Retail & Restaurant Space, **Rathfarnham Castle,** **Dublin 14** **For** **South Dublin County Council**	HOMAN O'BRIEN Engineering Excellence.

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Table of Figures

1 Introduction

1.1 Development Description

South Dublin County Council intends to carry out development at the former South Dublin County Council Depot, at the Stables and Courtyards of Rathfarnham Castle and the adjoining Sean Keating Garden, Grange Road/Rathfarnham Road, Dublin14 (D14 FC62 & D14 XT02), Rathfarnham Castle (Protected Structure RPS. 221) Grange Road, Rathfarnham, Dublin 14, on a development site of 1.1725 hectares. The site is bounded by Castleside Drive to the north, Rathfarnham Road to the west and Rathfarnham Castle and its grounds to the south and east.
The development will consist of the refurbishment and change of use of the former stable buildings and former council depot yards, to provide mixed-use cultural/arts/cafe/ restaurant uses together with retail use, WC's, storage areas and a switch room.

Detailed Description of the works:

1.Works to the building to the north of the castle known as Cromwell's Fort (GFA 269m^2), and its change of use to two multi-purpose event spaces and associated lobby areas.
The proposed works to include:

i) the removal of a modern flat roof covering and the replacement with a pitched roof with zinc finish and rendered masonry gable-ends;
ii) the removal of the existing solid floor to the southern internal room and replacement with a new insulated floor slab and the insertion of a new raised floor to the northern room;
iii) the removal of infill blockwork from existing openings and the provision of new windows and doors to existing openings;
iv) Installation of new services, partitions and repair and repointing works as required, including application of lime render finish.

2.Works to the existing single storey former stable buildings (GFA 591m^2) within the existing courtyards to the north of the Castle and change of use to cultural/arts spaces, retail, café/restaurant, public toilets and ancillary lobby, storage and services spaces. The proposed works to include:

i) the removal of temporary roof coverings and the replacement with slate roof coverings;
ii) the minor modification of roof profiles above 2no. entrance doorways to provide sufficient head height at entrances;
iii) the removal of temporary bracing to windows and doors and replacement with new windows and doors to existing openings;
iv) the insertion of a new opening to the western perimeter wall to provide a new public entrance to the courtyard immediately to the north of the castle, and the closing up of an adjacent existing doorway opening;
v) The creation of new openings within dividing walls of the existing stable buildings to provide improved connection between the buildings;
vi) The construction of a new single-storey mono-pitch extension (GFA 83m^2) to the northern elevation of a former stable building;
vii) New insulated floor slabs, installation of new services and repair, repointing and lime render works as required.

3.The provision of a new single storey café and restaurant and ancillary support space (area GFA 528m^2) within the former council depot yards comprising:

i) The demolition of a section of wall to the north-west to provide access between the proposed restaurant dining area and back of house areas;
ii) The construction of a single storey mono-pitch structure in the north-west corner including clerestory windows facing north and west along the existing perimeter walls of the site to provide a café/restaurant dining area, and an associated single storey flat-roof structure to the

north to provide ancillary support to the café/restaurant, including kitchens, staff and visitor WCs;

iii) The provision of an internal plant room to the rear;

iv) The provision of external ancillary support areas including a screened bin store, screened plant enclosure at ground level and screened rooftop plant enclosure;

v) The provision of two new openings within the existing western perimeter wall to facilitate the insertion of secure entrance gates, to provide staff, deliveries and bin store access to the rear of the ancillary space and bin storage areas;

vi) The provision of four new openings within the existing western perimeter wall to facilitate the insertion of new glazed window openings to the café/restaurant;

vii) Repairs and repointing to the existing walls as required.

4.The provision of new, single storey, slated roof structures to the existing structures (GFA 33m^2) to the north of the building known as the Seismograph Building consisting of:

i) A secure bike store area and provision of 10no. long term bicycle storage spaces including 1no. enlarged bicycle space for a cargo bike;

ii) A secure bin storage area for the retail spaces;

5.The demolition and reconstruction of the walls to the north and west of the northernmost former depot yard;

6.The provision of a new car park on part of the Sean Keating garden adjacent to the boundary with Castleside Drive, with entry from the existing Rathfarnham Road car park, including:

i) the demolition of 2no. existing gate posts and part of the adjacent existing garden wall and railings, and the removal of 14no. existing trees to facilitate the construction of a new pedestrian and vehicular entrance, pedestrian footpath and delivery drop-off area;

ii) the regrading and relevelling of the existing sunken pond and garden area to provide 54 no. car parking spaces (including 4no. accessible parking spaces and 10 no. EV parking spaces) and 42 no. short-term bicycle parking spaces to the north of the site and associated landscaping;

i) The reconfiguration of the existing pedestrian entrance gate and new hard and soft landscaping to the north-west corner of the site to facilitate improved pedestrian access;

7.All associated site services, site development works and landscaping comprising:

i) Removal of temporary cabin structures from the existing former council depot yards and associated site clearances;

ii) The construction of new gated entrance and railings between Rathfarnham Castle forecourt and the proposed site;

iii) The removal of 4no. car spaces from the existing Rathfarnham Road car park to provide a new enlarged pavement area adjacent to the entrance to the Café/Restaurant;

iv) The reallocation of the existing bus set down area to accommodate a universally accessible set down area;

v) The local regrading of the footpath within the Rathfarnham Road car park along the perimeter wall to the west of the courtyards to provide accessible entrance points to the courtyards;

vi) The removal of part of southern end of the existing low level boundary wall between the existing car park and Rathfarnham Road to facilitate a new raised table and improved pedestrian crossing point; installation of a new access control gate to the carpark entrance from Rathfarnham Road;

vii) The regrading and relevelling of the existing surfaces to facilitate universal access throughout the site

viii) The provision of new hard and soft landscaping to the existing courtyards;

ix) The provision of new secure entrance gates to the existing openings between the park and courtyards;

x) The infilling with masonry construction of an existing unused entrance between the northern courtyard and the park to facilitate the regrading of the courtyard.

xi) Installation of new drainage, attenuation and site services and associated trenching and reinstatement works.
xii) Installation of new external site lighting to the car parking areas and courtyard spaces;
xiii) Repairs and repointing of existing structures throughout, as required.

