintained] lx	$E_{sc,min}$ [maintained] lx
P1	15,0	3,00	5,0	5,0
P2	10,0	2,00	3,0	2,0
P3	7,50	1,50	2,5	1,5
P4	5,00	1,00	1,5	1,0
P5	3,00	0,60	1,0	0,6
P6	2,00	0,40	0,6	0,2
P7	performance not determined	performance not determined		

^a To provide for uniformity, the actual value of the maintained average illuminance shall not exceed 1,5 times the minimum \bar{E} value indicated for the class.

NOTE 4 A high colour rendering contributes to a better facial recognition.

Table 1: Section 6.1 Table 3 of IS EN 13201-2

Illumination levels on the main road intersection at the entrance to the residential estate will be kept to a minimum to meet the conditions of classification C3 (15 Lux average, Uniformity 0.4) at ground level, as detailed in Table 2 below.

5 Requirements for conflict areas

The C classes in Table 2 are intended for drivers of motorized vehicles, and other road users, on conflict areas such as shopping streets, road intersections of some complexity, roundabouts, queuing areas, etc.

NOTE 1 Guidance on the application of these classes is given in CEN/TR 13201-1.

C classes can also be applied to areas used by pedestrians and pedal cyclists, e.g. underpasses.

The average illuminance (\bar{E}) and the overall uniformity of the illuminance (U_o) are to be calculated and measured in accordance with EN 13201-3 and EN 13201-4.

The road area for which the requirements of Table 2 apply can include the carriageway only, when applying separate requirements for the adequate lighting of other road areas for pedestrian and cyclists, or it can include also other road areas.

NOTE 2 Limitation of disability glare can be demonstrated by evaluating f_{T} values for all relevant combinations of observation directions and observer positions (see Annex C) or achieved by the selection of luminaires according to the classes G*1, G*2, G*3, G*4, G*5 or G*6 (see A.1).

Table 2 — C lighting classes based on road surface illuminance

Class	Horizontal illuminance	
	\bar{E} [minimum maintained] lx	U_o [minimum]
C0	50	0,40
C1	30	0,40
C2	20,0	0,40
C3	15,0	0,40
C4	10,0	0,40
C5	7,50	0,40

NOTE 3 The C classes are mainly intended for use when the conventions for road surface luminance calculations do not apply or are impracticable. This can occur when the viewing distances are less than 60 m and when several observer positions are relevant. The C classes are simultaneously intended for other road users on the conflict area. The C classes have further application for pedestrian and pedal cyclists in such cases, where P and HS classes defined in 6.1 are not adequate.

Table 2: Section 5 Table 2 of IS EN 13201-2

A.2 Comparability of lighting classes

Within an overall area to be lit there can be adjacent areas to which different parameters might apply, such as footways and cycle tracks adjacent to a carriageway within the boundaries of a road. In some situations it might be appropriate to apply different lighting classes or concepts to such adjacent areas. Table A.1 shows lighting classes from BS EN 13201-2:2003 and CIE 115:2010 [N1] and indicates those of comparable level, whether using luminance or illuminance criteria.

Table A.1 Lighting classes of comparable level

ME or M class	CE or C class	S or P class
—	CE0 or C0	—
ME1 or M1	CE1 or C1	—
ME2 or M2	CE2 or C2	—
ME3 or M3	CE3 or C3	S1 or P1
ME4 or M4	CE4 or C4	S2 or P2
ME5 or M5	CE5 or C5	S3 or P3
ME6 or M6	—	S4 or P4
—	—	S5 or P5
—	—	S6 or P6

NOTE The data in this table is extrapolated from PD CEN/TR 13201-1:2004 (undergoing revision).

Table 3: Lighting class Comparability Table; extract from BS 5489-1:2013

4. Light Pollution

Light pollution is a recognised statutory nuisance. Obtrusive light from installations must be minimised taking into consideration the following:

- (i) Sky glow (direct upward waste light),
- (ii) Light trespass (intrusive light and light into windows/windcreens),
- (iii) Over illumination, glare (source intensity) and clutter.

Refer to illustration below...