The former council depot yards and former stable buildings fall within the zone of notification for Rathfarnham Castle, a National Monument (RMP DU022-014, Nat.Mon. 628) and a Protected Structure (RPS. 221)

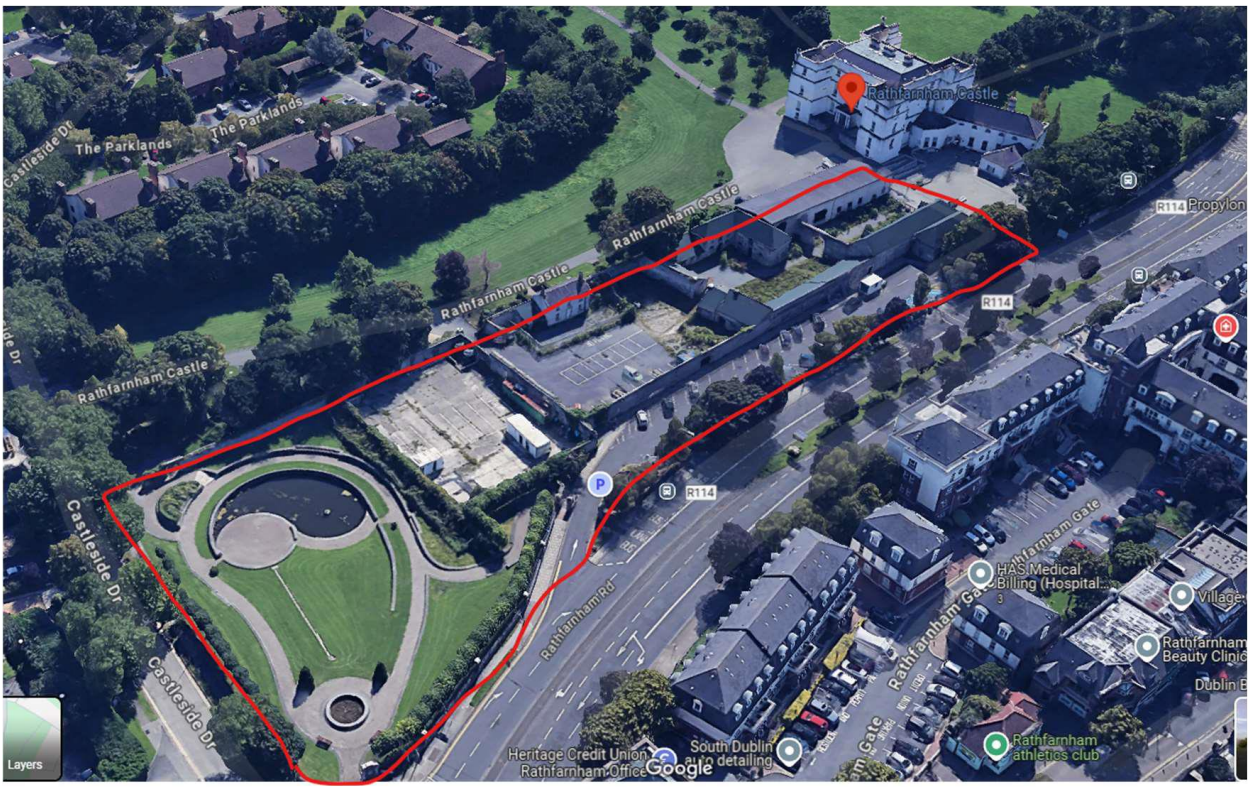


Figure 1 Site Location Map

The easiest and most effective way to protect the night-time environment is not to install any exterior lighting schemes, so the first question must be whether or not the lighting is necessary or justifiable. In this instance it is a necessity to illuminate the development. The decision to include exterior lighting is usually provided for one or more of a number of reasons, which can usually be broken down into two categories: need and desire:

1.2 Need

- Enhance safety of movement, such as roads, cycle routes and pathways
- Provide security by making surveillance possible, such as a car park
- Enable works to be carried out, such as works for communal resident hub.
- Traffic volume and traffic speed.
- The reduction in accident rates and severity
- Road lighting may be justified if there is an inhomogeneous traffic environment, poor road alignment, short spacing of junctions, greater than normal number of crossroads and bus stops, a lack of dedicated pedestrian footways, etc.
- Lighting is provided for social reasons; to improve the general amenity, to give safe passage for pedestrians and to provide a sense of personal security
- Improve Security lighting levels for CCTV Systems

1.3 Desire

- Lengthen the time that outdoor facilities can be used, such as sports pitches.
- Extend the economic day of an area, such as a town centre.
- Illuminate landmarks or structures, such as castles or bridges.

We have considered both Need and Desire in the design solution.

2 Proposed Design Approach

There were six key lighting design elements reviewed in advance of carrying out lighting calculations. The lighting design should conform to all standards listed below.

2.1 Design Criteria

- Lighting Lux Levels, and uniformity on walkways.
- Light pollution on surrounding properties.
- Luminaire intensity.
- Up Light Ratio (ULR).
- Lighting Controls.
- Bat disturbance mitigation.

This development is classified as an 'E3' environment in accordance with IS EN 12464-2:2014. This represents medium district brightness areas, such as industrial or residential suburban areas. The following lighting criteria must be adhered to when designing a lighting installation for an E3 environment**.**

There are two area designations, each with specific design principles.

- South Dublin County Council area to be 'taken in charge', i.e. adjacent Public Roadway and Footpath and public carpark.
- Private Areas within site boundary.

General design principles for the entire development are as follows –

- Provide adequate illumination to contribute towards the safe use of the site by both vehicles and pedestrians.
- Lighting need to enhance orientation, security and safe movement throughout including safe access to fire assembly points.
- Use enhanced base lighting for pedestrian and public spaces to reduce fear of crime and enhance sense of well-being.
- High colour rendering base lighting to unify elements across development.
- Achieve levels of illumination to improve CCTV camera imaging.
- Ensure design ensures reduced energy use, light pollution, sky glow, light spillage and visual glare.

Particular design principles for South Dublin County Council are as follows –

- Fully comply with South Dublin County Council Public Lighting Services Department's current specifications and requirements.
- Minimum mounting height for columns is 6 Metre.
- No fittings to be located within 3 Metres of trees at maturity.
- Isoline drawing to indicate cut off to 1 Lux.
- Cherry picker access needed for wall mounted luminaires for maintenance. This to be taken into consideration when placing fittings.

- Mini pillars, to SDCC standards, be located with a maximum load of under 2kW with an unmetered supply.
- Columns to be raise/lower type throughout for easy maintenance unless vehicle access is available.
- Columns to be fitted with solar clock, wiring to be provided for this in design and CCTV operator informed there is no power to poles during daylight hours.
- Particular attention paid to ensure unobtrusive light as outlined in guidance documents.
- Burn hour calendars to be as agreed as per the CRU guidelines (Commission for Regulation of Utilities).
- The height and arrangement of lighting columns and luminaires will be specified to prevent glare to cameras. The areas covered by the CCTV will be designed to provide adequate illumination levels, ensuring clear VDU image definition and sufficient lighting to allow staff to move safely around the establishment.

2.2 Standards

This report is to be read in conjunction with the following –

- SDCC Public Lighting 'As Constructed Documents'.
- SDCC Public Lighting General Specification February 2020.

Should there be ambiguity between this report and the above documents the above will take precedence.

- EN 12464-2 2014 - Light and lighting. Lighting of work places. Outdoor work places.
- SLL Code of Lighting 2022.
- SLL Lighting Handbook (Including corrigenda-March 2019).
- SLL Lighting Guide 1: The industrial environment (2018).
- SLL Lighting Guide 4: Sports (2021).
- SLL Lighting Guide 6: The exterior environment (2016).
- SLL Lighting Guide 9 – Lighting for communal residential buildings (2022).
- SLL Lighting Guide 14: Control of electric lighting (2016).
- SLL Lighting Guide 21 - Protecting the night-time environment Guide to limiting obtrusive light (2021)
- Institute of Lighting Professionals (ILP):
- PLG05: The brightness of illuminated advertisements (2015)
- GN01: Guidance notes for the reduction of obtrusive light (2021)
- International Commission for Illumination (CIE): CIE 150:2017: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (2nd edition)
- I.S 3217:2013+A1
- Building Regulations Part M
- LG21 Protecting the night-time environment.
- IS EN 13201-2:2015 Road Lighting — Part 2: Performance Requirements.
- IS EN 12665:2018 Light and Lighting – Basic Terms and Criteria for Specifying Lighting Requirements.
- IS EN 13201-3:2015 Road lighting — Part 3: Calculation of performance.
- IS EN 13201-4:2015 Road lighting — Part 4: Methods of measuring lighting performance.
- BS 5489.1 2020 - Code of practice for the design of road lighting Part 1: Lighting of roads and public amenity areas.
- DAC requirements specific for this development.
- HSA Regulations for Electricity.
- NSAI National Rules for Electrical Installations IS 10101:2020 5th Edition.
- ESB National Code of Practice for Customer Interface.
- Housing Schemes: Guidebook for ESB Networks Standard for Electrical Services.
- BS 5489.1 2020.

2.3 CIE environmental zones (source: CIE 150 (2017) Tables 2, 5 and 7

2.3.1 Zone Lighting Environment Examples

- E0 Intrinsically dark UNESCO Starlight Reserves, IDA Dark Sky Parks, major optical observatories
- E1 Dark National Parks, Areas of Outstanding Natural Beauty, relatively uninhabited rural areas
- E2 Low district brightness Sparsely inhabited rural areas
- E3 Medium district brightness Well inhabited town and urban settlements
- E4 High district brightness Town and city centres, out of town retail parks

Night-time limit values for different environmental zones (source: CIE 150 (2017)

Time Maximum values of vertical illuminance on properties (lux) for stated CIE Environmental zone

	E0	E1	E2	E3	E4
Pre Curfew	0	2	5	10	25
Post Curfew	0	0.1	1	2	5

Item Maximum permitted values of average surface luminance (cd/m2) for stated maximum values of upward light ratio (ULR) of luminaires (%)

	0	0	2.5	5	15
Building façade	<0.1	<0.1	5	10	25
Signs	<0.1	50	400	800	1000

* If the installation is for public (road) lighting then this may be up to 1 lux

2.4 Light Pollution (Obtrusive Light) on Surrounding Properties

This values are for an E3 Enviroment.

- 10 lux pre-curfew (maximum value of vertical illuminance on properties)
- 2 lux post-curfew (maximum value of vertical illuminance on properties)

2.4.1 Luminaire Intensity (cd - candela)

- 10000 pre-curfew
- 1000 post-curfew

2.4.2 Upward Light (ULR %)

- 15%

The development is classified as an 'E3' environment in accordance with IS EN 12464-2:2014. This represents medium district brightness areas, well inhabited town and urban settlements such as industrial or residential suburbs areas.

2.5 General Lighting Design Values

General Task Lighting allows occupants navigate through the site and around building pedestrian pathways. General lighting is required during the normal operation of the building while emergency lighting is required in the case were the normal lighting operation fails due to power loss. The CIBSE lighting guides and IS EN 12464-2: 2014 recommend lighting values for external roadways & path ways.

According to the SDCC public lighting specification and in compliance with I.S. EN 132021-2:2015 & BS5489-1:2013, pathways and roads must meet minimum lighting levels.

All walkway areas should adhere to a minimum of P3 lighting class, with the calculation surface on the ground.
Roads must be illuminated to at least P2 lighting class.

The plan also includes several steps and ramps, and per Part M. These areas must have adequate lighting. Specific lighting will be used for these steps and ramps.

Based on EN 12464-2 2014 – Table 2, Figure 2, below we categorise all areas as follows -

- E3 – 10 Lux pre curfew/ 2 Lux post curfew - Environment which represents medium district brightness areas such as industrial or residential suburbs.

The selection of an appropriate P Lighting Class for a given area are summarized in CIE 115 Table 6, Figure 3 below. Results based on this are as follows –

- P2 – Public roadway.
- P2 - Residential Roads & Parking areas
- P2 – Courtyards
- P3 – Walkways & pedestrian footpaths

Lux levels for P lighting class is confirmed in EN 13201-2:2015 Road lighting — Part 2, Figure 4, CIBSE SLL Lighting Handbook (Including corrigenda- March 2019) Table 26.5 Lighting Recommendations for areas adjacent to the carriageway, residential or tasks and activities, Figure 5 and BS 5489.1 2013 – Table A.7 Figure 6 below.

P2 area an Illuminance of 10 Lux average with a minimum of 2 Lux is required and P3 area an Illuminance of 7.5 Lux average with a minimum of 1.5 Lux is required.

For guidelines for carpark spaces refer to IS EN 12464-2:2014 Table 5.9, Figure 8 below.

For guidelines for pedestrian walkways refer IS EN 12464-2:2014 Table 5.1, Figure 9 below.

Steps/Pedestrian Ramps need to be compliant with Part M requirements.

Results based on this criterion are as follows –

Location	Classification	Design lux level	Uniformity
Public roads access roads (low traffic)	P2	10 Lux	0.25
Public roadways carpark (low traffic)	P2	10 Lux	0.25
Public footpaths, pedestrian walkways, amenity green areas and car spaces	P3	7.5 Lux	0.25
Courtyards	P2	10Lux	0.25

Figure 2 Lighting Design Values

2.6 Technical Guidance Document M- Clause 1.1.3 Access routes

Part (g) the access route should be clearly identifiable and well lit. Where this is provided by artificial light it should achieve a minimum luminance of 20 lux on level and gently sloped access routes, with a minimum luminance of 100 lux on ramps or steps, measured at ramp, tread and landing level. Signage should be provided where.