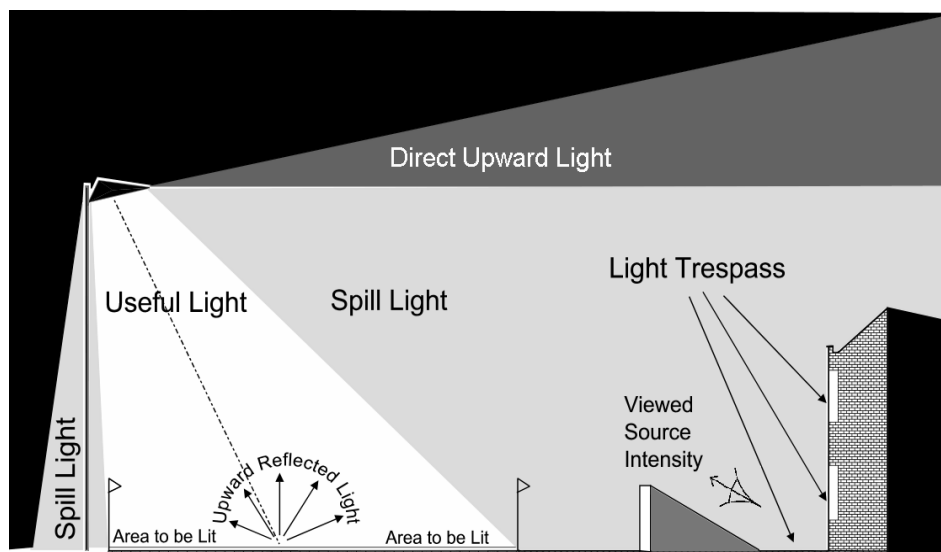


Figure 2: Light Spill

Outline predictive modelling software (Lighting Reality V2.2) has facilitated a study, which identifies and reduces potential light pollution.

Predictive modelling has further allowed for the optimum spacing of luminaires which minimise visual clutter from the artificial lighting scheme. Potential problems from glare and over-illumination have been considered and the design proposals use high quality optics coupled with aiming and commissioning to militate against these issues. Also, by optimizing illumination levels, it is possible to help mitigate against sky glow.

For the pedestrian and roadway lighting, it is proposed to utilise low wattage LED luminaires with +5/-20° inclination to the adjacent surface. Luminaires are positioned to comply with IS EN 16462-2 (2007) requirements meeting average Illuminance (E_m), uniformity (U_o) and glare rating (GRL) requirements.

5. Lighting Controls

Switching control of the lighting columns will be achieved by means of photocell control. Each individual luminaire shall be capable of being switched "ON" from dusk to dawn, unless otherwise requested by Cork Co. Co.

An individual solid-state Photo-Electric Control Unit (PECU) which will include a "fail safe" circuit that switches the luminaire on in the event of photocell failure will control each luminaire. The PECU will incorporate a phototransistor complying with I.S.428: 1991 as the light sensor, e.g. SELC 84 by Solar Enterprises Ltd., or equivalent approved by the Council. The unit will have a manufacturer's guaranteed warranty period of at least 6 years. The PECU will be designed to fit the National Electrical Manufacturers Association (NEMA) socket provided on each luminaire. Each luminaire will be fitted with a NEMA-type socket for mounting of the PECU unless otherwise directed by the Aecom Engineers. The socket will be fitted with a watertight gasket and secured by 4 non-corrodible screws that shall maintain the IP rating of the canopy. The NEMA socket shall be wired to the luminaire control circuit.



Figure 3: Photocell (PECU)

The maximum angle of light output from all the luminaires has no direct upward illuminance.

In accordance with the IS EN 12464-2; lighting and workplaces, it is calculated that the environmental zone will be E2, i.e., medium district brightness, with a maximum sky glow (URL) of 2.5%. Maximum light trespass (into windows in the surrounding buildings) of 5 lux and 1 lux at pre-curfew and post-curfew, respectively, source intensity of 7.5×10^3 cd and $.5 \times 10^3$ cd at pre-curfew and post-curfew, respectively, while the adjacent buildings luminance will be 25 cd max at pre-curfew; refer to figure 2.

A series of specific calculations using predictive modelling software results for test illuminance, luminous intensity, and glare from a range of angles relative to a light source was conducted. These concentrated on uniformity and glare in the roadway and pedestrian areas and on light spill and luminous intensity.

The public lighting scheme has been designed so as to maximise energy efficiency and to minimize light spill in so far as possible.

6. Conclusion

The public lighting design meets the requirements of Cork County Council and IS EN 13201 (2015) Road Lighting-Part 2.

Appendix A Lanterns

Below outlines the luminaires to be used in the various locations.

LANTERN REFERENCE	A, B and C	Family	Axia 3.1
LANTERN BODY :	Die-cast Aluminium, IP66 / IK10	COLUMN DESCRIPTION:	Root Mounted, Galvanised stainless steel or aluminium, 6m high from Ground Level
DIFFUSER TYPE:	N/A	LAMPS:	16.3W, 25.1W & 10.9W LED
REFLECTOR:	Wide Street optic	COLOUR OF LAMPS:	730, Warm White (WW)
CONTROL GEAR:	Photocell/Timeclock	LAMP LIFE:	100,000 hours, L90
AREA OF APPLICATION:	Residential Road Areas	MANUFACTURER	Urbis Schreder