2.7 Technical Guidance Document M- Clause 1.3.3.3 Corridors and passageways

Part m) corridors and passageways should be adequately lit. Artificial lighting for corridors and passageways that receive no daylight should be designed to achieve an illuminance at floor level of at least 100 lux.

2.8 Lighting Controls

Lighting controls are essential for all exterior lights. A photo-electric cell (PEC) is proposed for automatic switch-on at dusk and off with time control. Presence detection may also be incorporated for safety purposes & bat consideration, e.g. After curfew when no staff or public are outside, after a set interval time, lighting would reduce to a pre-determined level, e.g. 50%, but as soon as human or vehicular movement is detected, full illumination is restored.

We have not proposed any façade illumination.

We have a minimal Landscape illumination design included with negligible Sky Glow resulting.

2.9 Viewpoints

In addition to the setting we have considered the critical viewpoints which may be affected by the installation. We have reviewed impact on nearby residents, Businesses, Road users. There are no higher ground distant viewpoints to consider for this scheme

3 Road Lighting

The CIE has developed a structured model for the selection of the appropriate lighting classes (M, C, or P), based on the luminance or illuminance concept, taking into account the different parameters relevant for the given visual tasks. Applying for example time dependent variables like traffic volume or weather conditions, the model offers the possibility to use adaptive lighting systems.

3.1 Terms and Definitions

The terms discussed in this clause are defined in the International Lighting Vocabulary (CIE DS 017.2/E:2009) or in CIE 140-2000.

3.1.1 Average Luminance of the Road Surface [Lav]

The values of Lav are the minimum values to be maintained throughout the life of the installation for the specified lighting class(es). They are dependent on the light distribution of the luminaires, the luminous flux of the lamps, the geometry of the installation, and on the reflection properties of the road surface. Higher levels are acceptable when they can be environmentally or economically justified.

The calculation of the average luminance of the road surface should be carried out in accordance with CIE 140-2000.

Calculated values should consider the luminaire and lamp maintenance factors.

Luminaire maintenance factors vary according to the intervals between cleaning, the amount of atmospheric pollution, the quality of the sealing of the lamp housing of the luminaire, and the age of the materials. Their values may be established by field measurements. Lamp flux maintenance factors vary according to lamp type and power.

3.1.2 Overall Uniformity of Road Luminance [Uo]

Uo is the ratio of the minimum luminance at a point to the average road surface luminance and should be calculated according to CIE 140-2000. This criterion is important as regards the control of minimum visibility on the road.

3.1.3 Longitudinal Uniformity of Road Surface Luminance [Ul]

Ul is the ratio of the minimum to the maximum luminance along a line or lines parallel to the run of the road and should be calculated in accordance with CIE 140-2000. It is mainly a criterion relating to comfort and its purpose is to prevent the repeated pattern of high and low luminance values on a lit run of road becoming too pronounced. It only applies to long uninterrupted sections of road.

3.1.4 Threshold Increment TI [fTI]

Disability glare results from the scattering of light within the eye, so reducing contrasts of the retinal image. The effect may be explained by the superimposition of a uniform luminance veil over the scene, which is quantified as the equivalent veiling luminance. The magnitude of this depends on the illuminance on the driver's eye from the luminaires and the angles at which they are seen. While the degree of disability glare increases with the equivalent veiling luminance, it decreases as a function of the average road luminance.

TI is a measure of the loss of visibility caused by the disability glare from the road lighting luminaires. The formula from which it is calculated is based on the percentage increase in the luminance difference needed to make the object visible in the presence of glare when it is just visible in the absence of glare, that is, when the luminaires are screened from the view of the observer. The mathematical procedure is given in CIE 140-2000 and the calculation is made for a clean luminaire equipped with a lamp emitting the initial luminous flux.

3.1.5 Surround Ratio SR [Rs]

One of the principal aims in road lighting is to create a bright road surface against which objects can be seen. However, the upper parts of tall objects on the road and objects towards the side of the road, particularly on curved sections, are seen against the surrounds of the road. Thus adequate lighting on the surrounds helps the motorist to perceive more of the environment and make speed adjustments in time.

The function of the surround ratio is to ensure that light directed on the surrounds is sufficient for objects to be revealed. In situations where lighting is already provided on the surrounds the use of surround ratio is rendered unnecessary.

Surround ratio is defined in CIE 140-2000.

3.1.6 Discomfort Glare

No fully satisfactory method has yet been devised for quantifying discomfort glare to drivers on traffic routes. Formerly G, the Glare Control Mark (CIE 31-1976), was used but resulted in anomalies. Field evidence suggests that installations designed within the limits of threshold increment recommended in Tables 2 and 5 are generally acceptable as regards discomfort glare.

Bright surroundings, such as lighted buildings, tend to mitigate discomfort glare but as the lighting of buildings is variable and may be extinguished during the night, it is not practicable to allow for this in the design of the road lighting

3.1.7 Need

There are three main purposes of road lighting:

1) to allow all road users, including operators of motor vehicles, motor cycles, pedal cycles, and animal drawn vehicles to proceed safely,
2) to allow pedestrians to see hazards, orientate themselves, recognize other pedestrians, and give them a sense of security,
3) to improve the daytime and night-time appearance of the environment

3.2 Quality Criteria and Lighting Classes

3.2.1 Quality Criteria for Road Lighting

The approach generally used when selecting quality criteria for lighting roads for motor traffic is based on the luminance concept. Illuminance is still used by some countries, but experience has shown this to be an unsatisfactory criterion. In the application of the luminance concept, the aim is to provide a bright road surface against which objects are seen in silhouette. It uses, therefore, level and uniformity of road surface luminance, as well as glare control, as quality criteria. However, many objects on the road are of high reflectance, so they are not seen in silhouette but rather by directly reflected light.

Furthermore, in congested traffic conditions, much of the view of the road surface may be obstructed by vehicles and thus cannot provide a background for revealing objects. Nevertheless, the approach of providing a good level and uniformity of road luminance with adequate glare control has been widely adopted in national and international recommendations. Experience gained in using these criteria for several decades indicates that they provide a satisfactory basis for road lighting design. Although prescribed values of the criteria were originally arrived at because of experimental work, they have been tempered by experience over this time and the approach suggested in this document represents good present-day practice.

However, in special situations called "conflict areas" in this report, the design of the lighting installation can be based on the illuminance concept. The lighting design for pedestrian and very low speed areas is also based on illuminance requirements.

3.2.2 Quality Criteria

The road lighting should enable pedestrians to discern obstacles or other hazards in their path and be aware of the movements of other pedestrians, friendly or otherwise, who may be in close proximity. For this, the lighting on both horizontal and vertical surfaces, as well as the control of glare and the colour rendering, is important. Environmental issues should be taken into account.

3.2.3 Lighting of Horizontal Surfaces

To ensure that the pedestrian can move over the road and footpath surfaces in safety, the horizontal illuminance, Eh, must be adequate. Horizontal illuminance is measured at ground level in terms of average and minimum values, and applies to the whole of the used surface, which usually comprises the footways and the carriageway surface, unless the carriageway is treated separately under the provisions for motorized traffic.

3.2.4 Lighting of Vertical Surfaces

Adequate lighting of vertical surfaces is necessary for facial recognition, which may also enable an act of aggression to be anticipated. The quantification of this presents a difficulty CIE 115:2010 17 because of the multiplicity of planes at each measurement point which must be taken into account. An attempt to overcome this has been made by considering the illuminance on an infinitesimal vertical half cylinder situated at head height (1,5 m). This measure, the semi-cylindrical illuminance, Esc, has been introduced in CIE136-2000, as an adjunct to horizontal illuminance. For its measurement a special adaptation is required to the mounting of the photoelectric detector which is used to measure planar illuminance.

3.2.5 Control of Glare

The control of discomfort and disability glare is not as critical as for the motorist, because speed of movement is much lower, giving a greater reaction time. No method of quantifying glare has been agreed to internationally, but a number of methods are in current use on a national basis. Methods for quantifying and controlling glare in pedestrian and low speed traffic areas are given in Annex D.

3.2.6 Choice of Light Source

Monochromatic light sources should be avoided for areas where the crime risk is high, that are environmentally sensitive, or where pedestrian activities predominate. Using light sources with better colour rendering properties will improve the possibility to see colour contrasts and contributes to a better facial recognition. This could be of particular importance for elderly or visually impaired users of pedestrian and low speed traffic areas. NOTE The use of low-pressure sodium lighting is considered a positive environmental step in areas with sensitive optical astronomical facilities and near sea turtle nesting areas.

Selection of Lighting Classes Tables quantifying the details of different lighting classes and referred to below can be found in the relevant clauses following, where they are discussed in more detail.

3.2.7 Normal Lighting

Normal lighting class is that class which is appropriate if the same level is to be used throughout the hours of darkness. In selecting the normal lighting class the maximum value of the selection parameters likely to occur at any period of operation should be considered, e.g. for traffic volume consider peak hourly value.

3.2.8 Adaptive Lighting

The normal lighting class is selected using the most onerous parameter values, and the application of this class may not be justified throughout the hours of darkness (This might be under changing conditions e.g. weekends, different weather conditions). Temporal changes in the parameters under consideration when selecting the normal lighting class could allow, or may require, an adaptation of the normal level of average luminance or illuminance, usually by reducing the level. The adapted lighting level or levels should be the

average luminance or illuminance from a class or classes in the same table from which the normal lighting class has been selected.

It is important that the changes in the average lighting level do not affect the other quality criteria outside the limits given in the system of M, C or P lighting classes. Reducing the light output from every lamp by the same amount using dimming techniques will not affect luminance or illuminance uniformity, or the object contrast, but the threshold contrast increases. Reducing the average level by switching off some luminaires will not fulfil the quality requirements and is not recommended.

The use of adaptive lighting can provide significant reduction in energy consumption, compared with operating the normal lighting class throughout the night. It can also be used to reduce energy consumption by reducing the lamp light output to the maintained value when the installation is clean, and the lamps are new. Where the pattern of variation in parameter values is well known, such as from a record of traffic counts on traffic routes, or can be reasonably assumed, as in many residential areas, a simple time-based control system may be appropriate. In other situations, an interactive control system linked to real-time data may be preferred. This approach will permit the normal lighting class to be activated in the case of road works, serious accidents, bad weather or poor visibility.

3.3 Lighting Class P: Pedestrian and Low Speed Traffic Areas

Lighting Levels for Pedestrian and Low Speed Traffic Areas The parameters relevant for the selection of an appropriate P lighting class for a given pedestrian or low speed traffic area are summarized in Table 6. The lighting classes P1 to P6 are defined by the lighting criteria given for each class in Table 7. They are intended for pedestrians and pedal cyclists on footways, cycleways, and other road areas lying separately or along the carriageway of a traffic route, and for residential roads, pedestrian streets, parking places, etc.

CIE 115:2010

Table 6. Parameters for the selection of P lighting class.

Parameter	**Options**	**Weighting Value V_w**	**V_w Selected**
Speed	Low	1	
	Very low (walking speed)	0	
Traffic volume	Very high	1	
	High	0,5	
	Moderate	0	
	Low	-0,5	
	Very low	-1	
Traffic composition	Pedestrians, cyclists and motorized traffic	2	
	Pedestrians and motorized traffic	1	
	Pedestrians and cyclists only	1	
	Pedestrians only	0	
	Cyclists only	0	
Parked vehicles	Present	0,5	
	Not present	0	
Ambient luminance	High	1	
	Moderate	0	
	Low	-1	
Facial recognition	Necessary	Additional requirements	
	Not necessary	No additional requirements	
		Sum of **W**eighting **V**alues	V_{WS}

Figure 3 Parameters for the selection of P Lighting Class

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.

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.

Table A.6 **Lighting classes for subsidiary roads with mainly slow-moving vehicles, cyclists and pedestrians**

Traffic flow	Lighting class	
	Ambient luminance: very low (E1) or low (E2)	Ambient luminance: moderate (E3) or high (E4)
Busy [A]	S4 or P4	S4 or P4
Normal [B]	S5 or P5	S5 or P5
Quiet [C]	S6 or P6	S6 or P6

NOTE 1 If facial recognition is important then an ES lighting class from BS EN 13201-2:2003, Table 5, or an E_{SC} lighting class from CIE 115:2010 [N1], Table 7, can be selected as an additional criterion. Good colour rendering contributes to a better facial recognition. (The ES lighting class in BS EN 13201-2:2003 is expected to be replaced by SC upon publication of the revised edition.)

NOTE 2 To ensure adequate uniformity, the actual value of the maintained average illuminance is not to exceed 1.5 times the value indicated for the class.

NOTE 3 It is recommended that the actual overall uniformity of illuminance U_o be as high as reasonably practicable.

NOTE 4 Grey highlighting indicates situations that would not usually occur in the UK.

NOTE 5 The ambient luminance descriptions E1 to E4 refer to the environmental zone as defined in ILP GN01 [N5].

[A] Busy traffic flow refers to areas where the traffic usage is high and can be associated with local amenities such as clubs, shopping facilities, public houses, etc.

[B] Normal traffic flow refers to areas where the traffic usage is of a level equivalent to a housing estate access road.

[C] Quiet traffic flow refers to areas where the traffic usage is of a level equivalent to a residential road and mainly associated with the adjacent properties or properties on other equivalent roads accessed from this road.

Figure 4 Lux levels and uniformity for Lighting Classs P

4 Façade lighting

The extent to which floodlighting of building façades produces sky glow largely depends on the luminous intensity distribution of the luminaires, where they are mounted, and how well they are aimed.

Building façades can be lit either by floodlights placed at a distance or mounted close-set to the building.

Luminaires mounted so that they light downward and having a distribution that confines the light to surface of the building will create the fewest issues, although light intrusion into the building itself may still be a problem. Luminaires aimed upward and having a distribution that extends beyond the building will contribute most to sky glow and may well create light spill and have not been utilised in this design.

There is a trend for mounting bi-directional 'up/down' luminaires onto building façades whereas a direct-only downward version can still create the intended impact and also adds to the contribution of lighting on pathways and entrances at ground level, but without the harmful effects of the indirect distribution going up into the sky.

With the development and flexibility of LEDs, there is scope for covering the façades of large buildings with lighting to create an impact and beautify the nightscape. If strongly coloured light is used this offers the opportunity to use lower luminance light sources because the colour contrast will make the lit façade stand out against its surroundings. This reduces the contribution to sky glow, however it is crucial that the application of colour is relevant and that the colour palette selection is appropriate to that façade in its surroundings.

Consideration has been given to light colour in this design and we have proposed 3000K

5 Insect and Animal (Bat) Protection

Responsible outdoor lighting and environmentally friendly light design is essential as it has a significant impact on the biological activity of plants and microorganisms as well as people and animals.

Artificial light – especially light with high blue light content – attracts animals, especially insects and birds. It can severely disrupt life's natural rhythms. This design proposal mitigates against adverse effect on animals.

For Bat protection, the following mitigation measures have been imposed.

Lighting has only been installed where necessary for public safety. These lights have been designed and selected with specific shutters and filters to minimise any potential for back spills into the sensitive locations while still providing the primary function of safely lighting to the circulation routes.

5.1 Reflectance's

Downward lighting can be reflected from bright surfaces. To minimize bat disturbance, the design avoids the use of bright surfaces and incorporates darker colour lamp heads and poles to reduce reflectance (RAL Anthracite grey).

5.2 Shielding of Luminaires & Light

To minimize bat disturbance, the design avoids the use of upward lighting by shielding or by downward directional focus. Light should only be directed to where it is needed.

5.3 Type of Light

To minimize bat disturbance, the design avoids the use of strong UV lighting. The lighting design is based on the use of LED lighting which has minimal or no UV output of significance and use of monochromatic sources and a warm-white (3000K or less) LED with low blue content.

Glare, stray light and upward and sideward light from the luminaires has been be avoided where possible.

5.4 Illumination

The illumination should be no brighter than necessary and should be integrated into a demand-based control system.

6 Proposed Lighting Scheme

Pole top lighting is the primary lighting type proposed throughout. The proposed luminaires are utilized to meet all the mentioned design criteria (minimum lux levels, glare, colour rendering etc.). Lighting specification sheets can be seen in Appendix 1.

6.1 Proposed Lighting Scheme Calculation Results:

The figures below detail the light calculation result generated by Lighting Reality.

On review of the lighting results, light levels achieved are in line with standards and little or no light pollution on adjacent properties exist.

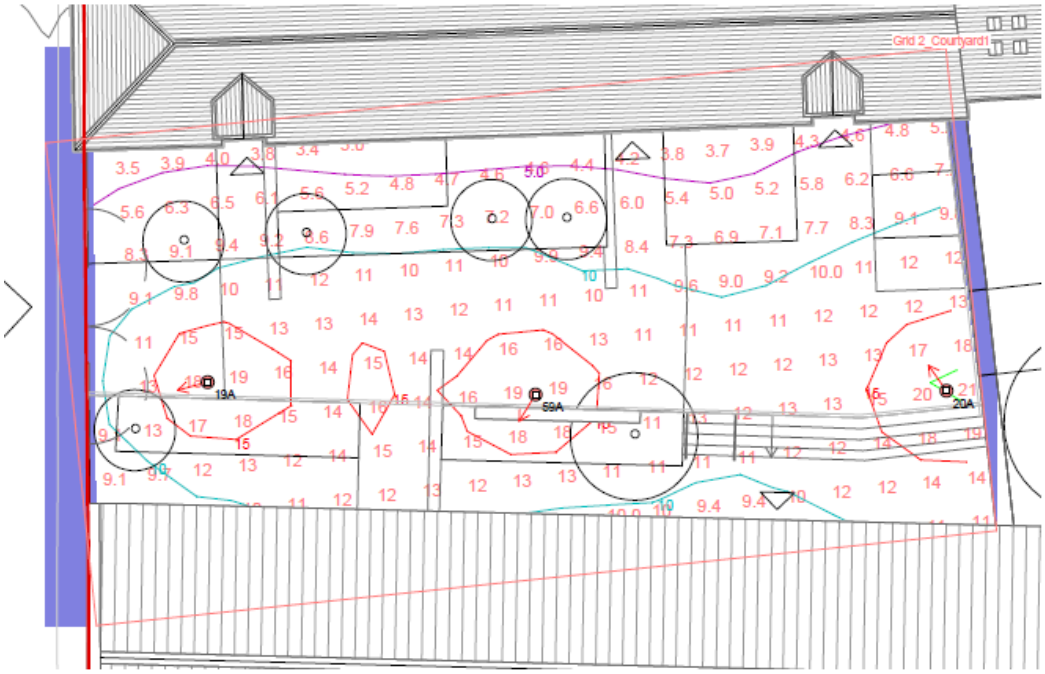
The ULR has been estimated at 1.0% which is less than the design criteria maximum of 15% for an E3 environment.

Levels can be reduced with dimming, see Section 2.8 for details.

On review of the lighting results, light levels achieved are in line with standards and little or no light pollution on adjacent properties exist.

The ULR has been estimated at 1.0% which is less than the design criteria maximum of 15% for an E3 environment.

Courtyard 1 – Average lux level: 10.80 Lux at 0.27 uniformity



Results

Eav	10.80
Emin	2.95
Emax	20.66
Emin/Emax	0.14
Emin/Eav	0.27

Figure 5 Courtyard 1

Courtyard 2 – Average lux level: 13.65 Lux at 0.29 uniformity

Results

Eav	13.65
Emin	3.96
Emax	26.01
Emin/Emax	0.15
Emin/Eav	0.29

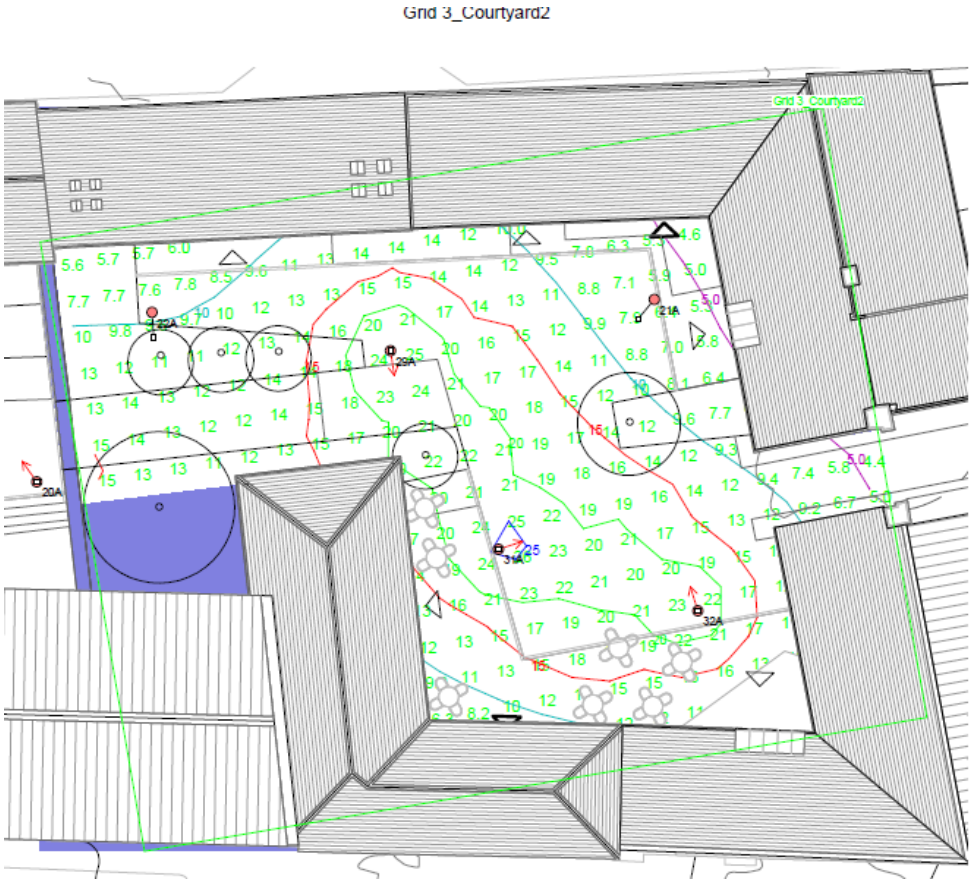


Figure 6 Courtyard 2

Courtyard 3 – Average lux level: 12.35 Lux at 0.20 uniformity

Results

Eav	12.35
Emin	2.50
Emax	24.75
Emin/Emax	0.10
Emin/Eav	0.20

Figure 7 Courtyard 3

Courtyard 4 – Average lux level: 9.26 Lux at 0.30 uniformity

Results

Eav	9.26
Emin	2.80
Emax	19.91
Emin/Emax	0.14
Emin/Eav	0.30

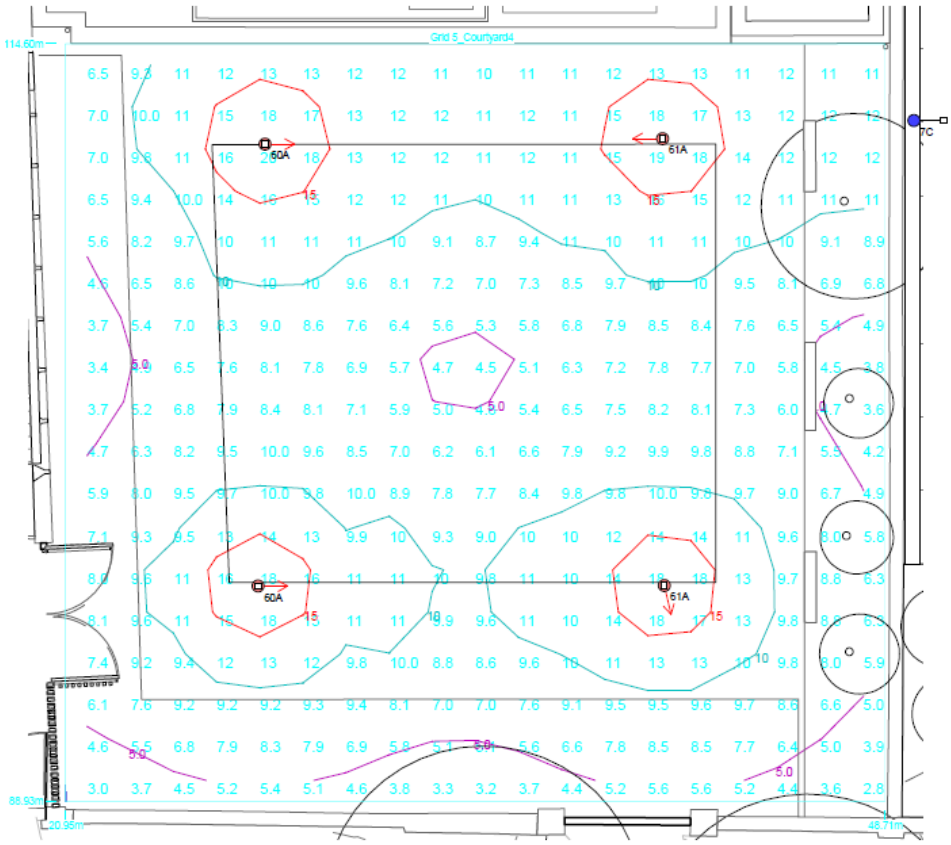


Figure 8 Courtyard 4

Walkway – Average lux level: 7.49 Lux at 0.29 uniformity

Results

Eav	7.49
Emin	2.19
Emax	11.65
Emin/Emax	0.19
Emin/Eav	0.29

Grid 6_Walkway

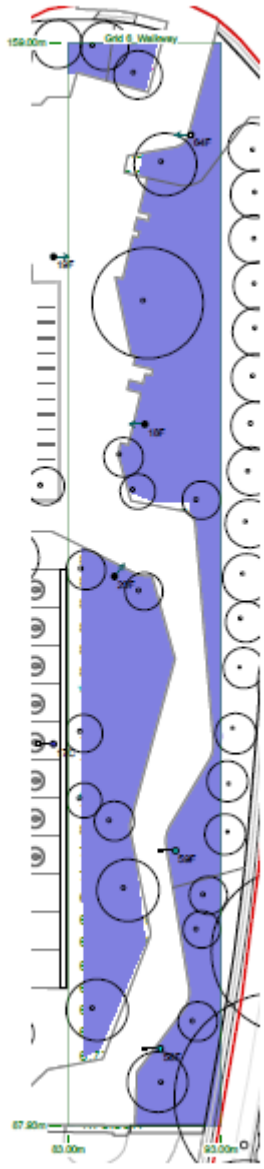


Figure 9 Walkway

Entry Road – Average lux level: 12.53 Lux at 0.24 uniformity

Results

Eav	12.53
Emin	3.05
Emax	29.07
Emin/Emax	0.10
Emin/Eav	0.24

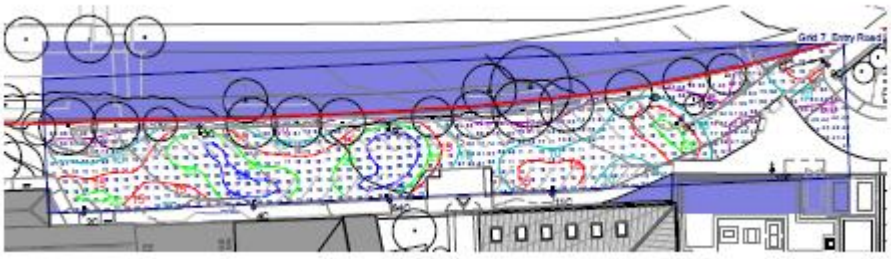


Figure 10 Entry Road

Road – Average lux level: 14.65 Lux at 0.50 uniformity

Results

Eav	14.65
Emin	7.38
Emax	21.07
Emin/Emax	0.35
Emin/Eav	0.50

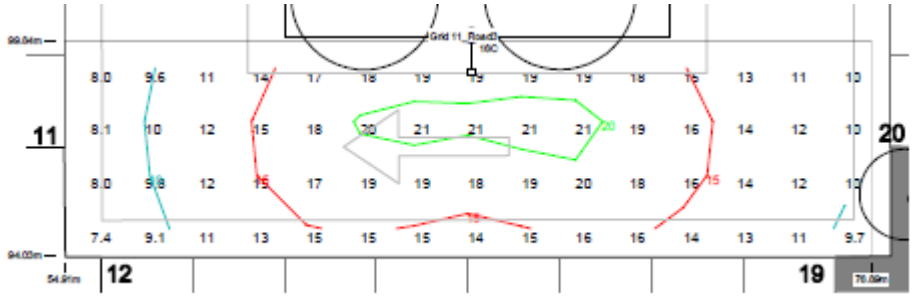


Figure 11 Road

Parking – Average lux level: 16.64 Lux at 0.40 uniformity

Results

Eav	16.64
Emin	6.71
Emax	26.04
Emin/Emax	0.26
Emin/Eav	0.40

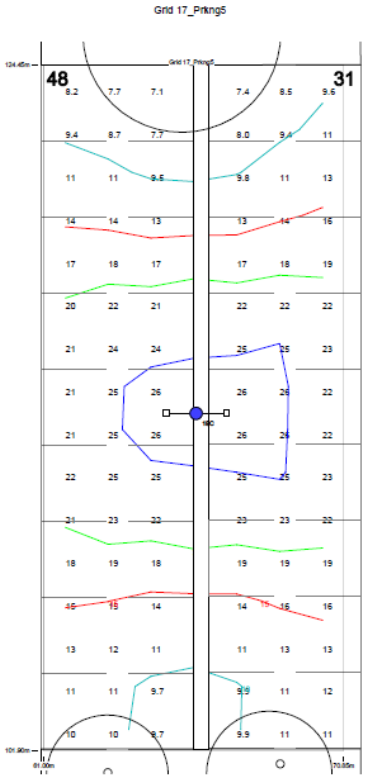


Figure 12 Parking

7 Luminaire Schedule

XA
LED External Street Lantern mounted on 6m Raise/Lower Galvanised steel hex-cross section type column
Thorn Urba or equal and approved.

Figure 13 Single Head

XB
LED External Twin Street Lantern mounted on 6m Raise/Lower Galvanised steel hex-cross section type column
Thorn Urba or equal and approved.

Figure 14 Twin Head

XC
LED External Post top Luminaire all mounted on a 6m Raise/Lower galavanised steel hex-cross section type column.
Thorn Plurio or equal and approved.

Figure 15 Thorn Plurio

XD
LED External Post top Luminaire all mounted on a 3m Raise/Lower galavanised steel hex-cross section type column.
Thorn Plurio or equal and approved.

Figure 16 Thorn Plurio

XF & XF/E
LED external wall mounted fitting, XF/E with emergency battery pack
Thorn Piazza or equal and approved.

XG
Handrail fitting
URBIS SCHREDER Alinea or equal and approved.

8 Conclusion

The calculation results, generated by Lighting Reality and confirm that the design as presented complies with the design criteria of an E3 environment.

The design includes for mitigation to bat foraging which are light sensitive, 3000k lamps are used throughout.

Light fittings used throughout with no upward light output throughout to minimise light spill.

Good optical control will be used with an upward light ratio of 0% for the fittings.

The proposed layout offers a design aesthetically pleasing for occupants and for the site as a whole.

Homan O' Brien believe the proposed layout will blend seamlessly into the surrounding environment.

9 As Constructed Documentation & Warranties

On completion O & M Manuals for Public Lighting Installation shall be provided by the Electrical Contractor directly to SDCC Public Lighting Department.

Following completion of the defect's liability period warranties for all equipment for Public Lighting Installation shall be provided by the Electrical Contractor directly to DCC Public Lighting Department.

10 Appendix 1: Drawing List

RATH-HOB-XX-XX-DR-E-1001	Site Lighting Layout Rev 'P-02'	Date: 09.04.2025
RATH-HOB-XX-XX-DR-E-1002	Site Lighting Isolines Layout Rev 'P-01'	Date: 09.04.2025

11 Appendix 2: List of Attachments

Electrical Drawing/Document Issue Register – Planning	Date: 09.04.2025
2331 Lighting Reality Report (PDF)	Date: 09.04.2025
2331 Lighting Reality Calculation File	Date: 09.04.2025